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JUNE 2011 ■ #190

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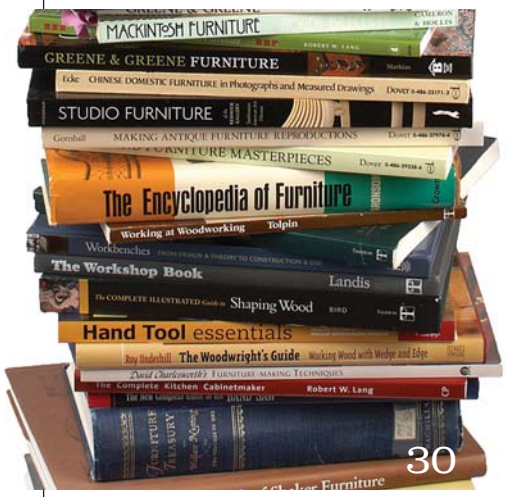

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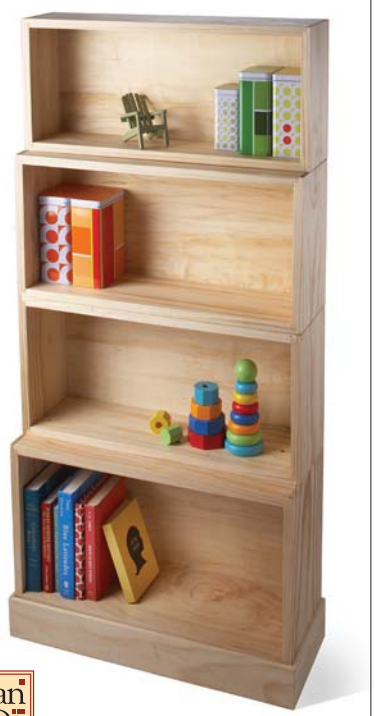

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CONTRIBUTORS

Gary Rogowski

"Jasmine Jewelry Box," page 46.

Gary Rogowski has been a woodworker since 1974, when he found an old wooden handplane outside his house, and proceeded to teach himself woodworking. He began showing his work in galleries in the late '70s, and building on commission. In 1989, his pieces were featured in the Oregon Biennial at the Portland Art Museum, and in 1991, Gary was awarded the Oregon Arts Commission fellowship in Crafts. Today, Gary is director of the Northwest Woodworking Studio in Portland, Ore.

He's been writing about woodworking since 1988 and has dozens of published articles and videos, and two books on joinery.

This is his first article for *Popular Woodworking Magazine*.

To read more about Gary and his woodworking classes, visit northwestwoodworking.com.

Jim Tolpin

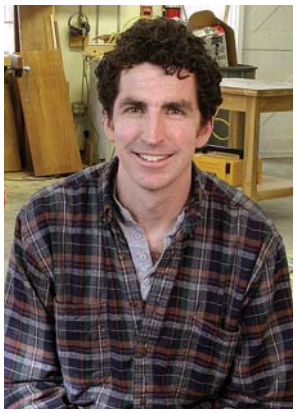
"Secrets of the Sector," page 40.

Jim Tolpin has been a professional woodworker for three decades, and his career spans everything from boat building to timber framing to building custom cabinets and furniture. He's also written a number of woodworking books (of which he's sold more than 750,000 copies) and articles for many major magazines, and now teaches at the Port Townsend School of Woodworking in Port Townsend, Wash.

Though he used to swear by his table saw, Jim has recently delved deep into the hand-tool world; his latest book, "The New Traditional Woodworker" (Popular Woodworking Books) covers that journey.

In this issue, he writes about the sector – a virtually forgotten woodworking tool for layout and design.

To read more about Jim and the Port Townsend School of Woodworking, visit ptwoodschool.com.



Ajax Alexandre

Your new Online Community Editor.

Ajax Alexandre joins us as the new online community editor, which means he takes care of the *Popular Woodworking Magazine* web site, answers your e-mails, coordinates and directs video shoots and much more. Plus he's a woodworker – so expect to see some of his work in future issues of the magazine and on the site.

Ajax earned a master of fine arts degree in Artisanry/Furniture Design from the University of Massachusetts at Dartmouth, and has a bachelor's degree in Theatre Arts from The Ohio State University.

He's moved back to his hometown of Cincinnati after 15 years in Rhode Island, where he most recently worked at the Rhode Island School of Design.

You'll see Ajax's work on our web site (popularwoodworking.com) and in upcoming issues of the magazine.

POPULAR WOODWORKING MAGAZINE

JUNE 2011, VOL. 31, NO. 3
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EDITORIAL OFFICES 513-531-2690

BY CHRISTOPHER SCHWARZ, EDITOR

The Curious Case Of The Stanley Works

When I grew tired of my no-name block plane and chisels, I did what every red-blooded woodworker wants to do: I bought Stanley tools.

After all, Stanley built America and America built The Stanley Works. Stanley made excellent metallic tools. And it was so successful at business that it gobbled up most of its competitors.

But when I bought Stanleys, I didn't buy new ones. I bought a jack plane from the early 20th century and chisels from before World War II.

PHOTO BY THE AUTHOR

Why not new?

You know why. After the war, Stanley turned its attention from building a full range of tools for the carpenter and serious woodworker to making everything for anyone. And I mean everything – garage door openers, sliding glass doors and laser levels. Stanley made almost everything you needed – except high-quality hand tools for woodworking.

This is the void that Lie-Nielsen Toolworks, Veritas, Clifton and other toolmakers filled during the last gasp of the 20th century. By the skin of their teeth, these small toolmakers (and others) made tools that improved upon the tools that The Stanley Works churned out during its early years.

It was these small-scale makers that ignited the renaissance we are now seeing in hand tools. But in the process they might have awakened a sleeping giant.

For Stanley has decided to again pursue the serious hand-tool user. Last year it introduced a modern line of planes to compete with Lie-Nielsen, Clifton and Veritas.

The results? Mixed. These new planes don't equal the tools Stanley made before the war. The castings are rougher. The lever cap is lightweight. The handles are uncomfortable.

Yes, the planes work. But not as well as old Stanley tools and new premium planes.

But in this issue of *Popular Woodworking Magazine* I review the new Stanley Sweet Heart chisels, and the results are different. The chisels are based on venerable Stanley 720 and 750 designs, which are so perfect that Lie-Nielsen used these discarded patterns as the foundation for its chisels – my personal favorite.

After weeks of using the Stanley chisels, I'm torn. The chisels are not as perfect as the Lie-Nielsen versions, but they are excellent. Have woodworkers prodded Stanley into making great tools again? Will Stanley start gobbling up its competitors again?

Can Stanley keep improving its tools to the point where it was in 1939?

I say this with both fear and hope: We'll see. **PWM**

POPULAR Woodworking MAGAZINE

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Safety Note

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

Highly Recommended

If you want to start in hand work and hand joinery, it can be difficult to figure out where to begin. Here's a good starting point: inexpensive reprints of two classic books by William Fairham.

"Woodwork Tools" and "Woodwork Joints" are two excellent and underappreciated English texts on handwork. Now Toolemera Press has reprinted them and they are less than $20 each. This is a steal. The reprints are excellent, but the content is even better. We like the books so much that we carry them in our store, or you can order them at shop.toolemera.com.

— Christopher Schwarz

PHOTO BY THE AUTHOR

FESTOOL

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Sawing for Lefties

In "How to Saw" (a post on his blog), Christopher Schwarz states that if you are left-handed, you should attempt to cut on the left side of the line when possible. But, on his sawbench DVD, Christopher states that you should always position the waste toward you.

That seems contradictory to me because to position the waste toward me would have me sawing on the right side of the line. Am I missing something? It seems to me that it would be best to position the waste toward the bench in order to saw to the left of the line. Please clarify.

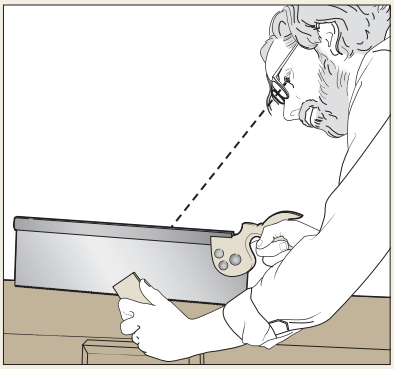
Duane Lindsey
via e-mail

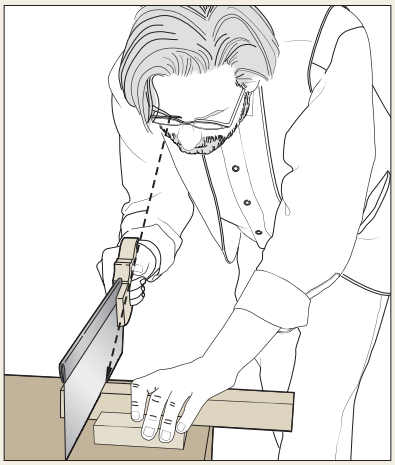
Duane,

You raise a good point that I should have clarified. When I saw in the vise, I find I am more accurate with the waste to the front and with my saw on the left of the line. I need to ponder "why" this is so, but I think it has to do with the different body positions. When sawing in the vise (for a tenon cheek), my body is parallel to the bench. But when I saw using a bench hook, I (a right-hander) saw on the right of the line.

So that's what I meant. Sorry for the confusion.

Christopher Schwarz, editor





Replacement for Gel Varnish

In my part-time work restoring antique furniture, I've been using Bartley's "Wipe On Gel Varnish" (satin) as a top coat on most of the pieces I repair and refinish. Regrettably, this product is no longer being made (though I hear someone may bring it back into production). Is there a product on the market that in your opinion might give me the same results as the Bartley's?

I hate to bother you with such a mundane request but I am running out of my hoard of Bartley's and may soon be getting desperate.

Ron Potter,
Forest City, Pennsylvania

Ron,

There are other brands of gel varnish, including Old Masters and General Finishes. Old Masters is sold in paint stores. General Finishes is sold in woodworking stores and catalogs. You may find "neutral" gel stain, also, which is gel varnish.

For an article on gel varnish I wrote for the December 2009 issue (#180), I did tests with a number of the brands. Bartley's dries considerably faster than the others, which causes some problems (which you have surely gotten used to) on larger surfaces. You may be able to recoat sooner, though. But after using all the brands, I actually liked using Bartley's the least.

All the brands had one really critical downside: None is water-resistant. So I recommended coating with another finish (which it sounds like you're doing), then coating over with the gel varnish at the end to produce the pleasing satin sheen, and dust- and brush-free results.

One more thing: There did appear to be a slight difference in the degree of gloss (shine). I applied seven coats of each brand, and the more I applied the more apparent the differences. Bartley's and Old Masters seemed to be a little glossier than General Finishes and Woodkote.

So I guess if you were trying to find the exact same "look," you should try to find someone who carries Old Masters, which is labeled "Gel Polyurethane."

I'd be curious to hear how you apply the gel varnish.

Bob Flexner, contributing editor

Kids & Woodworking

I have a 5-year-old grandson who I'm trying to get started in woodworking. And like elsewhere, the schools here aren't going to help.

I'm not an expert at which motor skills are available to pursue at what age, and perhaps in what sequence, and which tools might relate to a particular developmental stage. I do know the 5-year-old can navigate the Internet and find approved game sites on which to play. And on Wii he can beat teenage cousins in select games.

It's a stretch to expect a child accustomed to such quick feedback to accept "exercises" for skill building, nor will he learn to use a hammer by straightening all the reclaimed nails in the coffee can as I did. (Yes, I'm that old.)

Lowe's is trying to help by providing simple pre-cut projects for free (Sat-

CONTINUED ON PAGE 12

ILLUSTRATIONS BY MARY JANE FAVORITE

CONTINUED FROM PAGE 10

"We learn more by looking for the answer to a question and not finding it than we do from learning the answer itself."

— Lloyd Alexander (1924-2007)
American author

urday morning kids' sessions) or for a modest sum when purchased off the shelf. The sessions do hold his interest, but there's not a lot of skill building going on there. Skill-building projects that provide reasonably quick feedback seem important for today's kids.

I think such a book would find a lot of fathers and grandfathers finding value in it. And we've got to get him trained since he will inherit a terrific shop. Lucky guy.

Do you have any suggestions?

Harlan Janes
Chocowinity, North Carolina

Harlan,

You are right that there isn't a lot of stuff out there for kids. With my girl, I use "Exercises in Wood-Working," which is a school text for older kids, but works fine with the younger ones as well. My little girl is 9.

Doug Stowe has devoted his life to teaching young kids to be woodworkers using the Sloyd system. He could definitely help you out. Read through his blogs on his school and such. That will give you lots of ideas (wisdomofhands.blogspot.com and dougstowe.com).

The Sloyd system is very interesting and probably should be revived. But how?

Christopher Schwarz, editor

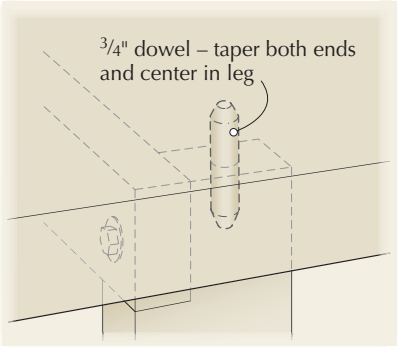
Vise & Bench Base Problems

I am trying to retrofit a leg vise on my oddball workbench that I built when I first started years ago. My top, which is laminated plywood, is about 3" thick. The base is quite rough – a 2x4 construction of my own design. The top is attached to the base with angle brackets. I am finding that the force of the leg vise, when I hold small, narrow pieces that are not wider than the depth of the top (so the leg vise pushes only on the top, not against the leg also), is pushing the top hard enough to offset it from the legs and that the legs are wracking so that they are no longer square. The result is that the top and the leg no longer line up. Do you think I just need to build a better base?

I want to use hem-fir from the home center (I live in the Pacific Northwest and yellow pine is out of the question). The dimensions of the stretchers, at 1 5/8" thick, are a bit awkward. If I use one piece of 2x lumber dried and machined in my shop, it will be about 1 1/4". Is that too thin? But if I laminate two pieces, I am up to 2 1/2".

Am I the only one who wonders about this type of thing? Any advice would be appreciated.

David Brown,
Spokane, Washington



David,

First, attempt to salvage your current workbench. Angle brackets work fine with some benches (I used them on the "24-hour Workbench" I built years ago). However, they don't play well with a leg vise because the vise will transfer the force of the chop to the front edge of the benchtop.

There's a simple solution: Join the top and base with a few 3/4"-diameter dowels. Some do this by drilling blind holes in the base and top, then dropping the top on the dowel. This will prevent the top from shifting.

As to using dimensional stock, I have found that 2x material will finish out at 1 1/2" thick. That's thick enough for stretchers. Double up and that's thick enough for legs.

But before you start building a new base, try securing your existing top to your existing base to withstand the force of a leg vise.

Christopher Schwarz, editor

Ticking Stick Memories

In the early 1980s I worked in a boat shop where we used ticking sticks all the time for fitting bulkheads and similar items into the V-bottom of boats and other irregularly shaped spaces.

Through the wonders of social networking, I recently reconnected with a gal I worked with at the time. I had recently unearthed my 30-year-old, 1/4"-plywood scrap, fiberglass-coated ticking stick and sent her a picture of it saying, "Remember this?"

In response, she sent me the November issue of *Popular Woodworking Magazine* (#186) with the article on ticking sticks! We had formed a bond being the only two women in the shop. Careers and families took us to different sides of the Pacific, but we both still work with wood and are looking forward swapping some shop tips when we get together this spring. PWM

Jody Fergerstrom
Captain Cook, Hawaii

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EDITED BY KARI HULTMAN

THE WINNER:

Multi-use Bench Hook

Many people eager to learn woodworking become discouraged by limited space or a tight budget. I designed a bench hook with them in mind. It's heavy enough to stay put, but it's easily moved out of the way when space is needed. Depending on which accessories I use, the bench hook enables me to work on the face, edge and end grain of small projects.

Because I use my low-angle jack plane for the lion's share of edge and surface work, the top of the bench hook needed to be long and wide enough to accommodate my 15" plane. The $2\frac{1}{4}$"-thick maple top provides a hefty, stable surface, and enables the bench hook to accept commercially available accessories.

The runner (for shooting) is attached as a separate piece. This allows for easy removal when truing the bench hook. As an option, you can layer two boards to construct the top, leaving the lower piece wider to create the runner.

The face piece is long enough to accommodate end-grain work, such as cutting dovetails, but not too long to upset the balance of the bench hook. Make sure all pieces are perfectly square and countersink the screws. Attach the runner to the long side of the top with screws, keeping the bottom edges flush.

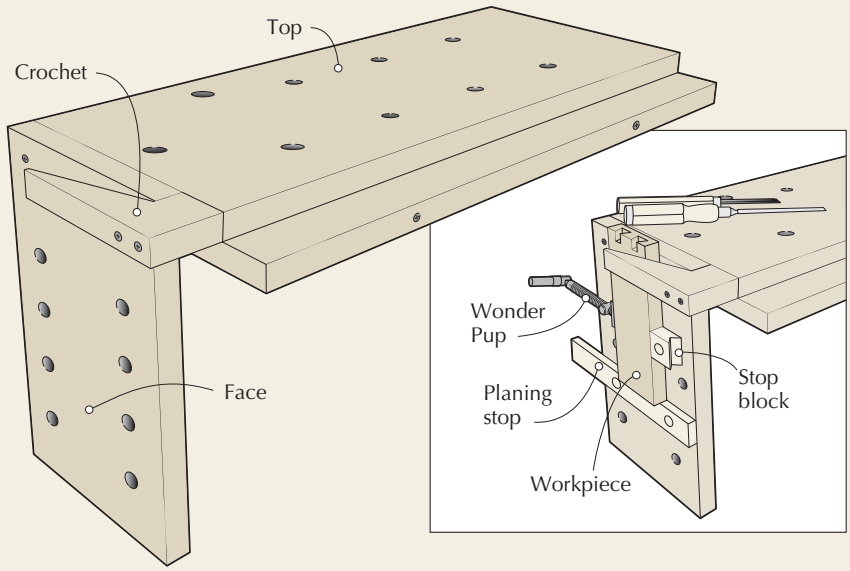
Attach the top edge of the face to the front edge of the top with screws, keeping it flush with the top's surface. Then attach the crochet with screws, keeping it flush with the top's surface and right-side edge.

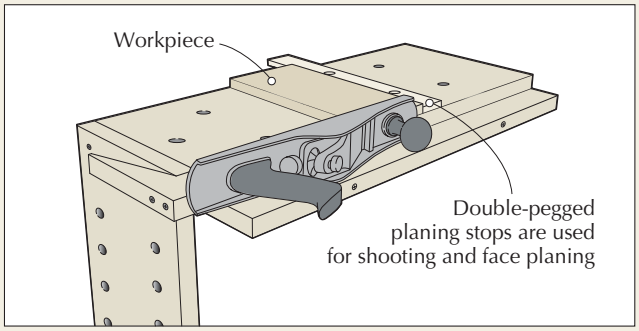
I built three double-pegged bench stops. Each is a different thickness – 1", $\frac{7}{16}$" and $\frac{3}{16}$". The $\frac{3}{4}$" dowels protrude $\frac{1}{2}$" from the bottoms of the stops and are spaced on 5" centers to match the holes on the top and face of the bench hook. The bench stops are at a 90° angle to the long edges of the bench hook.

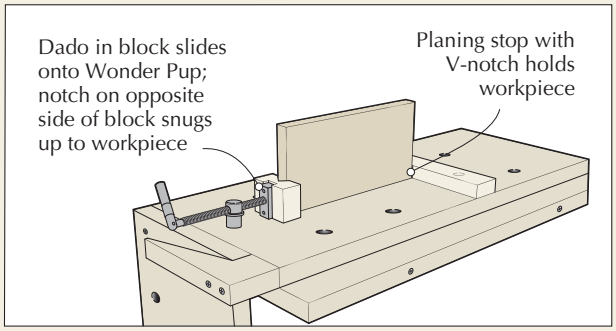
I made a "shoe" with a $\frac{5}{8}$" dado that slides over the Veritas Wonder Pup (#05G10.02). A V-shaped notch on the opposite side snugs the workpiece. I cut a corresponding notch in the thickest bench stop and use the two accessories together when working the edge of a board.

Mary Nickol
Coeur d'Alene, Idaho

Editor's note: Visit Popular Woodworking Magazine*'s 3D warehouse collection for SketchUp templates and dimensions for this trick.*







ILLUSTRATIONS BY MARY JANE FAVORITE

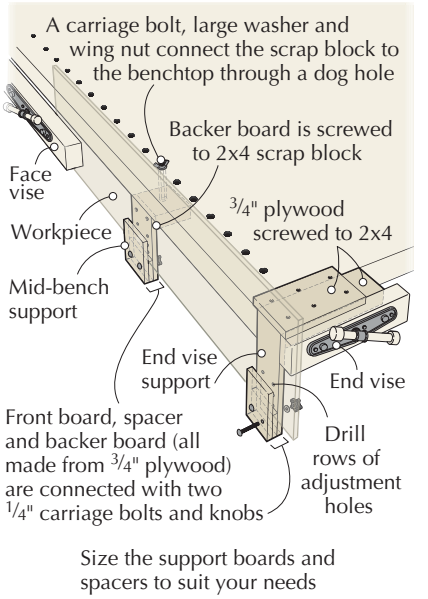
Long Board Supports

I used to use a freestanding, adjustable deadman to support long pieces at my workbench, but designed a better system that eliminates floor clutter and obstructions. I came up with end vise and mid-bench supports made from pieces of 3/4" plywood and 2x4s.

The end-vise support has a 2x4 body long enough to be held by the end vise without racking. The top piece of plywood rests on top of the workbench and end vise so that the weight of the workpiece is transferred to the bench.

The mid-bench support works with any of the dog holes near the front of my workbench. A large washer, carriage bolt and wing nut connect the support assembly to the benchtop through a dog hole.

As an alternative, you can install a Veritas Bench Anchor from Lee Valley (#05G22.05) mounted upside down in the dog hole. This way, a bolt can be inserted from beneath, through the support assembly, and into the bench anchor, so that no metal protrudes above the workbench.



Size the support boards and spacers to suit your needs

Workpieces are held in place by a spacer and a front board that connect to the vertical backer board with 1/4" carriage bolts and knobs. I use spacers that match the thickness of my work.

The carriage bolts go through the front of the jigs and the knobs are tightened on the backs, so they don't get in the way. Drill rows of adjustment holes in the vertical backer boards, and size the vertical backer boards, spacers and front boards to suit your needs.

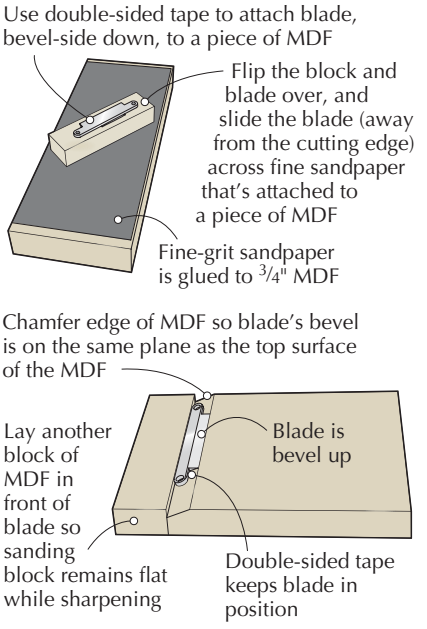
Jim Quinlivan
Torrance, California

Sharpening Spokeshave Blades

I use 3/4"-thick MDF, double-sided tape and sandpaper to flatten the backs of spokeshave blades and sharpen them. I attach the blade to the MDF, bevel-side down, with double-sided tape. This provides a way to handle the blade without danger of nicking my fingers. On another piece of MDF, I adhere a sheet of sandpaper and use it as I would a sharpening stone, to flatten the back of the blade.

I cut a chamfer on another block of MDF, the angle of which positions the blade's bevel on the same plane as the top surface of the MDF. Double-sided tape holds the blade at this angle. Then, I slide the MDF/sandpaper block across the bevel to sharpen it.

Bill Larsen
Round Lake, Illinois



Carabiner Cord Holder

When I am using a corded tool such as a sander, drill or router, the cord gets in the way or catches on something. My solution is to attach a large carabiner to my belt or belt loop. I run the power cord through the carabiner, which puts it where I want it – out of the way. If I'm moving around a lot and need even more control, I attach a second carabiner to the belt loop behind me and run the cord through it as well. Carabiners can be found at your local hardware store. PWM

Dan Urban
Glen Ellyn, Illinois

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VIDEO: *Tricks-in-Action shows you a free video of one of this issue's tricks in use in our shop. Watch the "Carabiner Cord Holder" – as well as a few of our other favorites.*

WEB SITE: *Visit the 3D Warehouse for templates of the Multi-use Bench Hook.*

BLOG: *Tricks editor Kari Hultman writes about woodworking on her blog, The Village Carpenter.*

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

Runners-up each receive a check for $50 to $100. When submitting a trick, include your mailing address and phone number. If your trick is selected, an editor will need to contact you. All entries become the property of *Popular Woodworking Magazine*. Send your trick by e-mail to popwoodtricks@fwmedia.com, or mail it to Tricks of the Trade, *Popular Woodworking Magazine*, 4700 E. Galbraith Road, Cincinnati, OH 45236.

BY THE EDITORS

Stanley's New Chisels

New Britain is back. And they want woodworkers.

Looking good. *Stanley's Sweet Heart chisels are a reasonably priced mid-range chisel.*

For woodworkers, good chisels have been hard to find or have been expensive. You could search the flea markets for nice vintage tools or shell out the money for Ashley Iles, Lie-Nielsen or (brace yourself for wallet impact) handmade Japanese tools.

Now The Stanley Works is wading back into the fight with a set of bevel-edge chisels that look like the excellent Lie-Nielsens but are priced more like the Ashley Iles, at $220 for a set of eight with a leather tool roll.

Should we care? After all, for 30 years, Stanley has focused more on the homeowner and the contractor – not the serious woodworker. Woodworkers demand good steel, wooden handles and excellent balance. As long as I have been woodworking, The Stanley Works has been delivering the goods only in the "good steel" department.

I think the new English-made Stanley chisels are worth a serious look.

Sweet Heart Chisels

Stanley ▪ stanleytools.com or 800-262-2161

Street price ▪ $220 for eight

VIDEO: *Hairspray secures socket chisels at popularwoodworking.com/jun11.*

Price correct at time of publication.

They are not Lie-Nielsens. But they are a serious competitor for the mid-range chisel makers. Stanley's steel is (as always) good. The handles are good. The fit and finish is pretty good. And the price is fair.

Here are the stats: The chisels are a high-carbon alloy with some chromium mixed in, but the good news is that the tools don't have so much chrome that they feel gummy when you sharpen them. The blades are fairly flat out of the box compared to other mid-range chisels. (No chisels compare to the Lie-Nielsens in initial flatness.) It took me less than two hours to set up the entire set of eight Stanley chisels.

The handles are hornbeam and are virtually the twin to the Lie-Nielsen versions. But unlike the Lie-Nielsen socket chisels, the Stanley handles kept dropping out of their sockets – even after a good beating. I fixed that problem with a squirt of hairspray on the male part of the handle.

The Stanley blades sharpened up quickly, and overall held their edges quite well. After sharpening the set I turned the eight tools over to a woodworking class to use. The chisels survived a lot better than I expected.

Hornbeam. *The hornbeam handles can take a beating and are nicely finished.*

Overall, these are good tools. They are lighter and machined a bit rougher than high-quality vintage examples and the best new ones. But they are worlds better than most of the new chisels on the market today.

It looks like Stanley still has some love for woodworkers.

— Christopher Schwarz

CONTINUED ON PAGE 18

STANLEY CHISELS & GREX BRAD NAILER PHOTOS BY AL PARRISH; WENZLOFF SAW PHOTO BY CHRISTOPHER SCHWARZ

CONTINUED FROM PAGE 16

Wenzloff & Sons No-set Saw

Most saws have too much set, which makes the tool wander and cut roughly, and makes it difficult to push. Now Wenzloff & Sons has produced a new backsaw based on the Disston No. 77, which was designed to run without set.

This 16" saw is nothing short of amazing in dry hardwoods. It tracks like a laser and leaves a surface behind that is – no lie – as smooth as glass.

Here's how it works. The blade's thickness tapers from .025" at the teeth to a nominal .018" at the spine. The tapered blade allows it to run without set. But that's not all.

The saw is filed for 10 points per inch (ppi) at the heel, but it is filed at 14 ppi at the toe, which makes the saw easy to start, even in hard maple.

The hand-filed teeth have a 25° rake and 25° of fleam, which would suggest that this saw is only for crosscutting. Not so. The No. 77 is excellent for both ripping tenon cheeks and cutting tenon shoulders. In fact, during the last month or so it has been the only saw I've been using for cutting tenons.

Mike Wenzloff has always made excellent custom and production saws from his shop in Oregon, and this saw is no exception. The walnut handle is perfectly formed with no hard lines. The back, blade and saw nuts all come together without gaps. Considering all the handwork, it's amazing this saw has an introductory price of only $265.

If precision sawing is your thing, this tool is a must-have. — *CS*

Wenzloff & Sons No. 77

Wenzloff & Sons ▪ wenzloffandsons.com

Street price ▪ $265

BLOG: *See close-up shots of the resulting cut at popularwoodworking.com/jun11.*

Price correct at time of publication.

The Best in Brad Nailers

Money spent on quality tools is seldom a bad investment, and having a quality brad nailer in your shop is a great idea. If you have the same thoughts, the new 1850GB from Grex is the right choice.

The 1850GB is an 18-gauge nailer that drives brads from 1/2" to 2" in length. With it Grex has upped the ante with a departure from traditional nailer construction.

The trend in nail guns is toward rear exhaust – who needs air bursts kicking up dust as you work? In most nailers that have rear exhaust, there's a copper or even plastic tube that carries the air to the rear. Grex did away with the tubing and has designed a channel in the casting to direct the air to the back.

Grex has also designed the 1850GB for tighter work areas. At the nose, the safety is cast, not stamped. The casting adds more strength to the safety, and allows for a smaller nose. That allows you to get in close at corners or in tight spaces. Also, the narrow nose allows the tool to drive brads at any angle.

Another modification that augments close-up work is the stepped magazine that is extruded aluminum instead of a composite. Tilting the brad nailer keeps its body behind the nose of the gun, which makes it easier to work tight to a vertical surface or wall.

Of course, the 1850GB has all the expected attributes, as well: a dry-fire mechanism, fastener indicator window, depth control adjustment that changes at .008" - .010" per detent, a swivel-type air inlet and a dual-firing option.

The 1850GB is not cheap, but if this is your "go to" gun, it's worth it. PWM

— *Glen D. Huey*

Grex 1850GB

Grex ▪ grexusa.com or 888-447-3926

Street price ▪ $198

BLOG: *Read more about Grex tools at popularwoodworking.com/jun11.*

Price correct at time of publication.

BY GEORGE R. WALKER

Ask a Toolmaker

Konrad Sauer designs more than just awe-inspiring infill planes.

Unraveling. *The plank forming this coffee table, designed by Konrad Sauer, appears to unravel.*

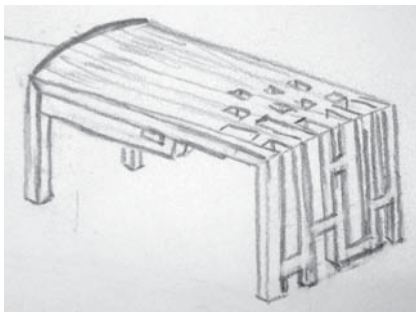
The next time you attend a woodworking show, don't pass up a chance to talk design with a toolmaker. As a group, I find toolmakers a treasure trove of knowledge. I've yet to find one who didn't have a practiced eye, and often their questions are just as insightful as their answers. You may know Konrad Sauer for his stunning infill planes inspired by classic British tools that exemplified the pinnacle of plane-making more than a century ago.

Last fall I took one of his infill planes for a test ride. Although the shiny metal and rosewood infill sparkled with newness, it fit my hand like a well-broken-in baseball glove. The blade sliced cleanly in a way that reminded me of the connection you get with clay responding to your fingers on a potter's wheel. Most of all, it made me want to create something wonderful, perhaps push my abilities to places I've never been.

Furniture Designer & Builder

Designing and building infill planes is a discipline practiced within tight boundaries, on par with striving to create a perfect wine. While most of Sauer's energy goes into his planes, he occasionally takes on furniture commissions. He graciously shared his thoughts on design with me as we discussed a coffee table he recently built. It stands in stark contrast to the curvaceous planes for which he is known. Yet this simple rectilinear form stretches the imagination with a play of light and shadow.

Sketching is an important part of Sauer's creative process. Since high school he has used a sketchbook to explore ideas and keep his thoughts flowing. Thumbnail sketches helped flesh out a concept for a table that begins as a large solid plank that gradually breaks apart. In this case he chose curly maple for its alluring reflective properties. Figured maple often displays a characteristic known as chatoyance, which is defined as "having a changeable luster." Depending on how the grain is oriented in relation to a light source, it will either glow softly or conversely go dim.



Starts with a sketch. *Rough ideas from a sketchbook spark the seed of an idea for this tool and furniture designer.*

In this case, Sauer ripped the plank into strips then crosscut those strips into smaller blocks. Randomly, he flipped the orientation of the grain so reflections would project in different directions. He also recessed blocks until they became voids. The voids create a delightful surprise as they allow sunlight to spill through and light up the surface of the legs below. As you walk

PHOTOS BY TRACEY SCHLOSSER; SKETCHES BY KONRAD SAUER

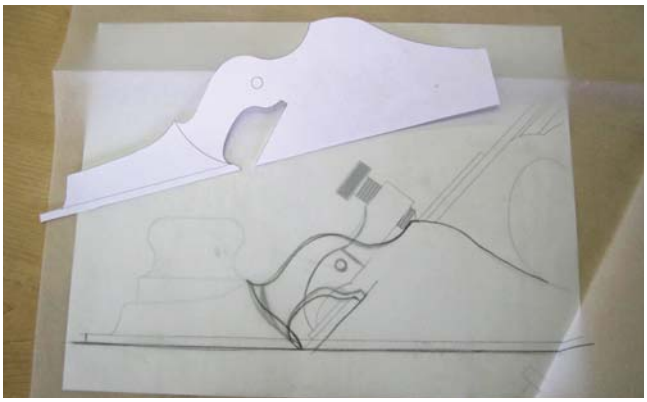
around the table the random blocks of figured wood twinkle on and off as they catch the rays of light from a nearby window.

Getting Seeds to Germinate

I asked Sauer how he develops an idea, and found his approach fascinating. He's a bit of a hybrid designer from a technical standpoint, combining both hand sketching and digital tools. Though an idea may cook for months or even years as bits and pieces in a sketchbook, he then takes the basic form and draws it using Adobe Illustrator on his computer. He shared with me that it's useful for working out the technical aspects of the design and handy for quickly making big changes or experimenting.

Yet Sauer said that it does have some limitations when it comes to exploring curves and more organic aspects of a design. (Although digital programs are capable of generating curves, they often hinge on the user's mastery of the software.) Instead, he jumps back to hand sketching. Sauer prints out the digital image, overlays it with tracing paper, then begins adjusting and detailing by hand. He can work in smooth, subtle curves or transitions that might prove cumbersome to manipulate digitally. This tracing can then be re-scanned, generating a revised drawing that can be manipulated electronically. This process can continue back and forth, as he gradually refines the image.

The maker. *Konrad Sauer, of Sauer & Steiner Toolworks.*



Best of both worlds. *Sauer sketches his ideas on tracing paper then lays it on top of a digital image.*

Sauer also utilizes a camera to take digital photos of an object that may contain the seed of an idea. Using orthographic views then downloading them into Illustrator, he can then print the image and continue detailing and revising by hand with tracing paper.

Getting Stuck

I asked Sauer a few of those age-old questions designers wrestle with: "How do you know when you have it? How do you know when to leave a design alone? What do you do when you get stuck just short of your design destination?" With the tone of his voice sounding to me as someone who's been there, Sauer explained that often when he can't seem to get that breakthrough, he concedes he's just going in circles, revising and redrawing. It's best just to walk away for a while, perhaps a few days. When he returns, he places a piece of tracing paper over the old drawing and starts over completely. This often helps him break free.

As far as knowing when to stop, it comes down to going back and looking at what you set out to achieve. If you were after a certain spiral on a table leg, can you step back at a distance and see it clearly? If you are after a tactile sense, do you feel this as you run your hand over a surface? This also speaks to the fact that some aspects of design, especially the tactile, can only be fully worked out as the piece is built. Something as small as softening a sharp edge with a block plane makes a big difference; it invites us to touch rather than pull away.

As I listened to Sauer share his approach to design I had a strong sense that his tool making and furniture making overlap and spill over each other. That infill plane perfectly sculpted to the hand offers an inviting connection, a reminder that the gentle curves worked into the arm rest on a chair are no accident. PWM

Why limit yourself? *Sauer's tools and furniture share a tactile quality.*

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

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ARTICLE: *Editor Christopher Schwarz wrote about Sauer for* Fine Tool Journal.

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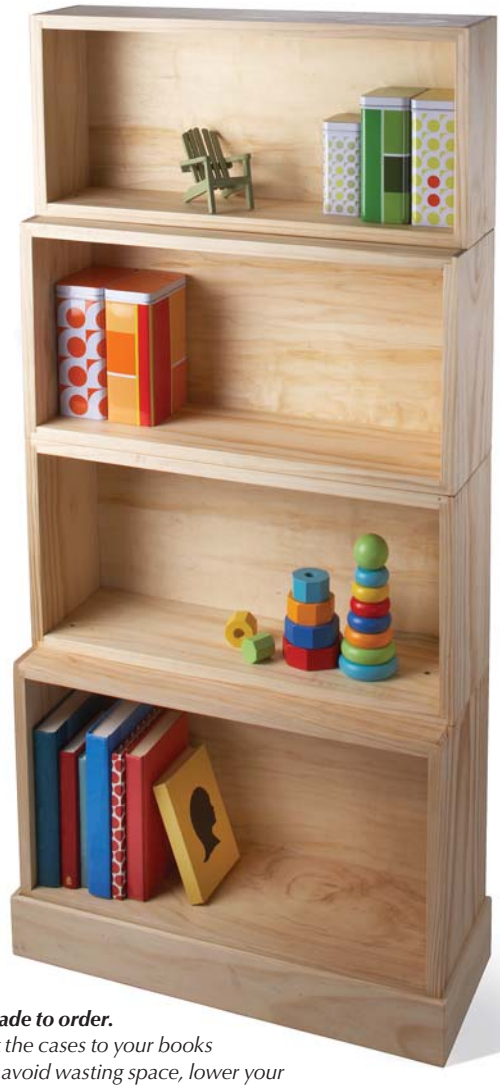
About This Column

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

BY ROBERT W. LANG

Stacking Bookcases

Make boxes to fit your books – and your space.



Made to order.
Fit the cases to your books to avoid wasting space, lower your material costs and make moving easy.

The typical bookcase is a good example of poor design. We make them that way because that's the way we've always made them; almost every plan you see is 12" deep, yet few books require that much space. Most bookcases are heavy and a pain to move. These stacking bookcases solve those problems, and won't take long to build.

Before you begin, assess your library. The three sizes shown here are based on common lumber sizes, and typical sizes of books and video cases. If you stay with standard 1x lumber, you won't be able to change the depth, but you can change the height and width.

An inch or two higher than your tallest book is a good inside height, but don't go too wide; beyond 36" and the shelves may begin to sag. Also consider how the parts of the sizes you are planning will fit the available lengths of material; an inch or so of adjustment may save you from buying another board.

Get Ready to Rabbet

The individual boxes could be just glued and nailed together, but the rabbet joints shown here will be stronger, and the boxes will be easier to assemble. I used a 3/8"-wide rabbeting bit that uses a ball bearing below the cutter as a guide.

You may find a cheaper version of this bit with a solid piece of steel instead of the bearing. Don't give into the temptation to save a few dollars. The solid guide spins at the same speed as the cutter, fast enough to burn the edges of your wood.

Plan on making at least two passes with the router to reach the final depth. In theory that should be 3/8", but your wood might be a bit thinner or thicker. In reality, the depth is half the thickness of your material, and the article on adjustable squares (page 52) shows a quick way to find and set your router to the exact center of the wood.

If you're new to routing rabbets, make a few practice cuts in scrap to get the feel of it. The router will behave differently when you move it in different directions. When you move from left to right, the cutting edge of the bit is moving into the work. This is more efficient and gives you greater control – but when you reach the edge of a board, it tends to break a chip out of the edge.

Moving from right to left is considered backward, and is called "climb-cutting." If you move the router backward into what would normally be the end of a cut before you make the cut, you can prevent blowing out the wood. You should only climb-cut for a short distance after the cutter enters the wood.

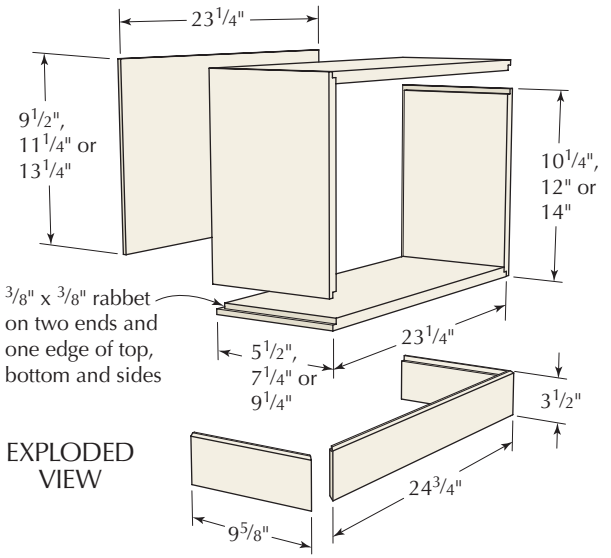
Keep the base of the router flat on your work while you press the guide bearing against the edge. Be careful at the start and end of a cut that the bearing doesn't go around the corner and on to the adjacent edge.

In This Corner

Before you put the boxes together, sand the inside surfaces with a random-orbit sander or by hand. It is difficult to sand into the corners after the boxes are assembled. The vertical pieces go outside the horizontal pieces, hiding the end grain when viewed from the side.

Put a bead of glue on the end-grain surfaces of the sides and spread it across the entire surface. Let it soak in for about five minutes before applying glue to the other joint surfaces. This allows the glue to soak into the end grain and makes for stronger joints – it's called "sizing."

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



Stacking Bookcases

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	2	Narrow sides	3/4	5 1/2	10 1/4	1x6 pine
❑	2	Medium sides	3/4	7 1/4	12	1x8 pine
❑	2	Wide sides	3/4	9 1/4	14	1x10 pine
❑	2	Narrow tops & bottoms	3/4	5 1/2	23 1/4	1x6 pine
❑	2	Medium tops & bottoms	3/4	7 1/4	23 1/4	1x8 pine
❑	2	Wide tops & bottoms	3/4	9 1/4	23 1/4	1x10 pine
❑	1	Narrow back	1/4	5 1/2	23 1/4	Plywood
❑	1	Medium back	1/4	7 1/4	23 1/4	Plywood
❑	1	Wide back	1/4	9 1/4	23 1/4	Plywood
❑	2	Base ends	3/4	3 1/2	9 5/8	1x4 pine
❑	1	Base front	3/4	3 1/2	24 3/4	1x4 pine

Put the corners together and use clamps to pull them tight. Clamp a Speed Square (or a square block of wood) in each corner as you nail to keep the entire assembly square. I used 3*d* finish nails, and set them slightly below the surface of the wood. When the nails are in, the clamps can be removed and you can move on to the next box.

Let the glue dry overnight, and remove any excess wood at the joints with a block plane or a random-orbit sander. When all the corners are flush, sand the outside surfaces and break the sharp corners with sandpaper.

Cut the backs to fit the openings, but finish the bookcases before attaching them permanently. You can hold the backs in place with either 3*d* finish nails (quick, but be careful with your aim) or #6 x 5/8" wood screws.

Router rules. *Clamp the work securely before routing the rabbets and keep the base firmly on the surface.*

Off the Floor

Cut a rabbet along one long edge of the piece for the base before mitering the corners. Size the mitered ends with glue, as was done with the end-grain of the rabbets. Assemble the three parts of the base with more glue and nails. Clear packing tape at each corner will hold the pieces in position while you nail.

I used clear shellac as the finish, brushing on two coats. Before finishing, I mixed some dust from the collection bag of the sander with a dollop of shellac to make a filler for the nail holes, and any gaps on the edges of the joints. This takes a while to dry, but the price is right, and the color will match the surrounding wood.

After finishing, the boxes are stacked on top of one another and on the base.

Nice and square. *Clamp a square in the corner to hold the boards in position while you drive and set the nails.*

Drive a couple 1 1/4" drywall screws from the top of one box into the bottom of the next to keep the assembled bookcase stable. PWM

Bob is executive editor of this magazine.

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Monticello's Stacking Bookcases

BY CHRISTOPHER SCHWARZ

Thomas Jefferson's book boxes became the foundation of the Library of Congress.

I like to think of Thomas Jefferson's personal library as America's first "bookmobile."

When the British burned down the nation's capitol in 1814, the inferno took with it many of the books owned by the government of our young nation. Lucky for us, Jefferson had a personal library of about 6,700 books – an astonishing accomplishment for the time.

And after some negotiations, Jefferson agreed to cede his entire library at Monticello to Congress for the sum of $23,950. The question was, how to transport 6,700 books from Virginia north to Washington, D.C., with horse-drawn wagons.

Lucky for us, Jefferson was a clever man. He stored his precious library in pine boxes that were designed specifically to travel. While it isn't known if Jefferson designed the book boxes (or "book presses" as they are sometimes called), they do bear the mark of his cleverness.

For when the day came to transport this massive chunk of knowledge, the process was straightforward. Scrap paper was stuffed among the books to protect them, then a lid was nailed over the front of each unit and it was loaded onto a wagon and carted to Washington.

Jefferson's collection of books (which continues to make headlines even today) was the foundation for our Library of

Stacked to move. *This modular system of stacking book boxes allowed Thomas Jefferson to easily expand and move his enormous library.*

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

Congress. His method for organizing his books (memory, reason and imagination) pushed us into a more modern classification system. Until that time it was common to organize books by height or color.

But What About the Boxes?

While a good deal is known about the books in Jefferson's collection that he sold to Congress, far less is known about the stackable boxes that he used to store his library at Monticello. By examining the written records, officials at Monticello built six bookcases for the museum in 1959 that are a good guess at what would have housed Jefferson's library (though he could have had as many as 20 of these units, if you do the math).

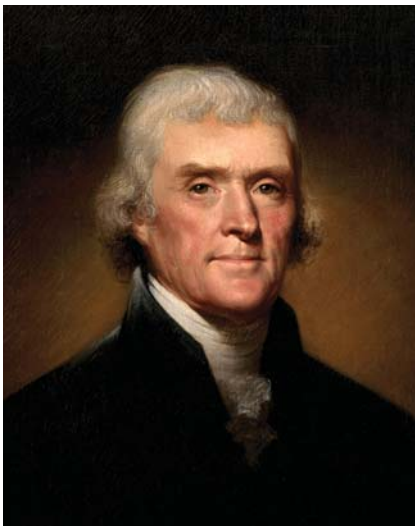
Since the day I started woodworking, I have been concerned about amassing information on the craft. For me, the written word enhances my personal experience in the shop, and it is a way to stay in touch with the craft while I am on the road, in bed or sitting on the couch.

As my library got out of hand sometime about 2005, I decided I needed to build something to store all my woodworking books. I also wanted something that would allow them to be easily transported when my wife and I leave our house after the kids are off to college, and we launch the next phase of our lives.

And so I became interested in Jefferson's book boxes. I read the original letters that describe how the books were transported. I used the standard measurements for books of the day to help fill in the blanks when it came to designing the three different case sizes Jefferson describes in his correspondence.

Oh, and what was the joinery on these boxes? Who knows. Perhaps the boxes were nailed together, as there were as many as 150 individual book boxes to hold the nearly 6,700 books. But I prefer to think that our third president, who was familiar with the principles of joinery, would insist on something more substantial.

And so, despite the fact that no surviving examples of these book boxes exist, I built each of these units using through-dovetails with mitered shoulders at the corners. The backs are shiplapped and nailed on to the carcases. This approach to building a box is typical for the time, and I bet that my modern book boxes would easily survive a wagon journey from Monticello to Washington, D.C.



The designer? *While we might never know if Thomas Jefferson designed these book boxes, he designed many clever devices at Monticello.*

> *"I cannot live without books."*
>
> — Thomas Jefferson (1743-1826)
> in an 1815 letter to John Adams

A Discussion of Sizes

After researching Jefferson's book boxes and the history of 18th-century publishing, I found that these original book boxes would not be as friendly to the modern library. The largest book box is taller than necessary, and the smaller two boxes are shallower than necessary for some modern titles that are squat. But I decided to build my book boxes to suit old books – you can alter yours as you see fit.

Here are the old dimensions. Jefferson said the bottom cases were 13" deep, the middle cases were 6¾" deep and the top cases 5¾" deep. As to the heights, we can turn to the standard sizes of books at the time (according to the American Library Association). The lower cases were designed to hold "quartos" and "folios." A folio is 15" high x 12" deep. A quarto is 12" high x 9½" deep (the typical size of a modern woodworking book).

The middle cases were designed for "octavos," which are 9" high x 6" deep. The top cases were for "duodecimos," which are 7⅜" high x 5" deep.

So I designed the three different book boxes around these three sizes. As I mentioned above, the lower cases are a little taller than necessary, and the middle cases are a little shallow. But it actually works, and I like the way the boxes step gracefully up my wall.

About the Joinery

I chose to use through-dovetails with mitered shoulders at the corners. This was the same joint the joiners at Monticello used in the 1959 reproductions of the book boxes. I like this joint because it dresses up the front edge of each box with a miter. Also, it is strong and easy to make. Yes, you read that right: easy to make.

You might be wondering if you can cut a mitered through-dovetail joint. The answer is: Yes. It is as easy as a regular through-dovetail, once you let go of your fear of miters and cut the joint freehand and use the joint's natural compression to help you fit it so it's airtight. Of the 24 mitered dovetails in this project, only one is less than airtight. And it was the first one I cut.

The rest of the joinery for these boxes is cake. The ½"-thick backs rest in ½" x ½" rabbets cut into the end pieces and are nailed to the top and bottom of the boxes, which are ½" narrower than the end pieces.

The only other thing to build is the plinth that supports the book boxes. Jefferson's papers don't mention a plinth, but the joiners at Monticello in 1959 built plinths for their cases, and I think it's a fine idea.

The profile I chose for the plinth is a typical late 18th-century foot that you can find on furniture made in both the North and South of the United States. Feel free to select another profile for your plinth, especially if your bookcases will reside in a more modern setting. After all, when old furniture started to look unfashionable, the owners would change the plinth and the hardware to update it. So you can alter your plinth to reflect Shaker, Arts & Crafts or even Scandinavian aesthetics. It's your library.

Worth the effort. *I dressed the concave face of my wide boards with my jack plane then ran them through my powered planer. By jacking one face before planing the other, I avoided having to rip the boards down and re-glue them.*

Building the Shelves

These shelves are 48" long without any center supports. This sounds like a recipe for sagging. But if you nail in your back pieces (which add strength) and use beefy, 7/8"-thick stock, you will find that your book boxes are nigh on indestructible.

You could get away with 3/4" stock throughout without too much of a visual compromise, so don't think that you have to find 4/4 rough stock to build these shelves.

Begin by dressing all your stock to thickness. I was lucky enough to score some Eastern white pine boards of unreasonable widths. So I had to dress the boards for my bottom cases by hand before I could run them through my powered planer.

After dressing my stock to size, I cut a shallow rabbet on the ends of the tail boards. This rabbet is 1/16" deep and the width of the mating pin board. This shallow rabbet makes it quite easy to mate up the two pieces when transferring the marks from my tail board to my pin board.

If I had only a couple boxes to build, I'd make this rabbet with a moving fillister plane. But because I had 28 of these rabbets to cut, I set up a dado stack in my table saw and cut them all using the table saw.

While this might seem like a no-brainer technique, it requires finesse. You need to really press the top of your work hard against the table when making these rabbets. Anything less, and the rotation of the cutterhead will lift the work off the table. No lie.

Under pressure. *Press the stock down hard to ensure that the cut is consistent across the width of your boards. The dado stack will try to turn your board into a hovercraft. Don't let it. Press down.*

With all your shallow rabbets cut, you can cut the 1/2" x 1/2" rabbets in the inside back edge of the end pieces. I again use a dado stack for this.

Now you can begin to lay out your dovetail joints. This is tricky to explain, but once you cut one mitered dovetail joint, you will laugh loud and hard. It's flipping easy. If you are skeptical, then please give it a try using some scrap first, then you can come crawling … .

Tail Layout

When you lay out a traditional through-dovetail joint, you will lay out a number of full tails on the tail board. The pin board has full pins – plus half-pins at the ends. Not so with this project.

Because of the miters, the tail joint at the front of the case has one of its corners that mutates into a miter. It looks like a half-pin in one direction and a full tail from another. I know, I know. It seems confusing. Stick with me.

At the rear of each case, I used a half-tail at the back edge so that I could easily conceal the backboards with simple through-rabbets. The half-tail conceals the 1/2" x 1/2" rabbet on the inside back edge. As a result, the completed end pieces look a little weird to the traditional eye. But you'll get over it.

So here's how you should proceed: Figure out a tail width at the rear of the case that will hide the backboards and remain strong. Lay out that tail.

At the front of the case, things are a little more complicated. The miter should begin 3/8" from the front edge. So mark a line 3/8" from the front edge of your tail board. Make this mark on the end grain. But don't mark it down the face grain of the outside face of your tail board, which would be typical. Instead, make this sloping tail mark on the inside face of the board. It's weird, I know. But do it.

Lay out the rest of your tail cuts between these two tails, leaving a gap between your tails that is about 1/8" wide at the top.

Now make your tail cuts with a dovetail saw. When you are done with one face, it should look like you have a board with two half-tails at either end. Turn the board around so the rabbeted face is facing you. Take your dovetail saw and make the compound cut at the front of the case that defines the face of the miter. This cut is 45° to the front edge. It looks tricky. It ain't. If you can see the line, you can cut the line.

Now position the board so the front edge of the corner faces the ceiling. Take a miter square (or your combination square) and use it to lay out the miter from the tip of the case to the baseline. When I mark this miter, I use a thin-lead (.3mm) mechanical pencil.

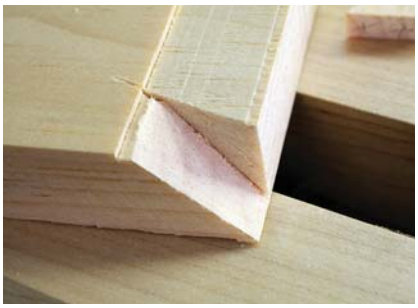
Cut this miter freehand to free the waste at the front of the corner. You'll need to angle the saw at 45° to make this cut. Again, try this once on scrap and you will be a pro.

When that waste has fallen away you can clear out the waste between

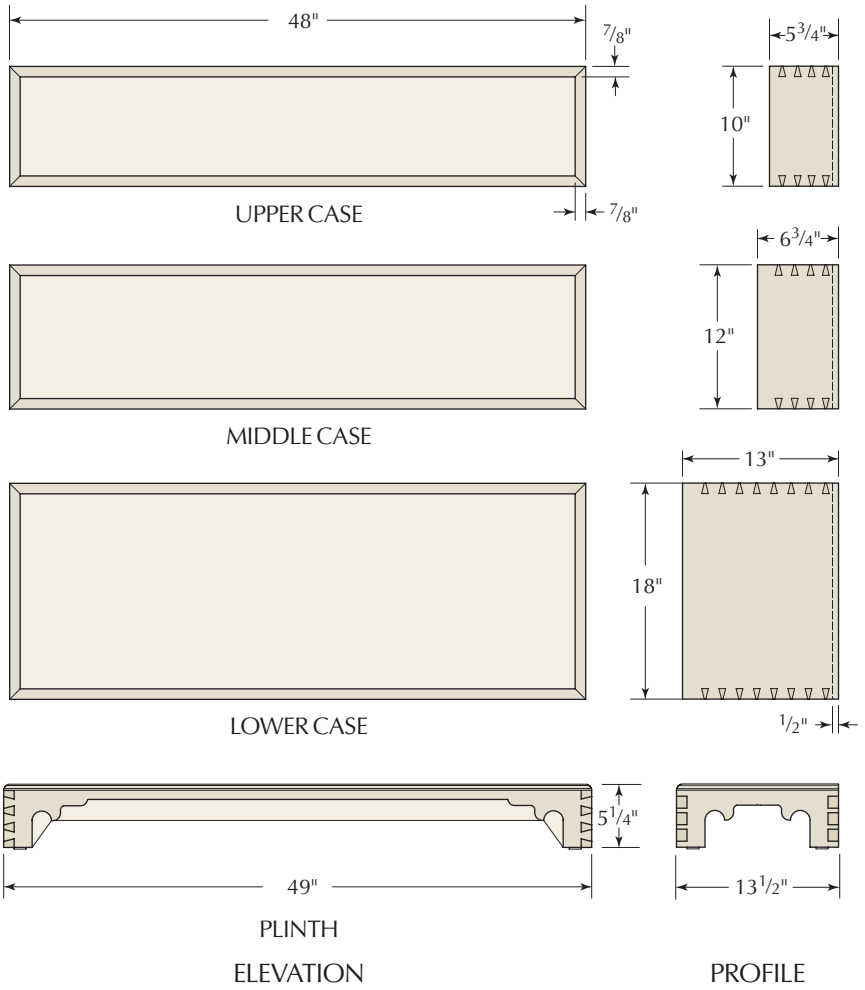
Here's the deal. *You can see almost all the trickiness here. Note how the tail on the left doesn't go through the face of the board, so it looks like a half-tail. On the right, you can see how the half-tail conceals the rabbet for the back.*

An inside job. *Turn your tail board around and cut the front tail on the inside of the corner. It's a 45° cut.*

Slice the wacky waste. *Then turn the board on its side and saw the miter on the front edge. This looks like a complex cut, but just follow the line. It makes sense when the waste falls away.*



The result. *See? Here's the miter at the front, which intersects the sloping tail. Once you see it, you'll get it.*



Monticello Book Boxes

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
LOWER CASE						
❑	2	Ends	7/8	13	18	Pine
❑	2	Top & bottom	7/8	12 1/2	48	Pine
❑	1	Back	7/8	18	47 1/2	Pine
MIDDLE CASE						
❑	2	Ends	7/8	6 3/4	12	Pine
❑	2	Top & bottom	7/8	6 1/4	48	Pine
❑	1	Back	7/8	12	47 1/2	Pine
UPPER CASE						
❑	2	Ends	7/8	5 3/4	10	Pine
❑	2	Top & bottom	7/8	5 1/4	48	Pine
❑	1	Back	7/8	10	47 1/2	Pine
PLINTH						
❑	2	Ends	7/8	4 3/4	13 1/2	Pine
❑	2	Front & back	7/8	4 3/4	49	Pine
❑	1	Interior support, front	3/4	3	47 1/4	Pine
❑	2	Interior support, ends	3/4	3	11 3/4	Pine
❑	4	Glue blocks	1	1	4 1/8	Maple
❑		Moulding	1/2	1/2	72	Pine

the other tails. I use a coping saw. But feel free to bang it out with a chisel.

Pin Layout

When the waste is clear, you need to transfer the pattern of the tail board onto the pin board. The shallow 1/16"-deep rabbet makes this a cakewalk. Clamp your pin board upright in a vise. Place the tail board's rabbet on top of the pin board and press the two together. When the two are mushed together, trace the shape of the tail board onto the pin board with a marking knife.

The little mitered section at the front is tough to get a spear-point knife into. Depending on the acuteness of the tip of the knife you can do a fine or a lousy job. Do your best and then "infer" (read: guess) the remainder of the slope with a ruler and a knife.

With the lines marked out on the end grain of the pin board, I take the extra step of dropping those lines down the face of my pin board to my baseline. It slows me down, but it's a habit I have yet to break from my first dovetail class.

Slice all the pins with your dovetail saw. But before you remove the waste between the pins, cut the miter at the front of the pin board.

Clamp the pin board on its side and lay out the miter from the tip of the board to the baseline – just like you did with the tail board.

Saw the pins and remove the waste between the pins using a coping saw and chisel. Then saw the miter (on the waste side) freehand. If you are sloppy, clean up the cut a bit to the line with a shoulder plane.

Fit & Slice

When you have the pins and tails cleaned up to your satisfaction, it's time for the fun part: fitting the miters.

Drive the tail board onto the pin board. What is likely to happen is that the tails will seat everywhere but up by the miter. The miter is what is preventing the tail from landing home at the bottom of the pin socket.

When the parts are driven together, they will generate some pressure right at the miter – a good thing. Place the joint on your workbench so the miter faces the ceiling. Take a thin-kerf saw and cut through the miter freehand.

Yes, you read that right. Saw through the miter freehand.

The set of the teeth will remove the excess wood on either side of the saw plate. As you saw, you should feel the wood pinch the blade. Keep sawing. When you reach the bottom of the joint, slide the saw out and the miters should draw closer together. The evidence of this will be that the tail will seat more deeply in the pin socket.

If the miter is tight and the tail is fully seated, you are done. If the tail isn't fully seated, saw through the miter again.

Sometimes the pressure from the joint isn't enough to pull the miters together as you are sawing. If this happens, clamp the joint and then saw it.

Make all the boxes using these techniques. Yes, it takes some time, but by the end you'll be able to make this joint without hesitation, and it's a fine one to have in your arsenal.

Tails, meet pins. *I have my tail board resting on a scrap to keep it in position as I press its shallow rabbet against the pin board. Knife in the joint. Use light strokes at first, followed by heavier ones.*

Needs a fit. *You can see how the tail isn't fully seated in its socket. The way to fix that is to saw through the miter.*

Saw right through. *Use a thin-kerf saw and cut right through the miter. The joint might pinch the blade a bit. That's OK. It means the process is working.*

More wacky miters. *Here's the completed pin board layout, with the waste marked with "X"s. Clear out the waste between the pins, then cut the miter.*

The pin board result. *This board looks a little more straightforward than the tail board. It's basically a standard-looking pin board with a miter cut on its front edge.*

The Backs

The backboards for these boxes are nothing more than 1/2"-thick pine boards that are shiplapped, beaded then nailed on the back of the boxes after the bookcase is finished. You can make your backs now or later.

The Plinth

A traditional plinth looks delicate but will support the entire weight of the book boxes above without any problem. The trick is to design it correctly.

The corners of the plinth should be dovetailed before you cut the scroll-

work to create the feet. If you cut the scrollwork first, the plinth boards will be too fragile for dovetailing.

After dovetailing the corners, trace your foot design onto the front, back and ends. I drew my shape freehand and it was based on a typical design of the period. Once the shapes are laid out, cut the scrollwork and clean up the saw cuts with rasps or an oscillating spindle sander.

Assemble the four plinth pieces with glue, clamps and lots of care. This is when the pieces are fragile. I destroyed one foot while clamping things together. Luckily, I was able to glue it back on.

With the outside of the plinth complete, work on the inside guts that offer brute strength. I glued a mitered three-sided frame inside the plinth to give it strength. I used 3"-wide boards that were scrap. Really, anything wider than 2" will be fine here.

Once you glue in the mitered frame, flip the plinth over and glue in 1" x 1" maple blocks in the corners. These glue blocks reinforce the corners of the plinth and carry the weight of the entire bookcase. When made properly, the maple blocks should extend 1/8" from the bottom of the plinth.

Moulding & Finishing

Trim all the dovetails and prepare the plinth, backs and book boxes for finishing. When that is done, place the lowest book box on the plinth and glue and nail a small moulding around the lowest case. I use a small square ovolo profile here, which matches the period.

Trace, cut, shape. *The plinth design is where you can alter the design to suit your house. Like Shaker stuff? Look at Shaker feet and draw something similar on your feet.*

Clean the corners. *I use a block plane to dress the long straight run on the front. But when it comes to the corners, a chisel plane is handy for getting right up against the scrollwork.*

To finish the bookcases, I applied two coats of orange shellac, followed by one coat of dull-sheen lacquer. The versions at Monticello are dark brown.

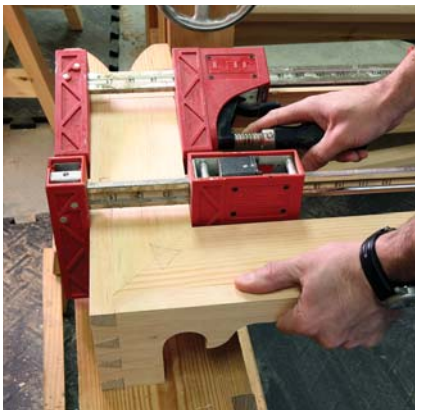
After the finish was dry, I nailed on the backboards using clout nails then stacked the book boxes in place on top of the plinth. To keep the boxes from sliding around, I screwed each box to its neighbor using #8 x 1 1/4" wood screws. And to keep the bookcase from tipping forward should a toddler attempt to scale it, I attached the whole thing to the wall with an anti-tipping kit.

Then came the best part—loading the bookcase with my woodworking books. These book boxes added 24' linear feet of storage for my books, which have been piling up in my office.

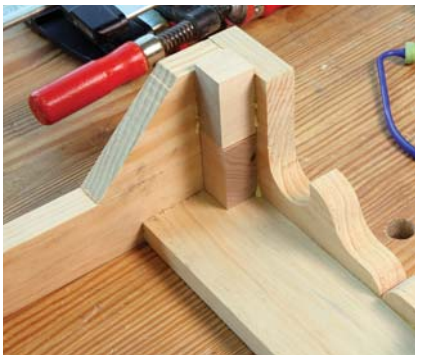
But joy turned to defeat. I have more books than I thought. When loaded, this case holds only half my books. I need to build a second set.

Hmmm, perhaps Jefferson's book boxes were just nailed together. PWM

Chris is editor of this magazine and the author of several woodworking books, including "The Workbench Design Book" (Popular Woodworking Books). He also writes a daily blog for our web site and spends entirely too much time with his nose in books.



Miters that won't show. *This will be covered by the lower case and moulding, so it doesn't have to look pretty. It just has to be strong.*



Glue blocks. *These maple blocks do almost all the work. They are 1/8" proud of the foot of the plinth and support all of the weight of the book boxes. They also strengthen each corner to protect them from swift kicks.*

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VIDEO: *Watch how the shellac and lacquer finish was sprayed on.*

BLOG: *Read about Southern furniture on our editor's blog.*

WEB SITE: *Take an online tour of Monticello and see the 1959 book boxes.*

TO BUY: *"Building 18th-Century American Furniture" by Glen D. Huey.*

IN OUR STORE: *DVD: Cheating at Hand-cut Dovetails.*

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

The Craft Classics in Just 5'

BY CHRISTOPHER SCHWARZ

Fight woodworking ignorance 15 minutes each day.

In 1910, Harvard University President Charles W. Eliot laid out a plan that allowed every man and woman to get the basics of a liberal education by reading for 15 minutes a day from a list of books that fit on a 5'-long shelf.

Called "Dr. Eliot's Five Foot Shelf," the 51-volume set of books were later renamed "The Harvard Classics" and are still a must-read list for people with ascots, pocket squares and elbow patches on their corduroy jackets. Eliot's list is comprised of everything from Charles Darwin and Cervantes to Descartes and Confucius.

What does this have to do with woodworking? Every week – if not every day – readers ask us for book recommendations. What they are mostly looking for is a single woodworking book, that will cover everything they need to know about every aspect of the craft, that they can refer to for the rest of their lives. Oh and it would be nice if it were $10.

That book doesn't exist.

But the idea of Dr. Eliot's Five Foot Shelf inspired me to compile a 5'-long shelf of woodworking books that would make you a well-rounded and well-read craftsman. And though I have a sizable woodworking library, I also know that my interests are a little too narrow. I like traditional texts and traditional furniture.

So I enlisted the help of the magazine's staff and asked them to bring in the books that they consider essential to their woodworking. Then I built a 5'-long shelf and we spent a long morning debating the merits of each book before we placed it in the shelf.

When the shelf was full, we called the list done. The results of that debate is the list of books that follows (publishers listed are for the editions we own). It's by no means a perfect list. It is a list that would probably change a bit if we had the debate again in a couple months. Some of these are classics, some are contemporary. But these are the books that are first in our hearts.

Design

"American Country Furniture" by Nick Engler and Mary Jane Favorite (Rodale).

"American Furniture" series, edited by Luke Beckerdite (Chipstone Foundation).

"American Furniture of the 18th Century" by Jeffrey P. Greene (Taunton).

"American Furniture in the Metropolitan Museum of Art" by Morrison H. Heckscher (Random House).

"American Furniture: The Federal Period" by Charles F. Montgomery (Viking).

"American Furniture: Queen Anne and Chippendale Periods" by Joseph Downs (Bonanza).

"The Book of Shaker Furniture" by John Kassay (University [U] of Massachusetts).

"Chinese Domestic Furniture" by Gustav Ecke (Dover).

"The Encyclopedia of Furniture" by Joseph Aronson (Crown).

"Fine Furniture for a Lifetime" by Glen D. Huey (Popular Woodworking Books).

"Furniture of the American Arts and Crafts Movement" by David M. Cathers (Turn of the Century Editions).

"The Furniture Masterworks of

An education. *Reading and browsing these books will make you a well-rounded woodworker.*

LEAD PHOTO BY AL PARRISH

John & Thomas Seymour" by Robert D. Mussey Jr. (Peabody Essex Museum).

"Furniture Treasury Vols. 1 & 2" by Wallace Nutting (Macmillan).

"Greene & Greene: Furniture and Related Designs" by Randell L. Makinson (Peregrine Smith).

"Greene & Greene Furniture: Poems of Wood & Light" by David Mathias (Popular Woodworking Books).

"The Heritage of Upper Canadian Furniture" by Howard Pain (Key Porter).

"How to Build Shaker Furniture, Revised Edition" by Thos. Moser (Sterling).

"John Townsend: Newport Cabinetmaker" by Morrison H. Heckscher (Yale University Press [UP]).

"Mackintosh Furniture" by Roger Billcliffe (Cameron & Hollis).

"Making Antique Furniture Reproductions" by Franklin H. Gottshall (Dover).

"Making Furniture Masterpieces" by Franklin H. Gottshall (Dover).

"Measured Drawings of Shaker Furniture and Woodenware" by Ejner Handberg (Berkshire House).

"The New Fine Points of Furniture: Early American" by Albert Sack (Crown).

"Sculpted Band Saw Boxes" by Lois Keener Ventura (Popular Woodworking Books).

"Shop Drawings for Craftsman Furniture" by Robert W. Lang (Cambium).

"Southern Furniture 1680-1830" by Ronald L. Hurst and Jonathan Prown (Colonial Williamsburg Foundation).

"Studio Furniture of the Renwick Gallery" by Oscar P. Fitzgerald (Smithsonian).

Finishing

"Flexner on Finishing" by Bob Flexner (Popular Woodworking Books).

"Understanding Wood Finishing" by Bob Flexner (Reader's Digest).

Tools & Shops

"Restoring, Tuning & Using Classic Woodworking Tools" by Michael Dunbar (Sterling).

"Hand Tool Essentials" by various writers (Popular Woodworking Books).

"The History of Woodworking Tools" by W.L. Goodman (G. Bell & Sons).

"Japanese Woodworking Tools: Their Tradition, Spirit and Use" by Toshio Odate (Taunton).

"Handplane Essentials" by Christopher Schwarz (Popular Woodworking Magazine).

"Mechanick Exercises" by Joseph Moxon (Toolemera).

"The New Complete Guide to the Band Saw" by Mark Duginske (Fox Chapel).

"The Table Saw Book" by Kelly Mehler (Taunton).

"Traditional Woodworking Tools" by Graham Blackburn (Blackburn Books).

"The Wooden Plane" by John M. Whelan (Astragal).

"Don't let school interfere with your education."

— Mark Twain (Samuel Langhorne Clemens) 1835-1910, author and riverboat pilot

"Woodworking with the Router" by Bill Hylton (Reader's Digest).

"The Woodwright's Guide" by Roy Underhill (U of North Carolina).

"The Workbench Book" by Scott Landis (Taunton).

"Workbenches: From Design & Theory to Construction & Use" by Christopher Schwarz (Popular Woodworking Books).

"The Workshop Book" by Scott Landis (Taunton).

Techniques

"The Art of Japanese Joinery" by Kiyosi Seike (Weatherhill).

"Bob Lang's The Complete Kitchen Cabinetmaker" by Robert W. Lang (Cambium).

"Cabinet Making for Beginners" by Charles H. Hayward (Drake).

"Cabinetmaking and Millwork" by John L. Feirer (Chas. A. Bennett).

"The Chairmaker's Workshop" by Drew Langsner.

"The Complete Guide to Sharpening" by Leonard Lee (Taunton).

"The Complete Illustrated Guide to Shaping Wood" by Lonnie Bird, (Taunton).

"David Charlesworth's Furniture-making Techniques" by David Charlesworth (Guild of Master Craftsman).

"Elementary Turning" by Frank Henry Selden (Popular Woodworking Books).

"Encyclopedia of Furniture Making" by Ernest Joyce (Sterling).

"The Essential Woodworker" by Robert Wearing (Lost Art Press).

"Illustrated Cabinetmaking" by Bill Hylton (Reader's Digest).

"The Joiner and Cabinet Maker" by Anon. (Lost Art Press).

"Measure Twice, Cut Once" by Jim Tolpin (Popular Woodworking Books).

"Modern Practical Joinery" by George Ellis (Linden).

"The Perfect Edge" by Ron Hock (Popular Woodworking Books).

"Turning Wood with Richard Raffan" by Richard Raffan (Taunton).

"Woodturning: A Foundation Course" by Keith Rowley (Guild of Master Craftsman).

"Woodturning Design" by Mike Darlow (Fox Chapel).

"Woodwork Joints" by Charles H. Hayward (Evans Bros.).

Inspiration

"A Cabinetmaker's Notebook" by James Krenov (Linden).

"The Craftsman" by Richard Sennett (Yale UP).

"Master Woodturners" by Dale L. Nish (Artisan Press).

"A Reverence for Wood" by Eric Sloane (Ballantine).

"The Soul of a Tree" by George Nakashima (Kodansha).

"Working at Woodworking" by Jim Tolpin (Taunton).

Raw Materials

"Harvesting Urban Timber" by Sam Sherrill (Linden).

"Oak: The Frame of Civilization" by William Bryant Logan (Norton).

"Trees of North America" by C. Frank Brockman (St. Martin's).

"Understanding Wood" by R. Bruce Hoadley (Taunton).

But I still wasn't entirely satisfied with our list. I wondered if we'd read enough woodworking books as a staff

Kelly Mehler. *Of Kelly Mehler's School of Woodworking.*

Michael Dunbar. *Of the Windsor Institute.*

Roy Underhill. *Of "The Woodwright's Shop" on PBS.*

to create a solid list. So we surveyed the readers of my blog (the results of that are on our web site), then asked many of the woodworkers who write for us to contribute lists of their favorite woodworking books. Theirs are below, in their own words (publishers have listed only on first reference; but if no publisher has been noted, the book is available on Google Books at books.google.com).

Kelly Mehler

Kelly Mehler's School of Woodworking, kellymehler.com

"The Encylopedia of Furniture Making" by Ernest Joyce.

"The Impractical Cabinetmaker" by James Krenov (Linden), for his woodworking philosophy.

"The Book of Shaker Furniture" by John Kassay, for his precision drafting of a variety of Shaker pieces.

"Understanding Wood" by R. Bruce Hoadley.

"The Workshop" and "The Workbench Book" by Scott Landis.

"Classic Joints with Power Tools" by Yeung Chan (Lark).

I have not looked at them in ages but the very first books that influenced me were the Eric Sloane books.

And of course "The Table Saw Book" by moi ….

Michael Dunbar

The Windsor Institute, thewindsorinstitute.com

"Dictionary of Woodworking Tools" by R.A. Salaman (Taunton). How can one work wood without knowing what tools do what jobs? Great reference, but also a great work for browsing. You learn something new every time you open it.

"Planecraft" by John Sainsbury, (HarperCollins). An old classic on a critical tool. I don't know that anyone has ever really improved on this book.

"The Old Way of Seeing" by Jonathan Hale (Mariner). Before machines began dictating how wood was worked and how it ended up looking, woodworkers saw the world very differently. Hale shows us how to see through their eyes. He opens ours to far greater understandings.

"Early American Furniture" by John T. Kirk (Knopf). Like Hale, Kirk shows how to look through different eyes.

"Understanding Wood" by R. Bruce Hoadley. The title says it all. How can you successfully work the material if you don't understand it?

Roy Underhill

"The Woodwright's Shop" and The Woodwright's School, woodwrightschool.com

"Woodworking in Estonia" by A. Viires (National Technical Information Service). This is our share of the booty from the cultural exchanges of the Cold War years. The Soviets got models of our nuclear subs, and we got one of the best books on folk woodworking ever. Aside from showing how to make everything from wooden wheels to bentwood cheese boxes, this book is also an education in the way Eastern European history gets written. Imagine Eric Sloane dividing early American woodworking into feudal, capitalist and socialist periods!

"The Wheelwright's Shop" by George Sturt (Cambridge UP). Here is the real deal. At the turn of the 19th century, a guy comes back from college when his father falls ill and can no longer manage the old family wheelwright business alone. He realizes that he has stepped into a vanishing world of "kindly feeling" when the "grain in the wood told secrets to men." Thanks to Sturt, the old English way with wood is still alive in the pages of this remarkable book.

"With Hammer in Hand" by Charles F. Hummel (UP Virginia). Resurfacing like Brigadoon, the woodworking shop of the Dominy family was sealed up with the tools still on the benches and saws still sharp. Moved to the Winterthur Museum, the workshop is an open portal into village woodworking in early America. Hummel's book takes it tool by tool, piece by piece, expanding our view with a true scholar/craftsman's eye.

Peter Follansbee

Joiner at the Plimoth Plantation, plimoth.org

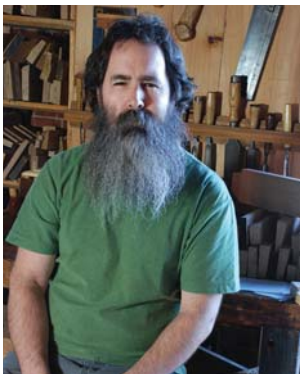
The best tool book I know is still Charles F. Hummel's "With Hammer in Hand: The Dominy Craftsmen of East Hampton."

If pressed, I'd add Henry Mercer's "Ancient Carpenters' Tools" (Dover), then Joseph Moxon ….

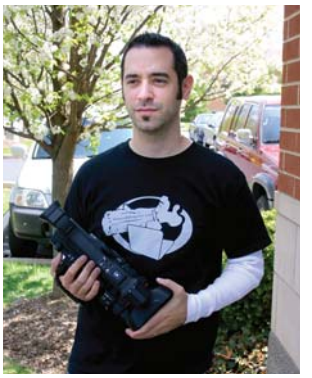
For how-to, I lean toward green woodworking, my introduction to the craft. So John Alexander's "Make a Chair From a Tree" (Astragal), Drew Langsner's "Green Woodworking" and "The Chairmaker's Workshop" are both excellent. Roy Underhill's books come next.

A couple of many books from England: J. Geraint Jenkins' "Traditional

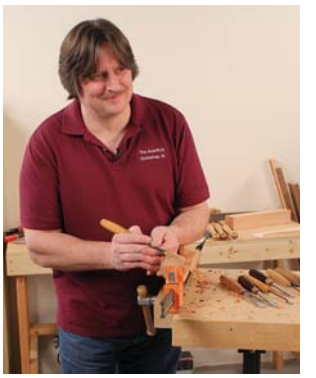
MEHLER & UNDERHILL PHOTOS BY AL PARRISH; DUNBAR PHOTO BY ANDREW EDGAR



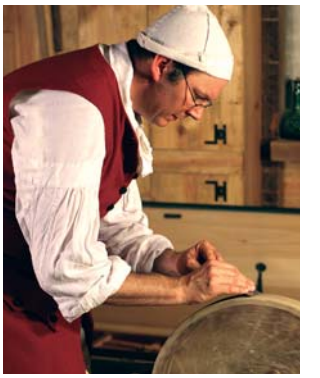
Peter Follansbee. *Joiner at the Plimoth Plantation.*



Marc Spagnuolo. *The Wood Whisperer.*



Chuck Bender. *Of the Acanthus Workshop.*



Adam Cherubini. *"Arts & Mysteries" columnist.*

Country Craftsmen" (Routlegde) and George Sturt's "The Wheelwright's Shop."

For furniture itself, mine all lean toward history, just as the previous books do. Here's three titles, not a stick of mahogany in the lot of them. Oak all the way, just about:

Victor Chinnery, "Oak Furniture: The British Tradition" (Antique Collector's Club).

Benno M. Forman, "American Seating Furniture 1630-1730" (Norton).

Frances Gruber Safford, "American Furniture in the Metropolitan Museum of Art I. Early Colonial Period: The Seventeenth-Century and William and Mary Styles" (Yale UP).

The annual journal *American Furniture* (edited by Luke Beckerdite) from the Chipstone Foundation is worth having. I never miss an issue. Ditto for *Regional Furniture* (editor Adam Bowett) from England.

And for sheer inspiration: William Coperthwaite, "A Handmade Life: In Search of Simplicity" (Chelsea Green).

I continue to turn to Bill's book; it hasn't been on the shelf yet and I've had it for seven years or so. The poem "Dead Time" (about his canoe) resonates perfectly with what I try to do with woodworking.

Marc Spagnuolo

The Wood Whisperer, thewoodwhisperer.com

There are two books that I would consider highly influential in my personal woodworking path. Darrell Peart's "Greene & Greene: Design Elements for the Workshop" (Linden) and "Adventures in Wood Finishing" by George Frank (Taunton). Peart's book kicked off my fascination with all things Greene & Greene. Peart does a fantastic job of covering history as well as practical techniques.

Chuck Bender

The Acanthus Workshop, acanthus.com

"American Furniture at Chipstone" by Oswaldo Rodriguez Roque (U Wisconsin P).

"American Furniture from the Kaufman Collection" by J. Michael Flanigan (Harry N. Abrams).

"New England Furniture: The Colonial Era" by Brock Jobe and Myrna Kaye (Houghton Mifflin).

"American Antiques from Israel Sack Collection" Volumes 1 through 10 (Highland House).

"Treasures of State: Fine and Decorative Arts in the Diplomatic Reception Rooms of the U.S. Department of State" by Clement E. Conger and Alexandra Rollins (Harry N. Abrams).

"Master Craftsmen of Newport" by Michael Moses (MMI Americana).

Adam Cherubini

"Arts & Mysteries" columnist, adamcherubini.com

These are books that I think every period woodworker should have in his or her woodworking library.

Tools: I am inspired by tools, whether the tool is a good chef's knife, a watercolor paintbrush or a lowly marking gauge. I find 18th-century tools particularly beautiful and elegant in their simplicity. To openly admit I am inspired by my tools makes me somewhat of a kook. But here, amongst friends, I suspect I am not alone. I've copied many tools in these books and sought tools that resembled these and been a happier person for it.

"The Tool Chest of Benjamin Seaton" (Tools & Trades History Society).

"Tools: Working Wood in Eighteenth-century America" by Jay Gaynor and Nancy Hagedorn (UP Virginia).

"Restoring, Tuning & Using Classic Woodworking Tools" by Michael Dunbar.

"Dictionary of Woodworking Tools" R.A. Salaman.

"With Hammer in Hand: The Dominy Craftsmen of East Hampton, New York" by Charles F. Hummel.

"British Planemakers from 1700" by Jane and Mark Rees (Astragal).

"A Guide to the Makers of American Wooden Planes" by Martyl and Emil Pollak (Astragal).

Inspiration/Projects: I derive inspiration for projects from many places: art museums, historic homes, even movies. The last two books on this list have beautiful pictures of furniture in the context of living spaces.

I find furniture takes on new meaning when separated from the sterility of an art museum (such as the Philadelphia Museum of Art's American Wing. Maybe that's why I prefer the museum's period rooms). Jeffrey P. Greene's book is perhaps my favorite of recent period woodworking texts for its ambition and helpful exploded diagrams of furniture in its appendix.

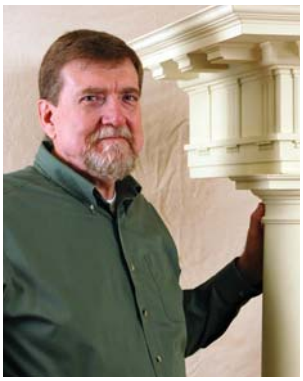
"Furniture Treasury" by Wallace Nutting.

FOLLANSBEE PHOTO COURTESY PLIMOTH PLANTATION; SPAGNUOLO PHOTO BY MEGAN FITZPATRICK; BENDER PHOTO BY RIC DELIANTONI; CHERUBINI PHOTO BY ADAM CHERUBINI

Tommy MacDonald. *Of "Rough Cut – Woodworking with Tommy Mac."*

David Charlesworth. *Of David Charlesworth Fine Furniture Courses.*

Jim Tolpin. *Of the Port Townsend School of Woodworking.*



George Walker. *"Design Matters" columnist.*

"American Furniture of the 18th Century" by Jeffrey P. Greene.

"Williamsburg: Decorating with Style," Colonial Williamsburg Foundation (Clarkson Potter).

"The Shaker Legacy" by Christian Becksvoort (Taunton).

Techniques: I use many techniques I "discovered" on my own. Many were things I learned from the Internet. At this time, I don't think there's a single great text on period woodworking technique. The edition of Moxon listed below would be my top choice for this category.

Period Documents: In addition to the books below, I recommend a thorough reading of Jay Stiefel's report on the Account Book of John Head, available at the web site of the American Philosophical Society (amphilsoc.org).

"The Gentleman & Cabinet-Maker's Director" by Thomas Chippendale (Dover).

"L'Art du Menuisier" by A.J. Roubo (Bibliothéque des Arts).

"The Art of Joinery," excerpted from "Mechanick Exercises" by Joseph Moxon (Lost Art Press).

"1772 Philadelphia Furniture Price Book" by Alexandra Kirtley (ACC).

"The Mechanic's Companion" by Peter Nicholson.

Thomas J. MacDonald

"Rough Cut – Woodworking With Tommy Mac," thomasjmacdonald.com/rough-cut-woodworking

"Tage Frid Teaches Woodworking" Volumes 1-3 by Tage Frid (Taunton).

"American Furniture in the Metropolitan Museum of Art: Late Colonial Period: The Queen Anne & Chippendale Styles" by Morrison H. Heckscher.

"American Furniture: Queen Anne and Chippendale Periods in the Henry Francis Du Pont Winterthur Museum" by Joseph Downs (Winterthur).

"John Townsend: Newport Cabinetmaker" by Morrison H. Heckscher.

"American Antiques from Israel Sack Collection" Volumes 1-10.

David Charlesworth

David Charlesworth Fine Furniture Courses, davidcharlesworth.co.uk

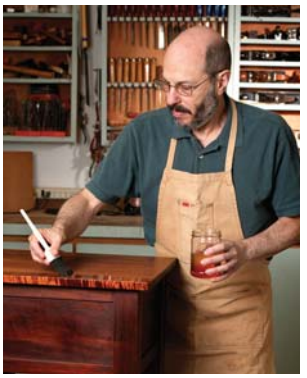
As a teacher I find Ernest Joyce's "The Technique of Furniture Making" (Batson) invaluable, 'tho it is as far away from an enjoyable read as possible. Similarly Bob Wearing's "Essential Woodworker." Bob is one of the only people who ever gave insight into traditional English technique. I believe the lack of similar books is due to the apprenticeship tradition of teaching, where nothing was ever written down.

I greatly enjoyed "Handplane Essentials" by Christopher Schwarz – particularly the punchy style and refusal to accept traditional lore without close scrutiny and experimentation.

If it's not too presumptuous, I also enjoy my own books. Largely because I have forgotten how difficult they were to write and the effort of preparing the examples and props. I think they address many of the practical issues of furniture making.

If the book fits. *After hours of debate, these are the books we chose for our 5' shelf.*

MACDONALD PHOTO COURTESY WGBH-TV; CHARLESWORTH PHOTO BY CHRISTOPHER SCHWARZ; TOLPIN PHOTO BY CRAIG WESTER; WALKER PHOTO COURTESY LIE-NIELSEN TOOLWORKS, INC.; BOOKSHELF PHOTO BY AL PARRISH



Bob Flexner. *"Flexner on Finishing" columnist.*

Marc Adams. *Of the Marc Adams School of Woodworking.*

Jim Tolpin

Port Townsend School of Woodworking, ptwoodschool.com

This is a list of books that have had a profound influence on my life in woodworking. Each one has inspired and informed me in ways that made me a more skilled and successful artisan.

"A Museum of Early American Tools" by Eric Sloane (Funk).

"Foxfire" (series) edited by Eliot Wigginton (Anchor).

"The Complete Woodworker" edited by Bernard E. Jones (Ten Speed).

"Hand Tools: Their Ways and Workings" by Aldren A. Watson (Norton).

"Restoring, Tuning & Using Classic Woodworking Tools" by Michael Dunbar.

"How to Build a Wooden Boat" by David C. "Bud" McIntosh (Woodenboat).

"The Furniture Doctor" by George Grotz (Doubleday).

"Adventures in Wood Finishing" by George Frank.

"How to Build Shaker Furniture" by Thos. Moser (Drake).

"The Wheelwright's Shop" by George Sturt.

George Walker

"Design Matters" columnist, georgewalkerdesign.wordpress.com

You can bookend my 30 years of woodworking with two volumes. Roy Underhill's "The Woodwright's Shop: A Practical Guide to Traditional Woodcraft" (U of North Carolina P) marks the beginning. Today, Steven W. Semes' "The Architecture of the Classical Interior" (Norton) makes sense of all the conflicting mishmash of "design speak" tossed about. Hope I have another 30 years in me so the Semes book will someday be a midway milepost in a long, rewarding journey.

Bob Flexner

"Flexner on Finishing" columnist

"Repairing and Restoring Antique Furniture" by John Rodd (Van Nostrand Reinhold).

"Antique Furniture Repairs" by Charles H. Hayward (Scribner).

These are the two best books on methods of doing proper wood repairs to antique furniture. Unfortunately, both are out of print so you have to find them in the secondary book market.

For the most part, furniture restorers/refinishers/conservators in the United States lack the necessary handtool skills to do proper wood repairs. But avid readers of *Popular Woodworking Magazine* do possess the skills. Like me in the 1970s, you just need instruction on how to go about it. These books provide this. They greatly influenced the techniques I use in my shop, and many are shown in the "Repairing Furniture" video/DVD I made for Taunton.

Marc Adams

Marc Adams School of Woodworking, marcadams.com

My absolute favorite book on woodworking is "Cabinetmaking and Millwork" (second edition, revised) by John L. Feirer. Although the photos are dated, the content is right on and very accurate. This book covers it all. I do wish I would have had the opportunity to meet John.

My second favorite book is "Designing Furniture From Concept to Shop Drawing: A Practical Guide" by Seth Stem (Taunton). Seth is a friend of mine and his book opened up a lot of doors for me as I was learning to give a voice to my own furniture style.

"Encyclopedia of Furniture Making" by Ernest Joyce. A lot of furniture makers think this is the best book but I disagree. It is a wonderful book but I have found some of the information not as informative as it should be. Still it is one of the better books out there.

"Table Saw Techniques" by Roger W. Cliffe (Sterling). This book was the first book written on table saws and definitely has the most information. Again it is a little dated but anyone who has written a table saw book since has plagiarized from Roger's book.

"The Encyclopedia of Wood" by the U.S. Department of Agriculture. What I like about this book is that it is very technical and is not for the fainthearted. It explains wood and wood movement and defines all the testing standards.

The Home Craftsman Series by Charles H. Hayward. This series includes books on joinery, jigs and fixtures, finishing and carving. They are well illustrated and very informative.

"The Complete Manual of Wood Veneering" by William A Lincoln (Scribner). Again, it is a little dated, but when it comes to veneering he knew what he was doing. He was a true craftsman and it shows in his writings. **PWM**

Chris is the editor of this magazine and spends too much of his kids' college money on books.

Go Online FOR MORE ...

For links to all these online extras, go to:
▶ **popularwoodworking.com/jun11**

VIDEO: *See a short clip of all the books fitting on our 5' shelf.*

ARTICLE: *Read the list of our readers' favorite books.*

BLOG: *Read Christopher Schwarz's favorite books on handwork.*

TO BUY: *We carry many of these books in our store.*

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

FLEXNER PHOTO BY JIM ROBERSON; ADAMS PHOTO BY AL PARRISH

Caddy for Your Tea, Governor?

BY GLEN D. HUEY

Use unconventional techniques to construct a traditional tea caddy.

Inlay outside the box. *Think differently about inlay as you slice and fit fans – assembled from wedges – into recesses created at your drill press.*

England began to import tea about the middle of the 17th century. When first introduced, tea was expensive, so it was a drink affordable only to the wealthy. That, of course, was an invitation to smugglers who, during the next 100 years, drove down the cost to make tea available to the masses.

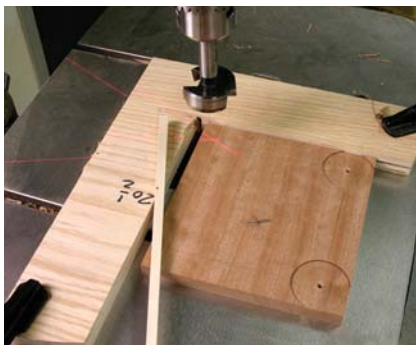
As the demand for tea increased, the need to store and protect the tea leaves also grew. By the mid-1800s, woodworkers were making wooden tea caddies of single-, double- or triple-compartmentalized boxes.

Traditionally, caddies are a study in veneer. The boxes are built in pine, oak or mahogany, then veneered with figured hardwoods and inlaid with intricate designs. While my caddy has figured hardwood and striking inlay, there is no veneer. This is how to accomplish similar results using methods that are much more simple.

Choose, But Choose Wisely

From the get-go, my inlay had to jump from the caddy. That meant no dyes or stains to mute the contrasting colors. I also wanted a mahogany-like color and good figure, so I chose quartersawn sapele for its strong stripe; the inlay is walnut and maple.

To begin, cut and size the four pieces that make up the box, as well as the caddy top. Before any machine work begins, establish the area for the bandings, both inlay and cross. Scribe lines 3/4" in along all four edges of the top. But because the caddy top sits on top of the top edge of the box (adding a 1/4" in height), only the bottom edges and the ends of the box sides are scribed at this setting. To scribe lines along the top edges of the box sides, adjust your cutting gauge from 3/4" to 1/2".



Proper spacing. *A spacer, to compensate for the 1/4" added when the box top is attached, moves the box parts into the proper position.*

Not by the Book

Preparing the panels for inlay is also not very traditional. Set up a drill press with a 1 5/8" Forstner bit to cut the fan recesses. Create an L-shaped plywood fence to accurately align each fan location. Set the fence and panel so the bit is centered over the intersection of two 3/4" scribe lines. Clamp the fence in place, set the drilling depth to 1/16", then cut the recesses at each corner.

The drill locations along the top edges change, so space the panel away from the fence using a 1/4"-square spacer set between the fence and your panel along the 1/2" scribe line.

To complete the recesses for the inlay, adjust your table saw to remove 1/16" of thickness from the show side of all parts, including the caddy top. Cut from center point to center point of the fan recesses – the top edge requires a blade height adjustment.

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

"A little inaccuracy saves a ton of explanation."

— H. H. Munro (Saki) (1870-1916)
British author

Assemble the Box

The four main parts of the box are joined with 45°-mitered corners. The miters need to be accurate. Use a step-off block as shown at right to ensure a matching length after the cuts (as long as your original parts were also identical when sized).

With the blade back to vertical, plow a 1/4" x 1/4" groove in the box parts. Set the groove, into which the caddy bottom fits, 1/4" up from the bottom edge.

Measure the groove from beveled cut to beveled cut, then mill the bottom to size and thickness (leave room for expansion, if needed). Rabbet the four edges of the bottom so the resulting tongues fill the grooves with the bottom flush with the box.

Arrange the pieces so when folded together they form a box – alternate the short and long pieces. Make sure to align the top edges before joining each piece to the next with a short length of tape. With the tape in place, flip the unit so the inside of the miters are up, then apply a thin layer of glue to the bevels and allow it to soak into the end grain. After a few minutes, apply another layer of glue then fold the parts together as the tape acts as a hinge. Don't forget to slip the box bottom in place as you assemble the box. Once the box is folded together, add a piece of tape to the final corner and allow the glue to dry.

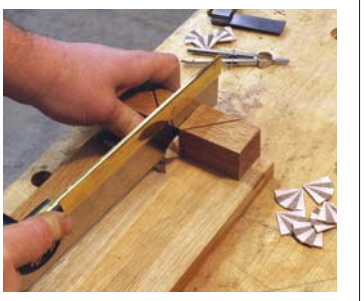
With the glue set, remove the tape then cut saw kerfs across the corners, as shown in the top right photo. The kerfs are angled to the corners, similar to the slope of dovetails (the degree of slope doesn't matter). When filled with thin stock milled for a tight fit, these veneer-keyed miters help secure the joint. Glue the veneer into the kerfs, then trim the pieces flush to the caddy.

Cut a 1/2" x 1/4" rabbet along all four edges of the top so that the field fits inside the box. The top is simply glued to the box. This is a cross-grain attachment, but there is no way around the problem – if the top were set into grooves as is the bottom, there would be problems with the cross banding used on the top. (Less movement is one advantage of quartersawn wood.)

Accurate lengths. *It's important that all the parts maintain their length relationships. Use a step-off block held behind the blade center. You don't lose contact with the block until you're into the cut.*

Thin reinforcement. *The seldom-used veneer-keyed miters add tremendous strength to a mitered corner.*

Be exact. *Setting the saw blade at less than 9° leaves your section short of 90°, while a setting of more than 9° results in excess trimming.*



Cut extra. *Twenty fans are needed to complete the box, but as you're sure to lose a few in the next steps, extras should be cut.*

Wedges to Fans

Traditionally, corner fans are made from pieces of veneer. After reading Jameel Abraham's "Precision Inlay, Simple Tools" in the April 2011 issue (#189), I decided to make a length of fan inlay that is sliced as needed. It worked great.

Begin with a simple table saw jig, as shown in the photo above. Tip the blade to 9°. With a couple 7/8"-thick pieces of four-squared scrap – use contrasting colors such as maple and walnut – cut one end square at the 9° setting. Flip the stock face down, then align the cut so the resulting offcut is a perfect, 7/8"-tall triangle. (A mark on the jig helps align each cut better than a stop-block – the block tends to hold your offcut at the blade.) Make enough pieces to create a couple fan sections.

Arrange five pieces in an alternating pattern – I used maple for the two outermost wedges. You're gluing end grain, so use plenty of glue as you assemble the fan inlay section. Arrange the wedges so the outer two pieces meet to form a tight point. Use rubber bands as clamps. Place bands at 1" intervals or the point end of your section will open as the glue dries. A dried fan section is then sliced by hand to produce individual fan inlays – keep the fan thickness at 3/32".

There is a trick. *Trimming the fans to shape is easy work, but don't cut directly at the line – sneak up on it.*

Set a compass to 13/16", place its pivot leg at the point of the fan then draw a quarter circle across the inlay. Next, trim the fans using a flat chisel in a rocking motion. Keep one corner of the chisel in contact with a sacrificial board

as you work to the line. Final smoothing can be done with a file.

The trimmed fans fit perfectly into the recesses created by the drill bit. Apply glue to the fan then affix the fan in position with a rub joint – a piece of blue tape across the fans helps secure the edges to keep them from lifting as the glue sets. Once the glue dries, trim the edges of the fans (if necessary) to align with the straightedges of the box.

Remaining Inlay

Because the diamonds on this 1/4"-wide, store-bought banding are tight end-to-end, it's more difficult to achieve a well-matched corner. Begin on the long sides of each panel. Center the inlay to the box and place a mark on the inside edge of the banding where it meets the edge of the panel. Looking at the reflection in the back of a shiny chisel allows you to make a near 45° cut without measuring each piece. Trim both ends then temporarily attach the banding with blue tape.

With the two long pieces set in position, slide a short section of the banding under the two trimmed ends and transfer the exact cut location with a pencil or marking knife. Match the designs for the best look.

As you finish fitting the banding to a panel, glue the pieces to the box. Apply glue to the banding pieces then use a rub joint to secure the fit. Add pieces of tape to secure the bandings in position until the glue dries.

The cross banding that wraps the field just outside the inlay banding is cut from 2"-long pieces. Slice those pieces into 3/32"-thick veneer using your band saw then use a spindle sander to dial-in the thickness to 1/16". The number of pieces you need depends on the width of your stock at the start. There's no big expense here, so make sure you prepare enough material.

Score a cut line with your cutting gauge to establish the width of the cross banding, then make the cuts using a utility knife and straightedge. Fit and install the cross banding just as you did the inlay banding. Of course, the longer runs may be two or more butted pieces.

With the cross banding installed and the glue dry, bring all surfaces flush with a card scraper or by sanding. Next, install the last bit of decoration for the box, the tiger maple 1/8"-square pieces. These protect and hide the cross banding edges.

Use a router and rabbeting bit to cut the edges of the box. Rout and install the vertical corners of the box first, then move on to the horizontal corners. As

Supplies

Horton Brass
horton-brasses.com or -800-754-9127

1 ▶ rosette pull w/ backplate #h-10 (3 1/4" boring)

2 ▶ solid brass desk knob #h-42 (1/2" diameter)

Call for pricing.

Rockler
rockler.com or 800-279-4441

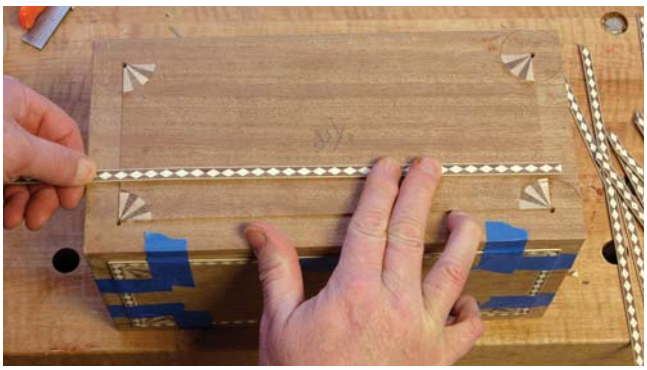
1 ▶ solid brass, fixed pin narrow hinge #32941, $14.59/pr

1 ▶ half-mortise box lock #71456, $14.99

Inlay Banding
inlaybanding.com or 704-221-2147

6 ▶ Federal-style banding #131, $6.35

Prices correct at time of publication.

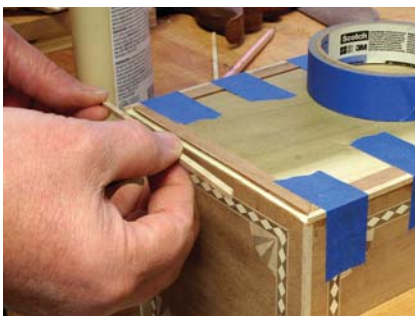


Position is pertinent. *Any inlay pieces should be centered to achieve the best look. It's not enough to simply run the inlay banding around the field.*

Easily aligned. *Fine-tuning the position of the end inlay banding is simple when positioned under the mating pieces. Slide the piece until the best look is attained.*

Modified thickness sander. *To flatten and thickness the cross banding, squeeze the band-sawn pieces between a fence and the sanding drum of a spindle sander.*

Take two. *The cross banding fits to the caddy just as the inlay banding did: work the two longer sides, miter the ends, then mark the remaining pieces off of those.*



Rabbet. Miter. Glue. *Climb-cut the 1/8"-deep by 1/8"-wide rabbet to help alleviate any tear-out, then fit the maple corners to the box. Quality craftsmanship dictates mitered corners.*

you rout the horizontal corners, you cleanly trim the previously installed maple inlay. Miter the corners of the 1/8"-square stock and use tape to hold the inlay secure as the glue dries.

Hardware & Finish

Separate the lid from the box at the table saw. The cut line is positioned 1/4" below the uppermost fan inlays. Use a thin-kerf 7 1/4" saw blade to save as much of the box as possible. Adjust the fence so the box bottom rides along the fence allowing the top to be the offcut. Raise the blade to 9/16" and cut the two long sides of the box.

Next, cut and install a snugly fit filler into the kerf. Attach a clamp to the center of each of the long sides of the box then cut the two ends. As you make the cuts, the lid stays put. It's easy.

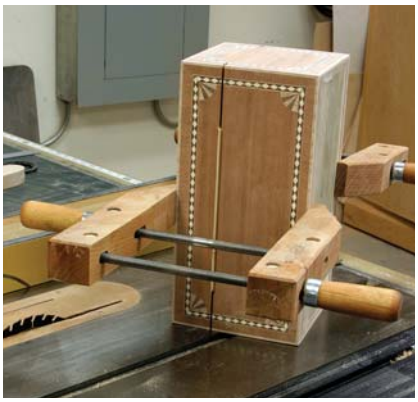
Install the 1/8"-square maple inlay along the cut lid and box edges. Miter the corners. Also, make and fit the interior partitions. The partitions are two long pieces that are cut to just fit inside the box and have centered dados to catch the middle divider. These pieces are slip-fit in the caddy.

Mill the material for the compartment lids, cut the 5/8" recess for the bandings then add the inlay banding and cross banding just as you did on the box. The lids are rabbeted so that the 1/4"-lips rest on the partition.

Sand the project to #180 grit after you fit the hinges and lock to the caddy. Your finish could be as simple as a few coats of an oil/varnish mixture, however, due to time constraints, I added a coat of oil to highlight the wood grain, followed by a couple coats of shellac and a layer of dull-rubbed effect lacquer.

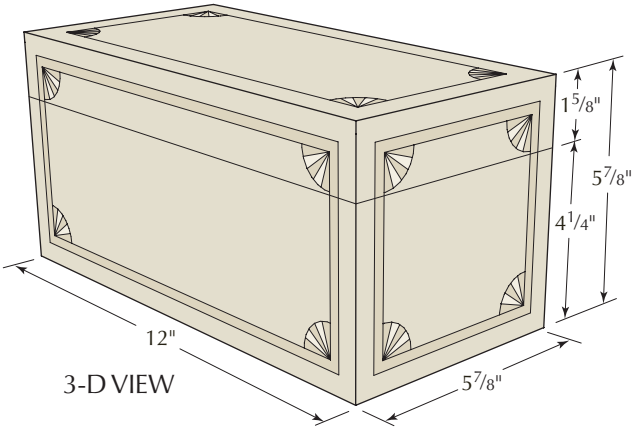
The handle makes for easy transport and a velvet-wrapped plywood panel squeezed into the lid dresses up the interior.

This box is a perfect example of how non-traditional techniques can lead to traditional-looking results. You don't need a veneer press. While I doubt this box will caddy any tea, I'm sure you'll find a taker when it's complete – if you wish to part with it, that is. PWM

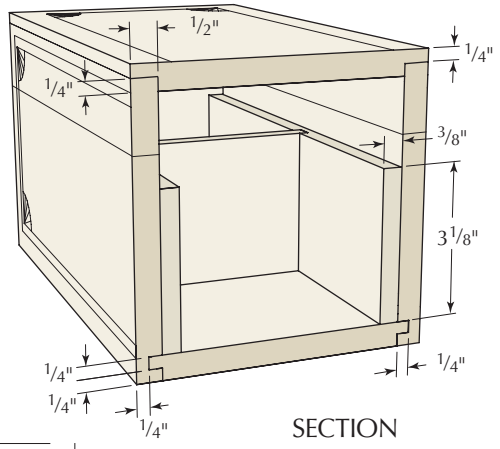


Fill the slot. *To keep the caddy lid from springing free as it's separated from the box, fill in the thin kerf with spacers. Add a couple clamps to hold everything secure.*

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



3-D VIEW



SECTION

Tea Caddy

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	2	Long sides	1/2	5 5/8	12	Sapele
❑	2	Short sides	1/2	5 5/8	5 7/8	Sapele
❑	1	Bottom	1/2	5 3/8	11 1/2	Poplar
❑	1	Top	1/2	5 7/8	12	Sapele
❑	2	Long partitions	3/8	3 1/8	11	Popular
❑	1	Center partition	3/8	3 1/8	4 3/8	Popular
❑	2	Compartment lids	1/2	4 3/4	5 3/8	Mahogany
❑	2	Fan blanks	7/8	6 1/2	12	Walnut/Maple *
❑	6	Inlay banding	1/16	1/4	36	Purchased
❑	10	Cross banding	1/16	6 1/2	2	Sapele
❑	12	Corner inlay	1/8	1/8	13	Maple

* One each of contrasting colors

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▸ **popularwoodworking.com/jun11**

VIDEO: *Watch as a fan is sliced, marked and trimmed for the tea caddy.*

VIDEO: *Watch Rob Millard create a traditional fan inlay using veneer.*

WEB SITE: *Get more information on inlay bandings, including shop-made designs.*

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Secrets of the Sector

BY JIM TOLPIN

Just 2 sticks and 1 hinge will eliminate both math and errors from your layout work.

The traditional tools. *Here's an ivory sector and traditional dividers. While original sectors are rare, you can make your own with scraps in an afternoon.*

If you haven't heard of the sector, it probably means you aren't an artisan or a ship's navigator living and working in the 17th and 18th centuries.

An invention attributed to Galileo, the sector is a calculation instrument comprised of a pair of hinged sticks engraved with a variety of scales that – coupled with a pair of dividers – enabled you to solve trigonometry, division and multiplication problems (amongst other functions).

Though I haven't found source documentation of this yet, the sector was likely used by architects and artisans to lay out designs based on the (once) ubiquitous whole-number ratio proportioning systems. You probably haven't heard of this tool, however, as post 1830s factory-based furniture manufacturing eclipsed the traditional design and processing methods of the artisans with the result that their tools of the trade – dividers, sectors and applied geometry in general – faded almost entirely from use.

I have discovered, however, that a simple version of the sector can be a useful and efficient tool for layout work. In addition to using it to create furniture designed to the whole-number ratios embedded in the classic order proportioning system, this simple device can divide a board's dimension (or the dimension of a space to be filled) into equal parts, lay out hardware locations, and change the scale of a design up or down without losing its integral proportions – all within a matter of seconds and all without having to crunch fractional numbers. As I will show you in this article, all you need do is hold a sector in one hand, a pair of dividers in the other and be able to count to 13. Once you start working with this tool, you'll wonder how you ever made do without it.

"The better class of workmen would rather part with the clothes off their backs and the beds from under them, than make away with their tools ... ."

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

The Sector & How it Works

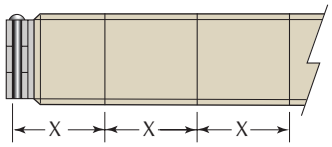
The sector works on this basic proof in geometry: "Similar triangles have their like sides proportional." That means the third side ("B" or "D" in drawing B) of a triangle formed by the two arms of the sector will always be in a whole-number proportion to the third side taken at any other division on the arms.

What this means "on the bench" is that when you set your dividers to fit the 10th notch on each arm, the spread of the dividers will be exactly twice that of the distance you'll find between the fifth notches (see Drawing C at right). Likewise, if you set your dividers to the ninth notches, you now have a dimension that is three times the dimension that exists between the third notches.

This opens up a world of possibilities in both refining and speeding up your layout work. Best of all, you no longer

LEAD PHOTO BY AL PARRISH; ILLUSTRATIONS BY MARY JANE FAVORITE FROM DRAWINGS BY THE AUTHOR; PHOTO ON PG. 45 BY CRAIG WESTER

have to deal with fractional numbers or, for that matter, division or multiplication work outside of single digits. The sector generates physical dimensions that can be "lifted" and transferred by a set of dividers, making it unnecessary to generate numbers that must be recorded and transferred with numbered measuring devices. I don't know about you, but I find that to be an enormous boon for my eyes, my mental health and, perhaps most important of all, my ability to avoid mistakes.



HINGE-TO-DIVISION LINE SPACING

Spacing "X" is not to any numerical measurement. Set divider spacing to allow 13 divisions within length of stick.

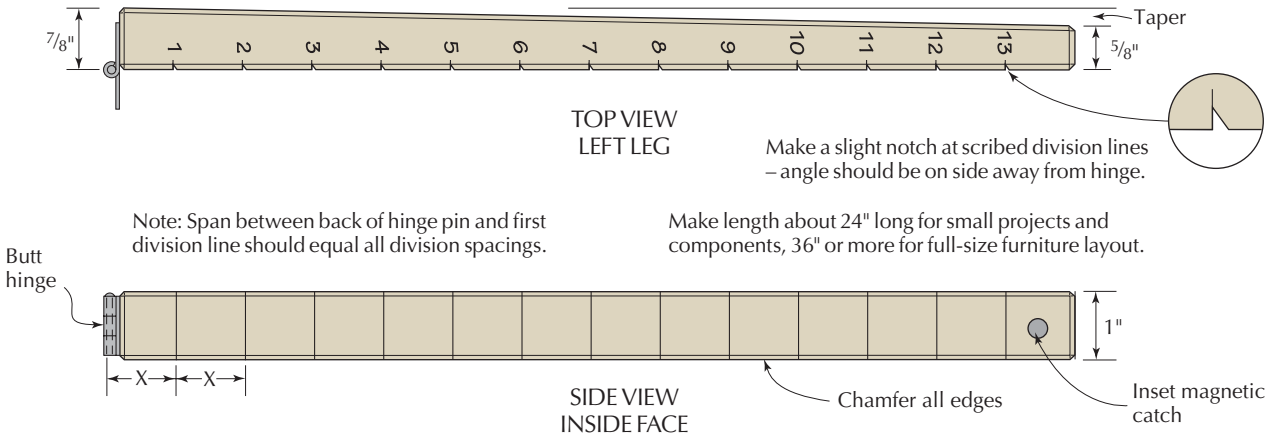
Working With the Sector

Once you have built a sector (see Drawing A below), begin to experiment with it to solve the following common layout problems. (Note: If I haven't yet convinced you to make a sector, you can substitute a traditional folding rule, using the full inch marks as the division points and setting the divider points to the inside edge of the rule to lift the transverse dimension as shown in the photo at right). When you feel you understand how to use the sector to solve these problems, then try using it for the more complex task of designing an entire cabinet.

Sector in use. *Try this with a traditional folding rule. To divide the board into five, set the rule so the marks at 10" up the legs touch the board's corners. Set the dividers to touch at 2" up each leg. That width is 1/5 of your board.*

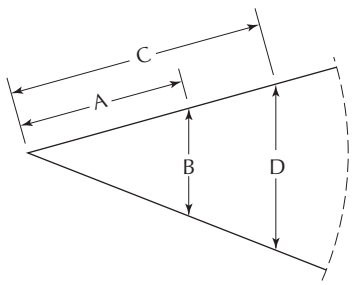
Problem 1: Divide a Door Opening Into Five Equal Parts

Let's say we want to make a plank door for a rustic cabinet, and that we want the five planks to be of equal width. Instead of measuring the width of the opening then dividing that number by the number of planks (quick: what is $17\frac{15}{16}$" divided by 5?), you can get the answer from the sector nearly instantaneously – with the bonus of having, in the process, set up a layout device (the dividers) to mark this width. If you are



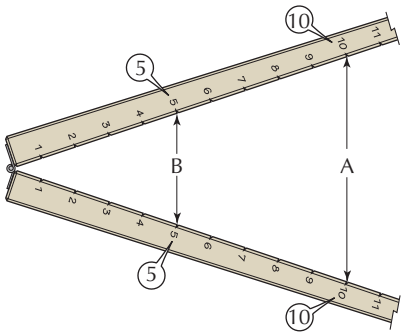
DRAWING **A**: SECTOR CONSTRUCTION

These two lines, when intersecting a circle drawn from the intersection, define a sector of the circle. The span at B is proportional to length A as span D is to length C.

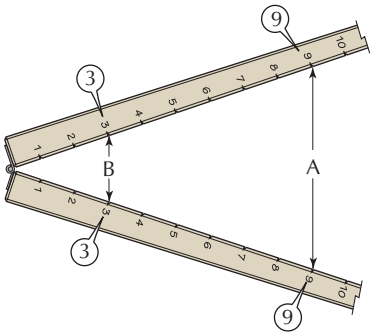


DRAWING **B**: GEOMETRY OF THE SECTOR

Span A is twice that of span B.



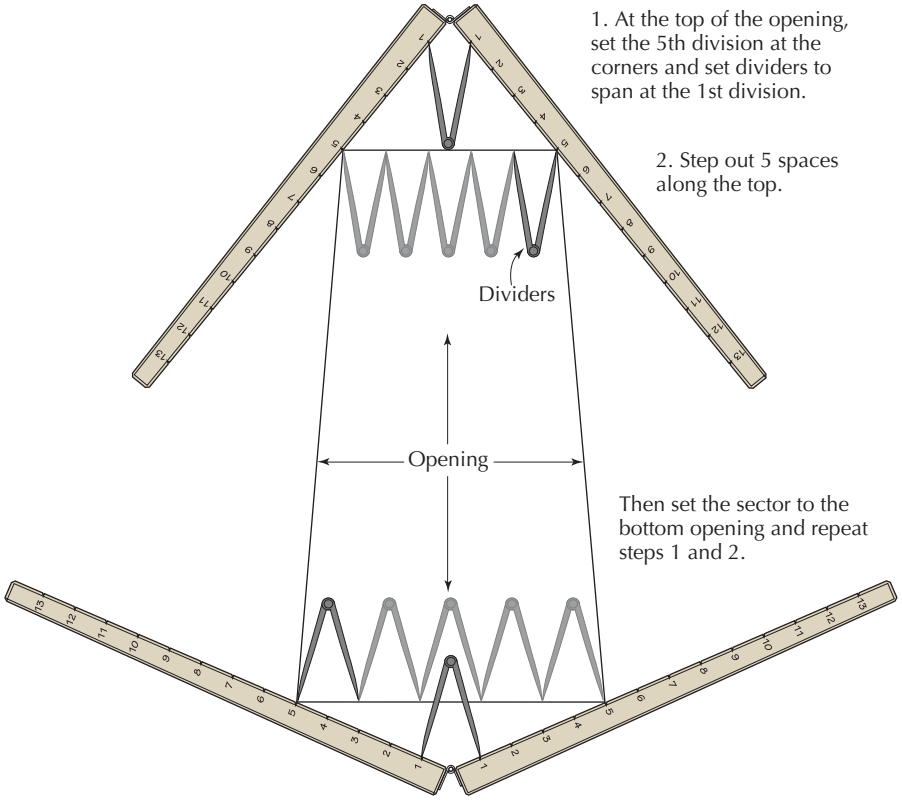
Span A is three times longer than span B. And note that at the 6th division line, the span would be 2/3 that of the span at the 9th division.



DRAWING **C**: DERIVING PROPORTIONS

ripping the stock by hand (that is, you don't need a number to index a machine to), then you don't even need to find the measurement for this span – you can simply lay it out from the dividers right onto the stock to be ripped.

So open your sector and place the marks at 5 on each corner of your opening. With the sector in place and set, adjust your dividers so their points touch at the marks for 1. The dividers are now set for 1/5th of your opening.



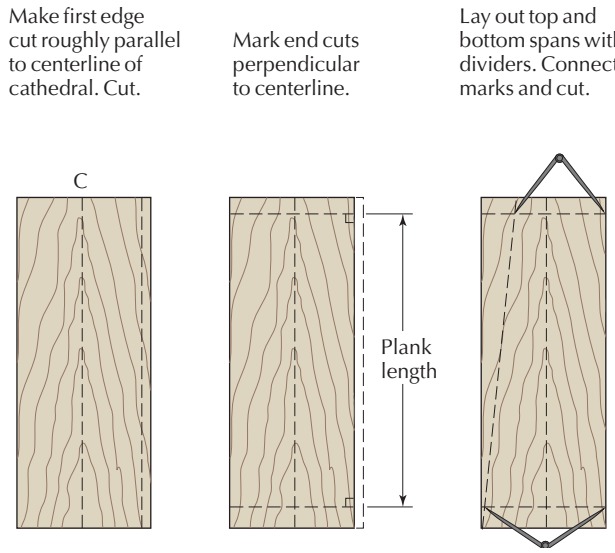
DRAWING **D**:
LAYOUT OF TAPERED PLANKS

Problem 2: Lay Out Tapered Stock

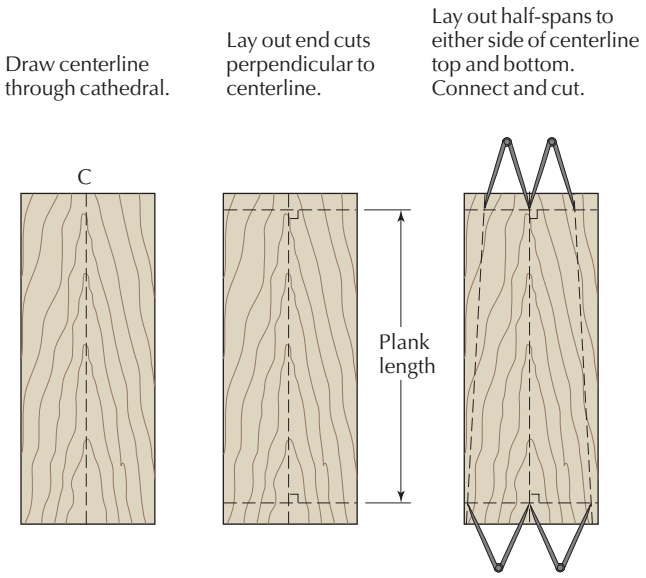
Now let's pretend the door opening is wider at the bottom than the top. How are we going to get five equal planks that taper in width from top to bottom? As you might guess, the sector comes to the rescue: We set the sector as described above to get the plank width for the span at the bottom and mark this on one end of the board. We then repeat the process at the top and mark the other end of the board. See drawing D at left.

For the sake of aesthetics, let's not assume we can lay out the taper from the edge the mill gave us to work with. As you can see in Drawing E below, this can result in an awkward (read: ugly) grain pattern. Instead, we'll begin by ripping and truing one edge parallel to the centerline of the cathedral, then we'll lay out the width of the plank's top and bottom from there. (And don't worry about the angles on the ends of these hypothetical boards – they'll be trimmed to fit the hypothetical opening after assembly.)

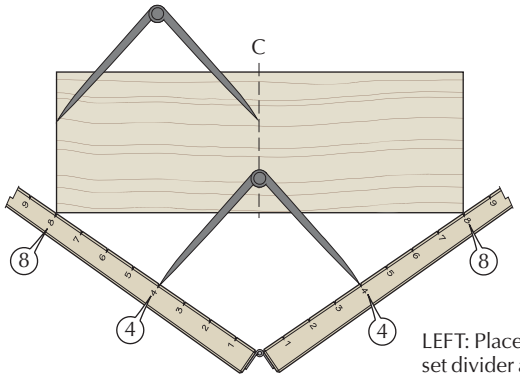
Another way to ensure that the cathedral is centered on the plank is to draw a centerline first, then lay out to either side of it. But wait, our divider is set to fifths of the span top and bottom. The solution: We'll reset the sector to give us 10ths and then use this dimension to lay out on either side of the centerline.



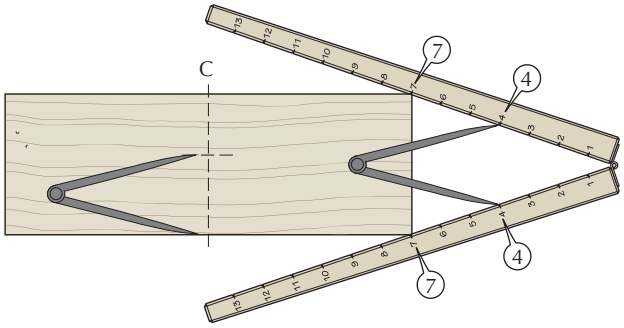
DRAWING **E**:
LAYOUT OF TAPER ON STOCK



ALTERNATIVE METHOD



LEFT: Place sector to 8th division and set divider at 4th division. 4/8 = 1/2 so divider will mark center.



ABOVE: Place sector to 7th division across width and set divider to fourth. Lay out 4/7 from bottom on centerline.

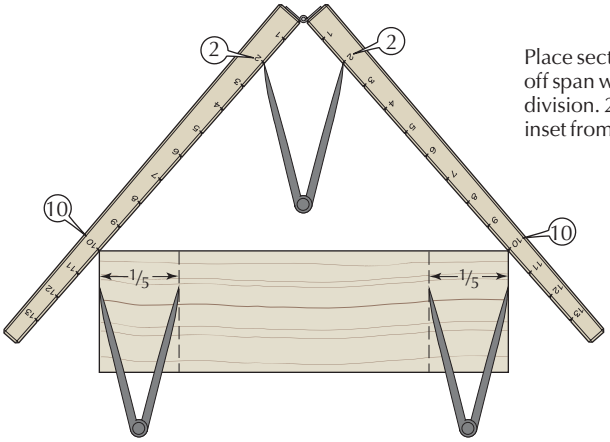
DRAWING **F**: LOCATE A SINGLE PULL ON CENTER

Problem 3: Lay Out Hardware

Now let's use the sector to lay out hardware locations (such as pulls) in pleasing, whole-number ratios that relate to the overall span of the component to which they are mounted (and to each other, if in pairs). For example, in Drawing F above, the sector finds the vertical centerline of a drawer face for mounting a pull: We open the arms of the sector so that an even number falls on each end of the face (in this case, eight) then set the dividers to half that number (four) on the arms: we've located the center as four-eighths, which reduces to 1/2.

We'll then set one leg of the divider to the edge of the drawer face, make a pin point mark with other leg, and erect a vertical line with a pencil. The pull will install somewhere along this line. If you want it centered, you just repeat these steps, setting the sector across the width of the face. If, however, you want it offset toward the top a bit (commonly done because we are usually looking down on a chest of drawers), a pleasing ratio is 4/7ths up from the bottom. To find this location, we orient the sector on its seventh division lines across the width then set the divider to the fourth division line: This, as I'm sure you've guessed by now, represents 4/7th the width of the face.

In a similar fashion, if we are laying out two pulls, we may choose to set them 1/5 of the way in from each end – a common and pleasing choice in 18th-century casework. We'll get this spacing by setting the sector so that the fifth division falls to either end then pick off the span at the first division. If the face is too long for the sector's fifth division marks to reach, we'll set the sector divisions at 10 and pick off the inset at the second division marks (2/10 = 1/5). See Drawing G above.

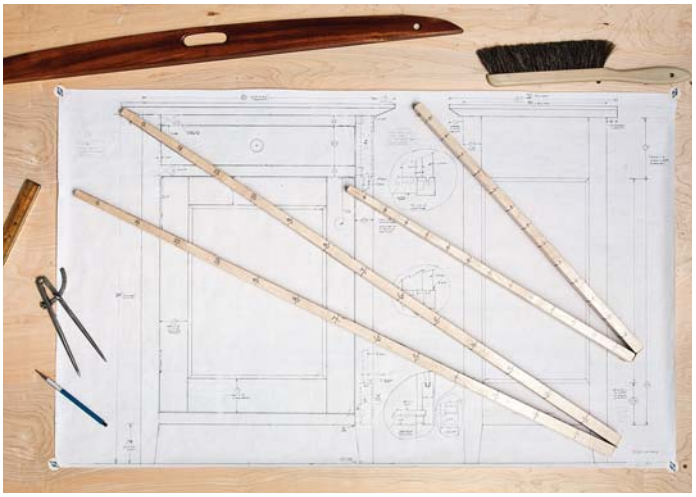


Place sector to 10th division and pick off span with divider at the second division. 2/10 = 1/5, so lay out 1/5th inset from either end with a divider.

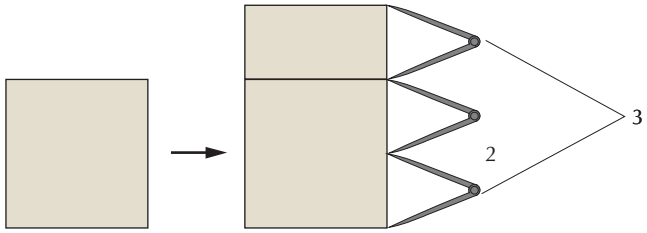
DRAWING **G**: LOCATE A DOUBLE PULL

Use the Sector to Design Furniture

Now let's step back in time to the world of the pre-industrial artisan. Here's the instructions that we, the journeyman cabinetmaker, might have been given by the shop master to build a particular



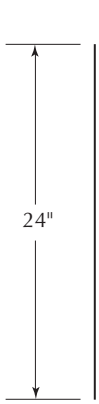
Old story sticks. *You can use your sector to quickly scale a project up or down, or detail its components.*



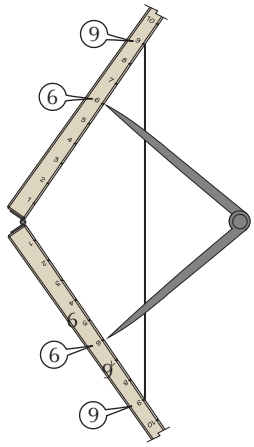
Square

Square and one-half of a square; 2:3, width to height

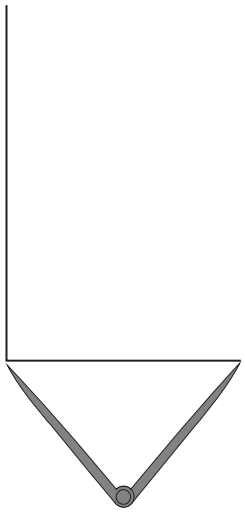
ESTABLISH THE ELEVATION



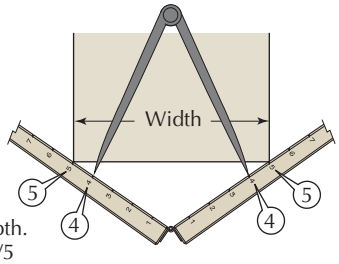
First, draw a 24" line.



Then, set the sector on 9 at each end of the line. Set the divider at 6.

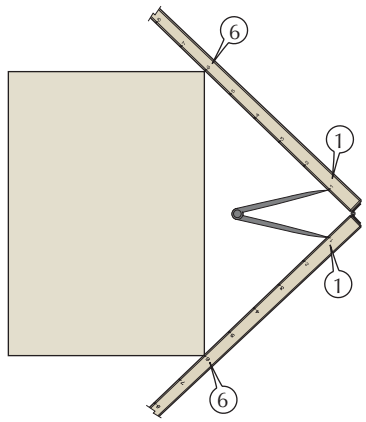


Third, set out the width 6:9 (2:3, width to height).



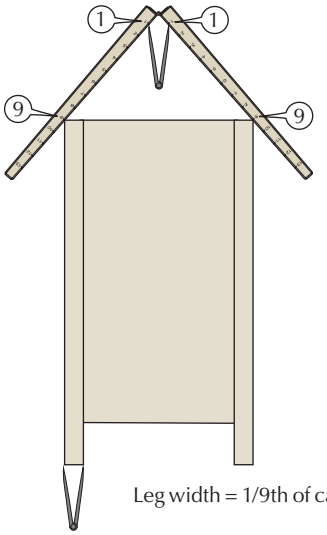
Last, set the depth. Case depth is 4/5 width.

ESTABLISH THE HEIGHT, WIDTH & DEPTH



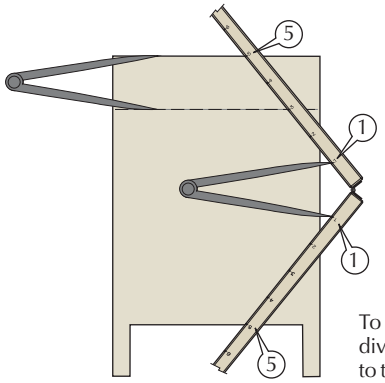
To find toe space to bottom rail, place sector at 6 and take off spacing at 1. This gives 1/6th of case height.

TOE SPACE



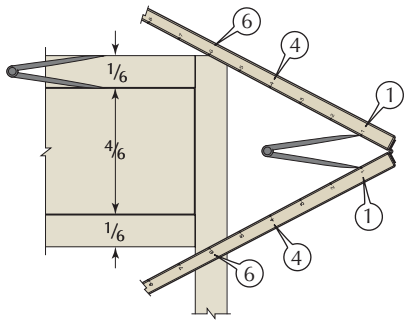
Leg width = 1/9th of case width

LEG WIDTH



To find height of drawer, set 5th division of sector to toe kick and to top of case. Take off 1/5th at 1.

DRAWER FACE



Drawer face = 4/6 spacing for drawer
Blades = 1/6

DRAWER DETAIL

DRAWING **H**: SIDE TABLE DESIGN

piece of furniture. (We are assuming it's a one-off and there are no templates or story sticks):

"The client wants a side table about 24" high with a door and a drawer above. The proportions will be a "square and a half" and the depth shall be 4/5 of its width. Now off you go …"

Because a "square-and-a-half" for a side table is accepted to mean that the table is half again as high as it is wide or three parts high to two parts wide (see Drawing H at left), all we need to do is draw a 24"-long line, set the sector so the ninth division line strikes the top and bottom of the line, then take off the span at the sixth division line. Because 6/9 reduces to 2/3, we have found our 2-to-3 ratio to lay out the width of the table. To find the depth – which the master told us should be 4/5ths of the width – we set the sector so that its 5th division lines touch the outside edges of the face, then take off the span at the 4th division line. This is the depth of the cabinet case. (Note: If your sector isn't large enough to reach at the 5th division line, set it at 10 and take off the span at 8 because 10/8 =5/4.

To find and lay out the proportions of insets and components within the form, we can again use the sector to set out the ratios. Refer to Drawing G to see how I've used the sector to establish such features as the rise of the toe space; the space allowed for the drawer face and its top and bottom blades (also called rails) as well as the proportions of these components within that space; and the width of the legs.

Problem: Scale the Design

We've got the design for the side table all done, we've built the table, and the customer is happy. But now he wants another one for his children's bedroom – but built to "kid-size." No problem, we'll just build the same thing, but to 2/3 scale. How do we change the design in the most efficient way possible to come up with a new cut list or tick stick? Again, the sector comes to our rescue. For every span on the full-scale drawing all we need do is set the sector so that a division line that can be divided by three (i.e. three, six, nine or 12) will fall to each side of the span. We then pick off the 2/3 point on the arms (two, four, six or eight, respectively) and record this new, scaled-down dimension. If we wanted to go to 3/4 scale, we would use division lines that could be divided by four (4, 8, 12) and set the dividers to 3, 6 or 9 respectively. PWM

Jim is the author of the book "The New Traditional Woodworker" (Popular Woodworking Books) and runs classes at his school: Port Townsend School of Woodworking (ptwoodschool.com)

***Not just for architects**. Sectors can open up a whole new way of dividing up your work and scaling your projects.*

***Modern sectors.** I built these two sectors for use in my shop. There are more details on these tools at the magazine's web site.*

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Jasmine Jewelry Box

BY GARY ROGOWSKI

Simple tools, techniques & joinery deliver elegant results.

Ashtastic. *This ash, finger-jointed jewelry box is simple to build with just a few tools: A band saw, chisel, handplane and router are all that's required.*

It's the stuff of arguments: Which tools in the shop are really the most important for joinery? It's almost like arguing the top movie or the best shortstop of all time. There is no one answer that satisfies everyone (although "The Maltese Falcon" and "Ernie Banks" should). Were you to ask me, my answers would be quick but not absolute. Give me three tools: a band saw, a chisel and a router, and I can build just about anything. This jewelry box project shows how versatile these tools are.

Choose your joinery on three factors: function, economy and skill. What will the piece do? This poses the question: How strong does it need to be? There are 10 ways of building this box and all of them are good. But which one of these methods is strong enough and adds something to the design?

How quickly does it need to be made? Is this jewelry box a diversion or a Christmas or birthday present? If it's the latter, then almost by definition it's late. The speed at which you work will come into play. You might want to use dovetail joints but you don't have the time to hand cut them. But you can quickly cut a finger joint that looks pretty good using the band saw.

"As with all woodworking activities the only true guide is positive experience, often bitter but nevertheless inevitable."

— Ernest Joyce
"The Encyclopedia of Furniture Making"

Finally, what are you capable of doing in your shop with your tools and your skills? You might want something a lot prettier than a butt joint and you have the tools and time to do it. This finger-jointed box offers in its design strength, simplicity and symmetry in equal measures.

Finger Joints on the Band Saw

To lay out the finger joints, I divided the width of the box side into thirds. Take a ruler and put the corner of it at one edge of the board and rotate the ruler until it hits the other edge at a number easily divisible by three. Mark out your thirds and square those marks out to the end of the board. Just make certain that the width of the center slot is just a hair wider than one of your chisels. This way your chisel will enter more easily when chopping out the waste. For this box measuring 2 1/4" high, I used a 3/4" chisel and the remaining space divided up at 3/4" evenly. This is not critical for the strength. What is critical is how accurately you set up to cut these joints.

Before beginning this method, try out this band saw technique on a piece of

Divisible by three. *To lay out your finger joints, place a ruler at the edge of your board, then angle it to the opposite edge until you have a measurement easily divisible by three – and ensure the center slot is a hair wider than the chisel you wish to use.*

PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG, FROM THE AUTHOR'S DRAWINGS

scrap. First, all your stock has to be the same width. Triple check and adjust as needed. Next, you'll need to make a shim that fits the width of the cut that your blade makes. This kerf will vary from blade to blade so make a practice cut in a board and try to find a shim that fits well. Perhaps two pieces of veneer glued together will work. Maybe you'll need to add a piece of masking tape to them to increase the thickness – or shave or scrape a little off the veneer instead to thin it. You may have to make your own shim by cutting it on the band saw. But however you make this shim, it has to fit the kerf tightly or the joint won't fit.

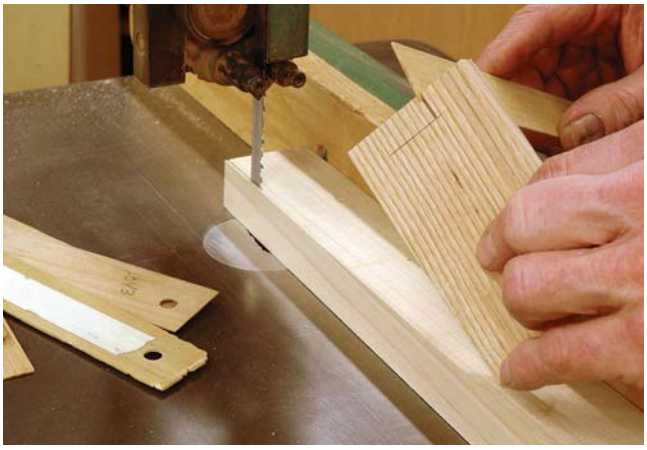
Use a band saw blade with at least 4-6 teeth per inch to cut the joint (I use a Wood Slicer blade). Cut the center notch first. Set up your fence distance to cut the closer of the two side walls of this notch. Line it up to make a notch wide enough for your chisel and make sure to mark the baseline for your cuts on this test board at slightly less than the board's thickness. Make the first cut up to this line. Flip the board and make the matching cut on this slot. Mark this slot as waste then check that the shim fits tightly. Adjust the shim as needed.

For the matching cut, nothing changes on the band saw except that you introduce the shim between the fence and the second board. Keep that board tight to the fence as you make the cuts and keep the shim always close to the end that's being cut. What's happening, of course, is that the second board is being pushed away from the fence by the width of the cut. If your shim is too loose, then so will be your joint. If it's too tight in the kerf, then you'll have trouble closing the joint. You can see this relationship when you hold the two boards up to one another. Once you cut away the waste, the joint should just fit snugly together with hand pressure.

Joinery Details & Fitting

One of the important ways to set a project apart is to detail it. With these finger joints, I make them protrude through and chamfer their ends to call them out. Set up your marking gauge for the thickness of the stock plus $\frac{1}{32}$" to $\frac{1}{16}$" more. Have your center slot marked out on the two long boards and mark their faces. For the end boards with the single finger in the middle, mark out the faces and the edges of the board. Next, chamfer the ends of your boards with a block plane. Then, using your block plane again (or a sander), clean up the ends of your boards. It will be simpler with less risk of tear-out to do all this work now rather than later.

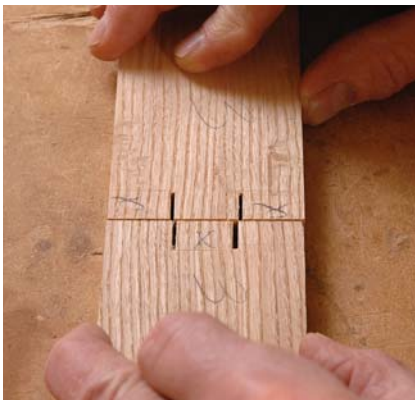
With your shim the perfect size, cut out the four notches on your long boards. A simple precaution when cutting is to set up a stop on the fence to



Tight shims. *You must use shims that fit tightly into your saw kerfs. If you don't have veneer that will serve, cut shims at the band saw.*

Notch test. *With stock at the ready sized in width the same as your actual pieces, set your band saw fence to make the first cut for the center notch, then flip the board and cut the second side of the notch. Make sure your shims fit the slots tightly and check that your chisel will fit just inside the waste.*

Fit test. *To cut the matching part of the joint, slip the end of the shim between the fence and your stock, and make the cut with the shimmed stock held tight to the fence, then flip the board and make the second cut.*



End-to-end match. *If your cuts are set up and shimmed correctly, the inside edges of your kerfs should align.*

Ease the edges. *Use a block plane to chamfer the ends of your stock now, before you make any cuts.*

prevent going past the gauge line. Cut these center slots first, mark out the waste sections, then add the shim and make the matching cuts on the shorter boards. Mark out the waste pieces on their ends too.

Use a narrow band saw blade to remove the waste more easily in the center slot. (If all you have is a wide blade, make a series of cuts to remove it.) When you get close to the line, with a deft touch, you can nibble away the waste by moving side to side, just catching the teeth. Get as close as you can to the line then chop out the waste with your chisel. Once you get started with your cuts, you can undercut the end grain a little to make the job go faster.

Before removing the waste on the ends, start to chop out the waste on your end slots about 1/16" to 1/8" deep. Chop down from both the faces and the edges of your boards to establish the plane of the end sockets. It's easier to get these cuts established now then band saw off the waste close to the gauge lines. You can pare these end sockets flat later for a great fit. Just be sure not to chop down too hard or your chisel will be forced off the gauge line and into the good wood. This can be visible from the edges.

After chopping, clean up the box sides with a handplane and scraper to remove any working marks.

Routing for the Bottom

After fitting the joints, I lay out and cut the grooves for the bottom at my router table. I line a piece of plywood with a decorative paper for this jewelry box so I make the bottom from 1/4" plywood (which of course measures something less than that). Check how thick your paper makes your plywood package before routing the grooves. Set the fence at the proper distance from the bit and set the bit height for two cuts at 3/32" or one at 3/16".

Stopped cuts are used on the longer pieces so I set stops on my fence to limit the travel distance of the cut. To find where the bit starts cutting, simply hold a block to the bit, rotate the bit backward by hand and mark on the fence where the block stops moving. This will be one cutting edge of the bit. Do the same for the other side. With stop marks penciled on the top of the long piece, line up the board with the marks on the fence and set your stops with a clamp.

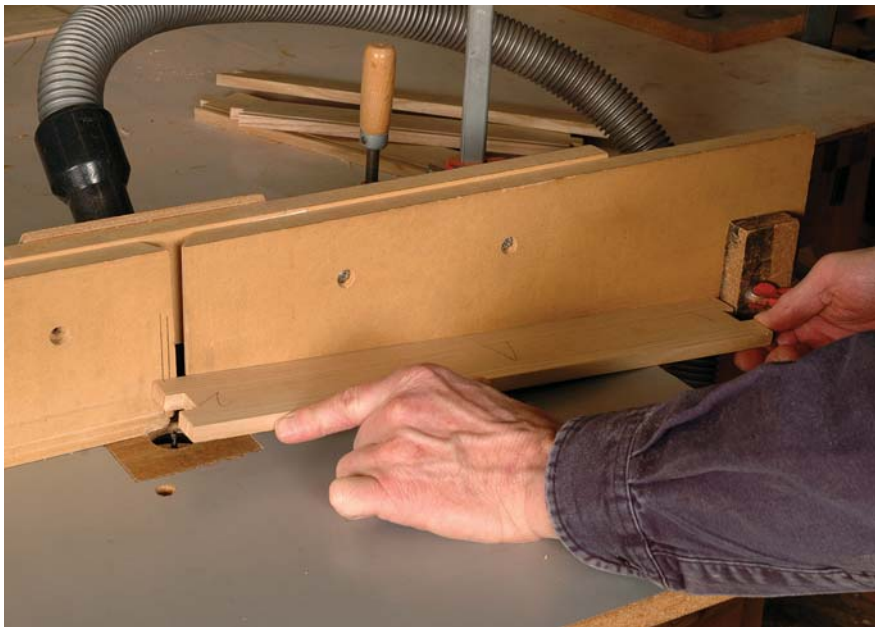
When making a stopped cut, hold the work tight to the stop and fence then move down onto the bit. Just move the work along as you rout so you don't burn your way to depth instead of cutting to it. It may take several passes to get to the finished depth, but once you do, make the cut until you reach the far stop. Make the through-cuts next on the shorter end boards. Then raise the bit height to the final depth, finish up the through-cuts then do the stopped ones. Clean up the round ends of the stopped cuts with your chisel.

Lining the Bottom

I use decorative papers often on the inside of my boxes as a pleasant surprise and contrast to the wood. At a good art store you'll find hundreds of options available and they're usually inexpensive at $5-$10 a sheet. The adhesive I used to use to lay them down with was a binder called matte medium. It was not cheap. One day a friend of mine walked into my shop and watched me gluing down some paper. He noticed that the smell of the expensive matte medium smelled curiously like the smell of inexpensive water-based polyurethane. Oh, happy discovery. The poly works great as a paper glue.

Cut your plywood exactly to size and your paper oversize by an inch or so. Coat the plywood surface with the water-based poly then coat the underside of the paper. Lay the paper onto the plywood, stretching it out as you go to eliminate bubbles. Press it flat from the center out to the edges. Then coat the top of the paper with the poly as well. Let the piece dry overnight and trim the excess paper with a knife. Once it's dry, check the fit of the bottom into your grooves being careful not to peel up the paper at the edges (you can also wrap

Establish the cut. *Use your chisel to establish your cuts and help guide the band saw blade.*



Stop(s). *Establish the beginning and end of the stopped grooves for the box bottom, then clamp stop-blocks to your router fence.*

the paper around the edges if you cut the corners carefully). Then prepare your clamps, dry-fit the box together and glue up.

Breadboard Ends for a Top

A thin 1/2" top like this will cup over time without the proper restraint. (Who doesn't need proper restraint from time to time?) A panel floating in a frame is one tried-and-true method of accomplishing this. But using a flat panel with breadboard ends also works. These breadboard ends fit over the ends of your large panel using loose-tenon construction and a little bit of glue at the center of the panel. But the key to success is the spring joint you add to them.

Take the time to grain match the boards. With quartersawn ash, matching boards isn't too hard. Hold one board on edge up to another to check their compatibility before committing to cutting your boards to length. Plane a light spring joint on the edges of these boards before gluing them up. This will lock them in place as you glue. Lay your boards together then fold them apart and place them in the vise. Take a few strokes with your smoothing plane until the edges are good and straight.

Before planing, take the time to tune your handplane on some scrap. Make sure it's cutting smoothly, lightly and evenly (a good rule for all of my cuts). Coming in on a diagonal, take a few passes over the center of your boards. Just a little gap is all that's required to give you good pressure at the ends.

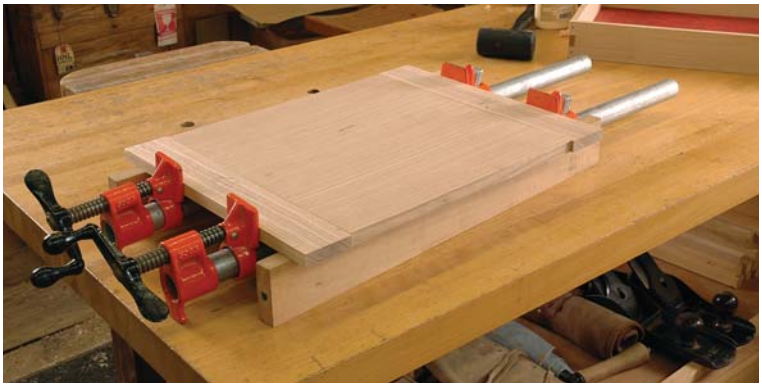
Glue up your stock, let it dry overnight, then flatten the new board and square its edges and ends. Plane the end grain so it's dead flat before beginning your joinery.

There are several methods for cutting the joint in the top and breadboard ends. The loose-tenon method works for a lid this size. It's simple to set up for stopped cuts in all the boards at the router table. Cut the pieces to length and clean up the end grain. Mark the length for the groove and set your stops. Lower each board carefully onto the bit and make your cuts to depth. Then prep loose-tenon stock. I used the offcuts from resawing my stock to thickness and passed one board through the planer to bring it close to thickness. Cut pieces to length then plane to fit. When the panel fits snug in the breadboard ends, it's time for the final touch.

Cutting a spring joint into the ends keeps them in tight to the panel. Come in at a diagonal to the edge and take two or three handplane passes. Check the fit again and you should now see a small gap in the middle of the panel. Center one clamp to it and see if you can't pull

Dead flat. *Before you start the joinery for the breadboard ends, plane the top's end grain so the end is dead straight.*

Loose tenons. *Cut your loose tenons to length, then plane them in thickness to fit the groove you cut at the router. Remember that the grain direction of the tenons should run the same as the panel.*



Raise your glue-up. *With thin stock, it's best to hold the assembly up so that the workpiece is centered in your clamps' jaws. If you skip this step, the clamping pressure could more easily twist the panel.*

Template. *Mark out the handle shape onto your blank. A template made of MDF or masonite allows for quick transfer of the shape.*

Cleanup. *Clean up the first band saw cut on the handle with a spokeshave or rasp. Work downhill into the hollow to avoid tear-out.*

it in good and tight. If you can, you're ready to glue up.

With a top this thin, use some shims to move the boards up higher in your clamps. This will help to prevent any twisting when applying clamping pressure. Put glue only on the center 3" to 4" of the grooves in the breadboard ends, and a dollop in the matching location on the panel (this is where the loose tenons will be inserted). No glue should be applied past this center section because you still have to allow for movement over time. With the spring joint and the loose tenon, you'll get plenty of pressure and support at the edges of the panel. Clean up the panel and breadboard ends, and chamfer the ends on them to match the finger joints.

Finishing Touches

Finger joints don't need pinning for strength, but if you like the look, adding round pins here is a nice detail. Make up pin stock at the band saw cutting just over the final diameter you want. Plane to size, then chamfer the edges with a block plane before hammering the stock through a dowel plate to size it accurately. Mark out and drill your finger joints then glue in your pins. A contrasting wood here adds a nice touch.

After hinging the lid with simple butt hinges, add dividers to the inside. I stopped cutting dados for dividers in my box sides when I realized that a tight-fitting length worked just as well. Mill the divider stock to 1/4" thickness and trim it exactly to length first. Use a plane and a shooting board to nail the fit. Put the dividers together with half-joints after you decide how you want to divide the inside compartments. Mark their positions and gauge in a line for the depth of cut. You can cut the half-joints at the band saw or by hand.

Designing handles is a job I postpone until I can look at the final piece. I first design on paper to find a shape that suits the intention of the box. Then I make up a template to guarantee that I'll get a shape that I like. Templates are quick to make in masonite or MDF and not so precious I can't throw one away. The other reason for using a solid material is that when I have a shape that I really like, I have the template for another handle.

Then I make up several options out of poplar until I find one that works. For purposes of visualizing, a black magic marker turns the poplar into ebony or walnut; blue and red make it rosewood. My final handle for this box is of walnut cut out on the band saw, then shaped and sanded to round the top edges. Cut

Plane to fit. *Fit the base boards together using a bench plane with a bench hook or shooting board. Plane the long-grain edges of the short boards until they just fit into their notches.*

the handle's top edge first. That way there's still some wood remaining and it's easier to clamp it into the vise to clean up with your spokeshave or rasp. If you need to work out to the end of the handle, clamp one end of it into the vise and clamp a stick onto your bench. The handle then rotates into that stick and won't budge as you shape it.

I drilled two pin holes for small dowels into the bottom of the handle, then glued and pinned to the lid.

The base pieces make the jewelry box appear to be floating. I notch the long boards 1/8" deep to capture the shorter ones. Mark out the starting line 4 1/2" in from their ends with a marking gauge. You can cut out the notches on the table saw with a crosscut sled set up with stops, or saw them by hand and use a shoulder plane to get them to depth.

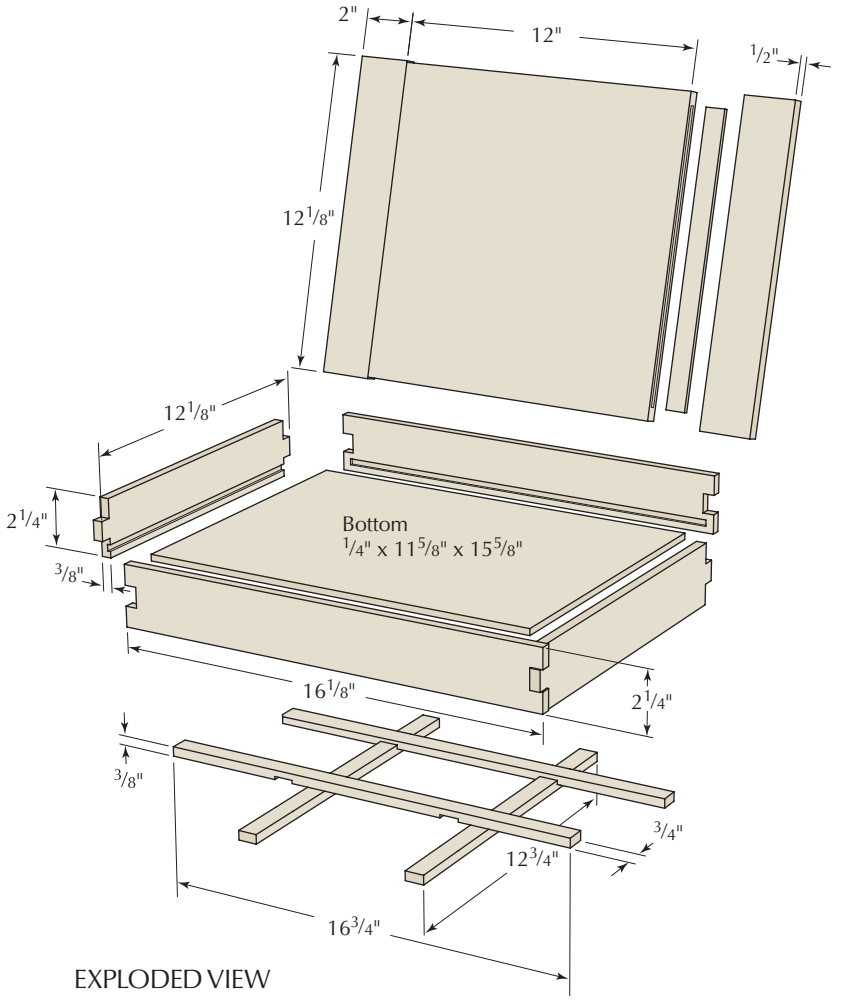
I never try to make the width of the cut perfect. There are too many ways I can find to screw that up!

I cut the notch just a hair undersized in width then plane the sticks to fit together. I use my bench hook as a shooting board with a No. 4 plane and take just enough passes to get a snug fit. Mark out the short pieces with a gauge line 2 1/2" in from their ends. This is where they'll fit into the longer ones. Check the fit on all the pieces before gluing them up. Use just a spot of glue and clamp the pieces together. You can also run a short dowel pin through the joint to lock them in place.

Finish the inside of any box with shellac – not an oil finish. Oil finish will leave a smell inside that will last, regrettably, forever. It's not a pleasant smell so get over your fear of shellac (if you have any), and give it a try. Thin the stuff in the can down with alcohol (or dissolve shellac flakes at a #2-pound cut) so it's easy to apply and add as many light coats as you want.

For a jewelry box like this, add a few drops of a pleasant essential oil such as jasmine, rose or vanilla to the shellac. This is guaranteed to make the recipient of this jewelry box barely notice how late it arrives – while you will have the satisfaction of building something that uses just a few great tools. **PWM**

Gary is director of the Northwest Woodworking Studio in Portland, Ore. (NorthwestWoodworking.com).



EXPLODED VIEW

Jasmine Jewelry Box

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	2	Front/back	3/8	2 1/4	16 1/8	Ash
❑	2	Sides	3/8	2 1/4	12 1/8	Ash
❑	1	Top	1/2	12	12	Ash
❑	2	Breadboard ends	1/2	2	12 1/8	Ash
❑	2	Front baseboards	3/8	3/4	16 7/8	Ash
❑	2	Side baseboards	3/8	3/4	12 7/8	Ash
❑	1	Bottom	1/4	11 5/8	15 5/8	Plywood
❑	1	Handle	1/2	1	11	Contrasting wood

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Combination Squares

BY ROBERT W. LANG

Choosing and using this must-have measuring and layout tool.

Quality counts. *The combination square is one of the most frequently used tools in any project. Get yourself a good one, and chances are you will see a need for several more.*

In 1878, Laroy S. Starrett designed and patented the combination square. His invention was a multi-purpose layout and measuring tool for machinists and it was rapidly adopted in the trade.

Woodworking books of the period don't mention this tool. After all, the try square and marking gauge were common and effective, so it took a while for the transition from machine shop to cabinetshop. Today, most woodworkers own a combination square, but few know all of its uses, and many try to get by with inferior versions.

The biggest technical challenge Starrett faced was milling a groove that was perfectly parallel to the edges of the rule. That's what allows the head to slide to any position and remain square to the blade. This is the part of the tool that most manufacturers still don't get right. After 133 years, the Starrett square is still considered to be the best.

I use my combination squares to check corners and miters. It's precise enough for that task, but I use it more often to mark, set, gauge and transfer precise measurements, both in the layout and in the making of joints. If the shop caught fire, I wouldn't have to look for it as I ran out the door; it's in my apron pocket or hand most of the time.

"A thing is worth what it can do for you, not what you choose to pay for it."

— John Ruskin (1819-1900)
English critic and social thinker

The adjustable square is also a great example of ergonomics, even though it was invented a century before the term became current. The curve in the stock is a comfortable place to park your thumb, or it nestles neatly in the crook between you thumb and forefinger. If you have any doubts about how to hold the tool, find a comfortable hand position and you can't go wrong.

Size Matters

The combination square and its brother, the adjustable double square, come in several sizes, designated by the length of the rule. Four inch, 6" and 12" lengths are the useful sizes for the woodworker. The two I use most are a 6" combination and a 4" double square. These fit easily in an apron pocket and cover most common tasks.

Prices range from around $50 for the smallest to around $80 for the largest. That's a tidy sum for a little bit of metal, but these are high-quality tools that last for generations. Every machinist who practiced the trade in the last century had at least one, so they are plentiful on the used-tool market.

Don't pay more than half the price of a new tool for an old one. In old tools, the level vial and small metal scribe are often missing. Use that as a bargaining tool to get a lower price (you won't notice their absence). Parts are generally interchangeable and available; if you find a usable head you can get a rule for it, and you can replace a broken lock bolt.

When you shop, you'll see two additional heads: a center-finder and a protractor. You may be tempted to get these, but in all likelihood you can live without

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR

them. I inherited my grandfather's tools, and the protractor and center-finding head have been in the same drawer for the last 20 years.

The heads are available two ways: cast iron or hardened steel. The steel costs about $10 more and is more durable. The cast head will still last several lifetimes, and a smooth file and a few minutes' effort will smooth out minor dents and dings in the cast head.

It may be painful to pony up the cash for a Starrett, but that pain will go away and you won't have any regrets after you start using one. There are a couple other brands that are close in quality; Browne & Sharpe and Mitutoyo are well regarded, and Lee Valley has a very nice double square in 4" and 6" sizes for a bit less money than a Starrett.

The cheap imitations you see for half the price or less are, well, cheap imitations. That kind of tool will hurt every time you try to use it. If you only splurge on one tool in you life, get a Starrett square. You'll be glad you did every time you pick it up, and your children and grandchildren will inherit a valuable and useful tool.

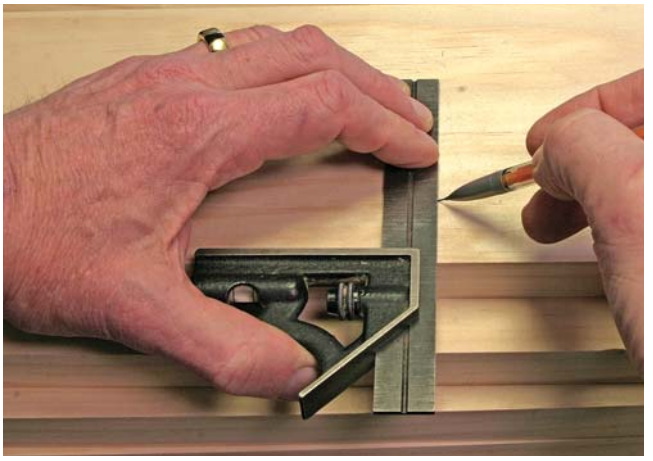
Follow the Rule

There are also options for the graduations on the rule. The most common is called 4R. The 4R scale is in inches and fractions (as it should be) with one edge marked in 1/8" increments, with the opposite one in 1/16". Flip the rule over and it is marked in 1/32" on one side and 1/64" on the other.

Scales in other formats are available. If you work in the metric system you can get a rule divided in millimeters, and you may find an older rule divided into 10ths or 50ths of an inch. You can always buy a replacement rule with the 4R graduations.

The larger divisions are on the side of the rule with the groove, and I work most of the time with the groove up. I rarely need to set a distance finer than 1/16" and when I mark with a pencil from the end of the rule, the pencil point won't slip into the groove.

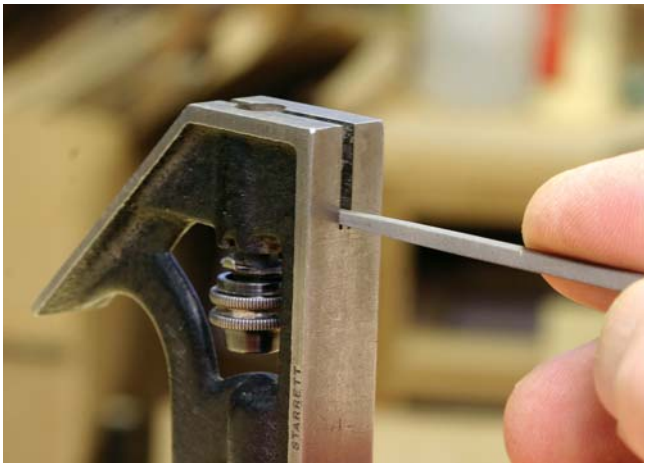
The rule is held to the head with a lock bolt on a spring-loaded knurled knob. A tongue on the end of the bolt fits in the groove, and when you tighten the knob, this holds the rule against two raised nubs within the head. If the square ever goes out of alignment, you



Like a glove. *The head of a good combination square fits comfortably in the hand, in almost every usable position.*

Pencil's partner. *Make a parallel line a precise distance from an existing edge by sliding the head along the work and holding a pencil to the end of the rule.*

Remove & reverse. *The groove in the rule slides in a tongue at the end of the spring-loaded reversible lock bolt. If you remove the rule, you need to line them up.*



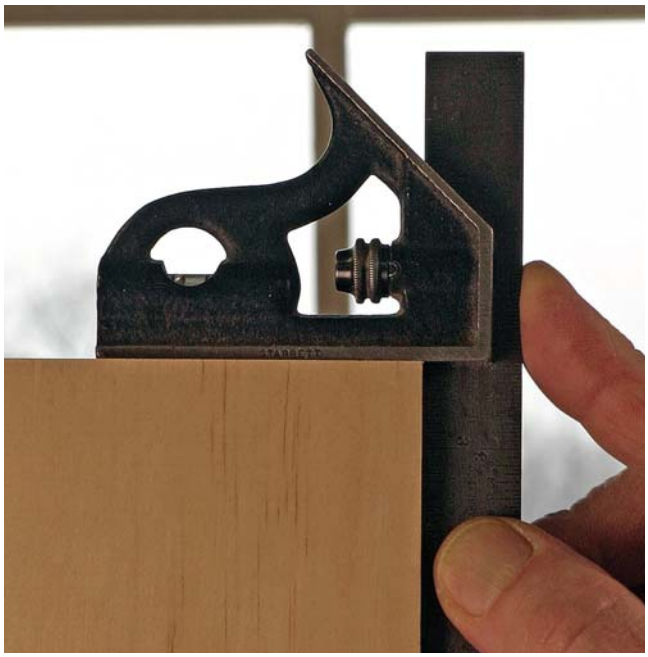
There is a solution. *The rule rides on two nubs inside the head. If it isn't square, filing one nub or the other will bring it back.*

can get it back in by carefully filing one of the nubs.

To fit the rule to the stock, push in on the knurled knob and turn it to align the tongue with the groove. It's dark in there and hard to see, but you can reverse the direction the rule extends from the head by turning the post 180°. Wipe the rule once in a while with some light oil to keep it sliding smoothly and free of corrosion.

To use the square to check an inside corner, loosen the knob and set the bottom of the rule down on a flat surface, such as the top of your table saw. This ensures that the rule is not extending past the head.

To check an outside corner, hold the square against the end of the board and aim that at a source of light. Check a 45° miter the same way. Teeny-tiny discrepancies will show as a band of light between the metal edges of the square and the wood.



Light the way. *Hold the square and your work up to a light source and you can detect tiny variations. Here, there aren't any.*

The Good Part

Checking corners isn't anything special, and you don't need to spend a lot for a tool that is capable of that task. If that's all you need, you can get an imported engineer's square for $10. Where the combination square and the adjustable square become heroes is when you make use of the sliding rule.

Most joint layout involves making a line parallel to an existing edge. Adjust the rule to any dimension from the bottom of the head and hold the head against an edge. Place the point of your pencil against the end of the rule and slide the square along the edge, keeping the pencil in place. The result is a parallel line. This works along convex curves just as easily as for straight lines.

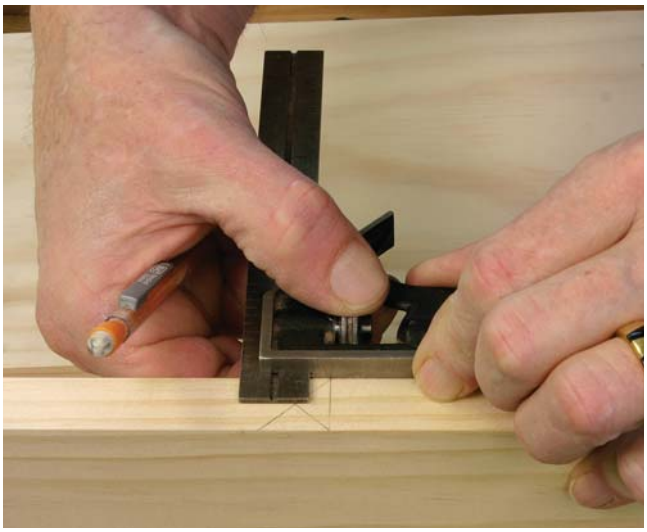
Want to make a rabbet in the end of a board that matches the thickness of another board? With a fixed-head square, you have to measure the thickness, then carefully measure from the end and make your mark. If you're good at measuring and really careful you can come pretty close, but it will take a while.

With an adjustable square, you can set the first piece on your bench, set the bottom of the head on top of it, loosen the knob and drop the end of the rule down on the benchtop. Tighten the knob and move on to the other board. Place the head of the square on the end and mark from the end of the rule.

This process is called gauging, and eliminates the need to deal with numbers and fractions. A piece of wood that should be 3/4" may actually be 25/32" or 49/64" – but that won't matter. Because you set the distance from the material you know you're right and the parts will

Don't touch that dial. *A setting from your layout can also be used to set cutters to an exact distance.*

Check your work. *After you make a cut, you can check to see how close you came to your layout lines.*



"X" marks the spot. *Use the 45° head to find the exact center by drawing angled lines from opposite edges. Where they meet is dead center.*

Fast & precise. *Make a series of accurately spaced marks by lining up the end of the blade with the last mark made.*

fit. Not only are you right but you're finished in far less time than it would take to squint and decide which itty-bitty mark is closest.

You can use this trick to match one element of a joint to another. Drop the rule down into a groove, or down the shoulder of a tenon, and transfer the exact size to the matching part. You can use the same square you used to make the mark to set up your tools. Then, when you cut the parts, you can use the pre-set square to check your work.

You can also find the precise center of board in a similar fashion. Draw a square line anywhere across an edge, then mark a 45° line starting at the corner of the line and the edge. Flip the square over and draw a second 45° line from the opposite corner. The two lines will make an "X" and the intersection will be at the exact center of the edge.

Place the bottom of the head against the edge, and set the end of the rule to the intersection and your square is now set to mark the centerline of your stock. Make a mark from both sides and draw a pencil line parallel to the edge, through the center of the "X". Mark from both sides to be sure you're right.

If there is a gap between the two lines, you're off a little bit, or you need to adjust for the thickness of your pencil line. Aim the end of the rule for the center of the gap and readjust. When the two lines coincide, your line is dead center, and you didn't have to divide $^{49}/_{64}$" by two. If you want to find the center of a square piece, eyeball the center and mark in from all four sides. A tiny square in the exact center will be the result, even if the stock isn't perfect.

Repeat After Me

It's handy to be able to keep a distance setting throughout a project, and this is a valid reason for owning more than one adjustable or combination square. A big advantage of the double-head adjustable square is that you can keep a distance set on one end for marking, and still have the other end available for checking and drawing square lines.

You can also use an adjustable square to mark repeating distances along a line, such as a row of regularly spaced holes for shelf pins. Set the center-to-center distance and make a mark at the center of the row to start. Then set the edge of the head on the mark and make a second mark from the end of the rule.

You can continue on indefinitely, and if you are spacing parts, you can set one square to the size of the part, and a second square to the size of the gap. Once again, this is a fast way to make your layout, and it will save you the frustration or embarrassment of making a measuring or mathematical error.

Parts of the square itself can be used to mark common dimensions. The rule on the 6" Starrett combination square is $^{1}/_{16}$" thick and $^{3}/_{4}$" wide. On the 12" square, the blade is 1" wide.

The knowledge of when and how to use the sliding head is the key to the tool's versatility and precision. Much of woodworking is simply cutting to a line. With a good adjustable square, getting good lines in the right places is simple matter.

A good square will also improve your accuracy, and provide you with a reference that you can rely on with confidence. It's also an inspirational tool; it reminds you that accuracy is important in all phases of woodworking. If you can work up to the level of the quality of the tool, you'll have nothing to be ashamed of in your woodworking. **PWM**

Bob is executive editor of this magazine. He can be reached via e-mail at robert.lang@fwmedia.com.

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BY BOB FLEXNER

Lacquer Thinner

This solvent is unique.

Three thinners. *You have far more control of the drying rate of lacquer-type finishes than other finishes. To speed up the drying, add a little acetone. To slow the drying, add some lacquer retarder. Because of the variables you can't know how much to add except by experimentation, but you have a wide range available to you.*

Lacquer thinner is the thinner used for all types of lacquer (not water-based finishes, which are sometimes misrepresented as "lacquer"). These include the most common lacquer – nitrocellulose lacquer, colorless CAB-acrylic lacquer and the most durable lacquer – catalyzed lacquer.

Of all solvents used in wood finishing, lacquer thinner is by far the most unique because it is the only one made up of a half-dozen or so individual solvents. By varying the solvents used, manufacturers control the strength of the lacquer thinner and the speed of evaporation.

Even if you don't use lacquer, understanding a little about lacquer thinner will help you understand the other thinners used in finishes – denatured alcohol, mineral spirits and water – and, most important, the limitations of these thinners compared to lacquer thinner.

Solvent Strength

The various types of lacquers don't need a whole lot of solvent to put them into solution. But the nature of these finishes requires a lot of thinner to make them thin enough to brush or spray. This is because the molecules of these lacquers are very long and skinny, shaped somewhat like strands of spaghetti. It takes a lot of thinner to separate these molecules enough so they don't bump against each other, which has the effect of making the finish thick, or viscous.

So, to lower the price of lacquer thinner, manufacturers add a significant amount of what are called "diluting" solvents. These solvents don't actually dissolve the lacquer. But, critically, they evaporate more rapidly than the dissolving solvents so the lacquer doesn't come out of solution.

The ratio of dissolving to diluting solvent varies depending on the intended use for the lacquer thinner. For example, automotive lacquers require more solvent strength than wood lacquers. So a higher ratio of dissolving solvent is used, making these lacquer thinners more expensive.

Cotton blush. *If you thin lacquer with "clean-up" lacquer thinner, the lacquer will probably come out of solution and show up on the surface as small cotton-like particles. Always use a lacquer thinner meant for thinning lacquer.*

An automotive lacquer thinner, available from auto-body stores, will dissolve and thin wood lacquer fine, but a wood lacquer thinner may not work well in an automotive lacquer.

Similarly, a lacquer thinner meant just for cleaning spray guns doesn't have to be as strong as a lacquer thinner meant for thinning wood lacquer. So less dissolving solvent is included in clean-up thinners to reduce their expense.

Don't use a clean-up lacquer thinner for thinning any type of lacquer because the thinner will probably take the lacquer out of solution. The sprayed surface will be covered with small white particles resembling cotton. This is called "cotton blush."

In case you're interested, the dissolving solvents are ketones, esters and glycol ethers. Alcohols also have a dissolving effect when combined with the other dissolving solvents. The diluting solvents come from the hydrocarbon family and include toluene and high-flash (fast evaporating) naphtha.

Evaporation Rate

Manufacturers can make lacquer thinners that evaporate faster or slower simply by which individual solvents they choose to include.

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

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There's no reason, except expense, that a lacquer thinner couldn't be made with just one dissolving solvent if it evaporates at a proper rate. But there is a really big advantage to using a number of solvents that evaporate at different rates: resistance to sagging when the finish is sprayed onto a vertical surface.

If you have ever sprayed a finish that thins with lacquer thinner and compared the experience to spraying any other finish – for example, polyurethane, water-based finish or shellac – you must have noticed how easy it was to spray the lacquer-type finish without runs and sags. And how difficult it was to do the same with the other finishes.

This is because the solvents in lacquer thinner are chosen specifically to evaporate at different rates so the lacquer thickens quickly. Some of the solvents, especially the diluting solvents, begin evaporating even before the sprayed finish reaches the target. Others, including some of the dissolving solvents, remain in the finish for five or 10 minutes to allow it to level out.

This step-by-step drying, made possible by the varying evaporation rates of components of the thinner, is the principle quality of lacquer that makes it loved by professional finishers. It's so easy to spray a flawless finish.

Problem Solving

With dozens of individual dissolving solvents available, it should be obvious that brands of lacquer thinner can vary noticeably in evaporation rate. You should be aware of this possibility if you switch brands. You may have to adjust your timing.

It should also be obvious that lacquer thinners can be made to evaporate very slowly or very rapidly to make possible lacquers that can be brushed, called "brushing lacquer," and lacquers that can be sprayed in extreme weather conditions.

For example, lacquer "retarders" are made with slower evaporating solvents. You can add a little retarder to your lacquer in hot, dry conditions to avoid "dry spray," which is a sandy surface caused by the lacquer drying so fast that it has turned to dust before it reaches the target.

Dry spray. *Spraying in hot temperatures, or spraying the insides of cabinets and drawers, can lead to dry spray that creates a sandy look and feel. The lacquer is drying so fast that it turns to dust before it lands on the surface. To avoid dry spray, add some lacquer retarder to the lacquer.*

Moisture blush. *A very common problem when spraying lacquer is moisture blush, which occurs in humid conditions, and appears milky or cloudy. To avoid this problem, add some lacquer retarder. It will slow the drying of the lacquer, allowing time for the moisture to evaporate.*

Retarders also make possible the avoidance of "moisture blushing" in humid conditions. Condensed moisture enters the finish, which then dries before the moisture can evaporate. When the moisture does evaporate, air voids are left which cause the finish to appear milky white. Slowing the drying allows time for the moisture to evaporate before the finish dries so completely.

At the opposite end, some automotive lacquer manufacturers supply "fast" lacquer thinners that make the lacquer dry at a normal rate in cold temperatures, even as low as 45° F or 50° F. These thinners are available at auto-body supply stores. Adding acetone will achieve the same end, and it is widely available.

Restricted Areas

Some parts of the country have volatile organic compound (VOC) laws that restrict the percentage of polluting solvent that can be included in a finish. Typically, these laws restrict lacquer to 27.5 percent, which is way too little for spraying.

Acetone, however, is an exempt solvent. It can be added to lacquer in any amount, so manufacturers typically make up the difference with acetone.

This has two impacts. First, it makes the lacquer more expensive. Second, and much more significant, it makes the lacquer dry so fast it can't be sprayed in warm temperatures without getting dry spray. (The lacquer works great in cold temperatures, however.)

Finishers get around the fast drying by adding butyl cellosolve, the slowest evaporating retarder, to the lacquer. It's legal to sell and buy this solvent everywhere, but you should be aware that adding it to your lacquer may take it out of compliance with local laws.

Lacquer thinner is indeed a unique solvent, especially when contrasted with the other solvents used for finishes. **PWM**

Bob is author of the new book "Flexner on Finishing," available at ShopWoodworking.com.

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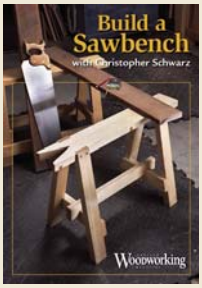

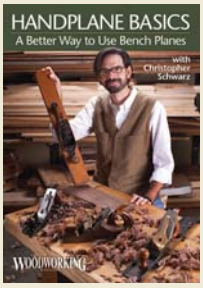

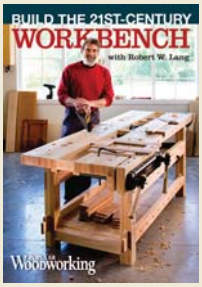

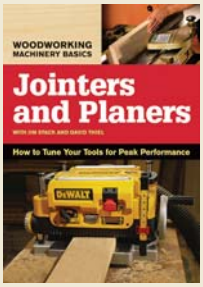

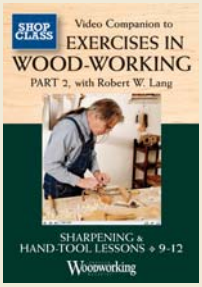

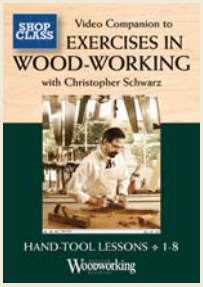

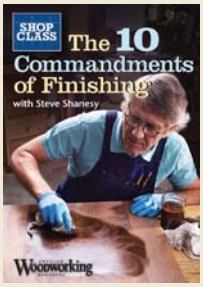

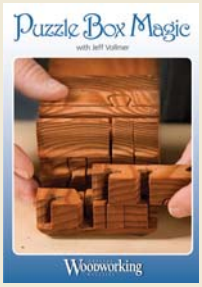

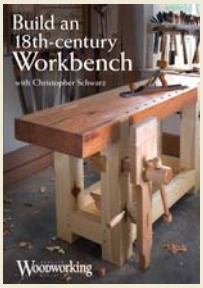

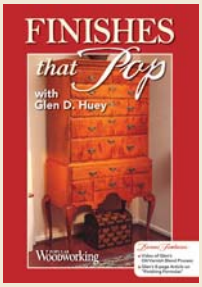

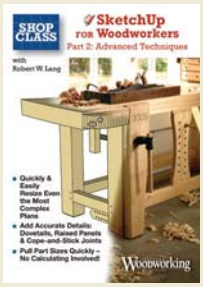

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GLOSSARY

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

catalyzed (adj)
A finish that is "catalyzed" requires an acid catalyst to harden. Though usually sold as a two-part finish, the product called "pre-catalyzed" lacquer has the acid catalyst added by the manufacturer.

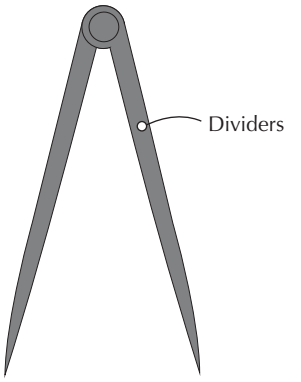
chisel plane (n)
A small handplane on which there is no mouth; instead the blade is held by a lever cap in position just beyond the front edge of the body. Thus, the plane can sneak into corners or elsewhere where a typical plane toe prevents the blade from reaching.

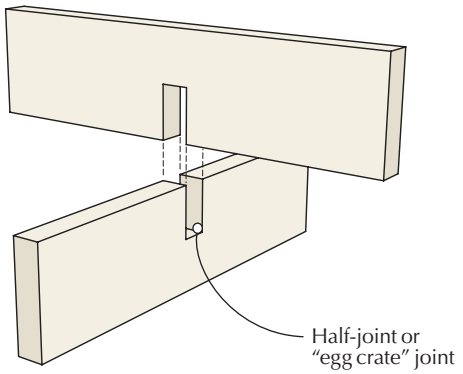
"You see, if you take pains and learn in order to get a reward, the work will seem hard; but when you work ... if you love your work, you will find your reward in that."
— Leo Tolstoy (1828-1910)
Russian novelist

dividers (n)
A traditional layout tool shaped like a compass, but with a sharp point on each leg. Use dividers to step equally spaced points on a workpiece or to transfer marks from a drawing to a workpiece.

finger joint (n)
A joint comprised of interlocking rectangular cuts in two workpieces. Unlike a dovetail joint where the sloped pins and tails can stay together without glue, a finger joint must be glued (or otherwise secured) to keep it together.

gel varnish (n)
Liquid alkyd or polyurethane varnish to which a thixotropic additive has been added. The product appears thick in the container but can be easily spread, and it doesn't run.





glue block (n)
A small block of wood typically chamfered on one long-grain edge that gets glued into the interior corner of a case joint to provide additional strength. (If the case joint grain runs crosswise, several smaller blocks should be employed.)

half-joint (n)
Also called an "egg crate" joint, this joint has a notch in each piece; they slot together to interlock, like the cubbies inside an egg crate or box for wine bottles.

jack plane (n)
Typically the first plane used to process a piece of stock, this plane has a sole that is between 14" and 20" long, with a cambered iron to quickly remove a lot of stock. It is typically followed by the jointer plane, then the smooth plane.

knurling (n)
A series of small grooves or ridges on the surface of a metal piece, such as knob. Knurls make it easier to get a secure grip on a small surface.

plinth (n)
The base of a casework piece; it sits on the floor and is often decoratively shaped with scrollwork.

pound-cut (n)
The amount of shellac flakes by weight dissolved in one gallon of alcohol. A #2-pound cut, for example, denotes two pounds of shellac flakes per one gallon of alcohol.

rabbet (n)
A recess in the edge of a piece of wood, either with or across the grain, typically cut to accept a mating piece.

set (n)
On a sawblade, the distance the teeth are bent to the right and left of the sawplate. The set provides clearance for the sawplate and prevents the tool from binding in the cut.

Sloyd (n)
A hands-on craft education system that was founded in Finland in 1865 by Uno Cygnaeus. "Sloyd" can be translated, loosely, as handy or skillful.

spelch (v)
To blow out or splinter the grain on the edge of board when planing or routing it. This usually occurs when the cutting action is perpendicular to the grain of the board.

spokeshave (n)
A traditional tool with a two-handled body available in either wood or metal, with a thin, flat blade, that is used for trimming and detail shaping of curved pieces of wood. PWM

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BLOG: *Read more about dividers on George Walker's Design Matters blog.*

ARTICLE: *Learn how to grind and sharpen a jack plane.*

SECTOR ILLUSTRATION BY MARY JANE FAVORITE; JOINT ILLUSTRATION BY ROBERT W. LANG

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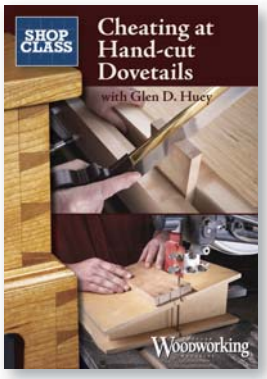
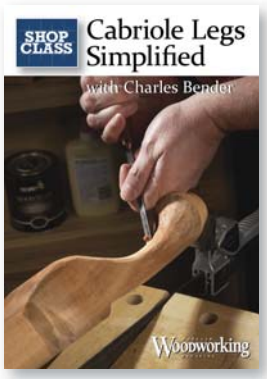


Cheating at Hand-cut Dovetails *with Glen D. Huey*

With Glen Huey's help, your hand-cut dovetails will quickly identify you as an accomplished artisan! You'll learn tips for perfect dovetails with a saw and chisel – plus a band saw trick that speeds the process. **Bonus:** Plans for a Dovetailed Keepsake Box.

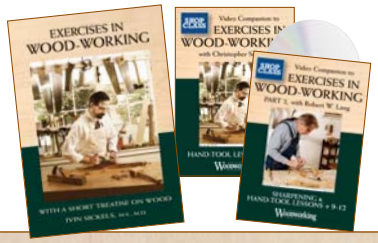


Cabriole Legs Simplified *with Charles Bender*

If you have a band saw and just a few sharp chisels and gouges, you can learn (from this hour-long video) how to carve a traditional pad-foot cabriole leg like a pro, with easy-to-follow step-by-step instruction from renowned period furniture maker Charles Bender.

'Exercises in Wood-Working'

This hardcover reprint of an 1889 book on hand-tool woodworking has 39 exercises on hand-tool use plus fascinating insight into the period trade. And, it's spawned a series of instructional videos shot by the *Popular Woodworking* editors. Check out all things "exercises" at shopwoodworking.com/exercisesinwoodworking.



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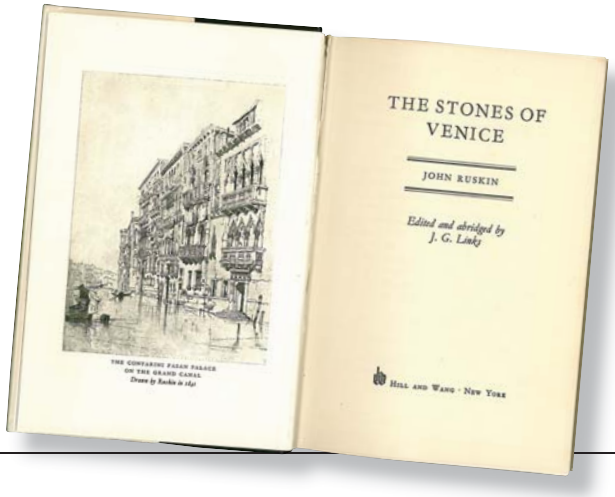
Workshop Radicals

Farewell TV, DVDs and http.



One of my more serious-minded friends asked me why I was a woodworker. I replied that I'm just here to have a good time playing in my woodshop. No, he insisted. That's not good enough. You've got to have a theory, a woodworking philosophy.

"Huh?" I adroitly responded. But I will admit, he planted a seed. Not wanting to appear inadequate, I came up with a personal philosophy. So here goes.

The original Arts & Crafts movement had a strong element of socialism. It was an attempt to improve the lives of the masses by eliminating the capitalists and factories. The founders found fault with division of labor and romanticized the individual craftsman. As John Ruskin said, "It is not truly speaking, the labour that is divided, but the men: divided into mere segments of men – broken into small fragments and crumbs of life; so that all the little piece of intelligence that is left in a man is not enough to make a pin, or a nail, but exhausts itself in making the point of a pin or the head of a nail."

Thus, the original Arts & Crafts movement was a social movement. It was also a reaction to the excesses of the Industrial Revolution. Ruskin, William Morris and others romanticized the Middle Ages with its emphasis on guilds. The idea of the designer and the craftsman united in one person was appealing to them. They did not like the concept of the designer as an elite industrial engineer and the worker as a limited troglodyte serving as a machine.

Ruskin's most successful book, "The Stones of Venice," makes this point.

That backward-looking romanticism is dead. The Middle Ages are no longer idealized, but recognized as dirty, unhealthy, intellectually straightjacketed and socially frozen. The impracticality of returning to a guild system is recognized, but fortunately, Industrial Revolution ills have been reduced. Labor is not as brutally exploited and workers have more of a say.

But life is not ideal with all our technological wonders. The relentless onslaught of multi-media manipulation from our mercantile overlords demands that we work at meaningless jobs for money we squander on meaningless tech toys in the belief that will make us happy. It doesn't. It keeps us satiated so we'll prime the pump and make the plutocrats of industry richer. Sorry to sound anti-social; that's just the way it is.

The juggernaut of the advertising machine will continue to have most people completely beguiled. However, each individual can choose to manage his or her life differently. When the modern worker comes home to a McMansion, popped up in a McSubdivision and surrounded by McMalls, he or she can make a decision whether to pop in a CD, turn on the television, throw in a DVD, fire up the PlayStation, read the McNews on the McNet, chat with virtual friends about virtual lives in a virtual world – or make an alternate individual decision, and do something creative and uplifting.

The New Arts & Crafts Movement is not a social movement, but an individual movement. The idea that the designer and the worker can be united into one individual is not dead. The idea that each individual can devise suitable work methods based on his or her own needs (and not what the big box store wants to sell) is not dead.

You and I decide what we do with the leisure time the technological revolution has supposedly given us. We decide what to buy with our paychecks and to what degree we are enslaved by our ties to the mercantile dictatorship. Even though we would like to think that we are different from the serfs of the Middle Ages and have free will, we are not and we do not. We just have a slightly longer leash. What we choose to do with that leash makes all the difference.

In other words, I'm just here to have a good time playing in my woodshop.

PWM

Roy has been a woodworker for a decade and enjoys making things in the Arts & Crafts style using a mix of hand and power tools.

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BLOG: *Editor Christopher Schwarz has recommended a number of books on his blog about all aspects of woodworking.*

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