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AUGUST 2007
ISSUE #163

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Features

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AUGUST 2007

Regulars

30

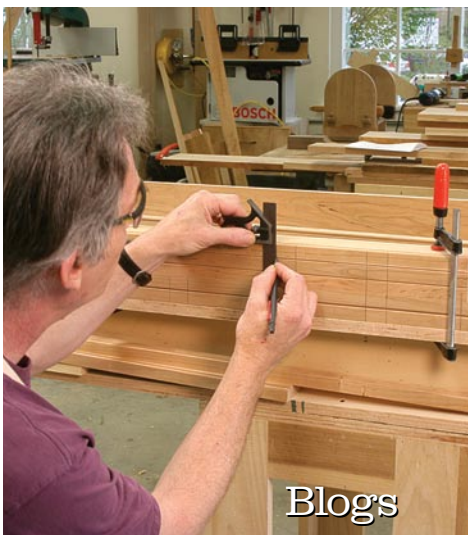
I Can Do That

ON THE AUGUST COVER

This tall clock is a replica of an 1811 Erastus Rude piece that now resides at the Shaker Museum and Library in Old Chatham, N.Y. The story begins on page 32.

COVER PHOTO BY AL PARRISH

Online



Video Gallery

Split Turnings

The Shaker clock Senior Editor Glen D. Huey built for this issue includes split turned columns for the hood section. You'll find a free video online at popularwoodworking.com that gives you step-by-step instructions for turning these on your lathe. Visit the home page and click on the video link at the top of the page.
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On the Blogs

PW Shop Projects

Senior Editor Robert W. Lang is in the thick of a few workshop projects: a new tool storage cabinet, a new bench and new (and improved) stands for our benchtop machines. You can read about his progress on our blog (he usually posts on Mondays).
popularwoodworking.com/blogs

18th-century Standing Desk

Adam Cherubini has been working on a standing desk for his shop in his current series of Arts & Mysteries. You'll find more information about the desk and about 18th-century woodworking on his blog at artsandmysteries.com.
popularwoodworking.com/projectplans

New This Month: Finishing Articles

Visit the Finishing Archive

Contributing Editor Bob Flexner has been writing a finishing column in almost every issue of *Popular Woodworking* for nigh on a decade. We put some of our favorite articles (with more to come) in a new finishing section.
popularwoodworking.com/finishing

Project Plans

Sawbench and Shop Stool

This simple afternoon project is perfect for handsawing, holding doors for planing, organizing tools and giving you a leg up.
popularwoodworking.com/projectplans

Seedling Shelter

This simple cold frame helps nurture your spring plantings during the winter.
popularwoodworking.com/projectplans

Traditional Hanging Shelves

Few projects are as fast, easy and good looking as these two designs. Take a peek at these project plans to see for yourself!
popularwoodworking.com/projectplans

And More!

Visit popularwoodworking.com/aug07 to find a complete list of all the online resources for this issue – including videos, additional drawings and photos.

Contributors

Kelly Mehler After many years of building furniture for other people and teaching other people to build furniture, Kelly is finally making the time to replace some of the "store-bought junk" in his own house. Right now, he's working on a bedroom suite using curly ash he set aside a long time ago.

In his first story for *Popular Woodworking* (on page 49), Kelly discusses how European-style table saws differ from their U.S.-style counterparts in efficiency, effectiveness, user-friendliness, safety and cost – all considerations you'll want take into account when making your next table-saw buying decision.

John Walkowiak and his wife, Cindy, live in Minneapolis, Minn. At the tender age of 10, John requested a saber saw in his Christmas letter to Santa; Santa delivered. At 19, John restored his first piece of furniture, and subsequently became fascinated with the history, tools and techniques behind antique furniture. In this issue, John writes about how he adapted an old benchtop standby – the plane wick – for 21st-century use (page 68).

Christopher Schwarz is the editor of this magazine, a hand-tool enthusiast and a student of the history of woodworking. After building about 10 different workbenches, including some of ancient design, he wrote a book about the experience. "Workbenches: From Design & Theory, to Construction & Use" (Popular Woodworking Books) will be published in October and asks why older and highly effective forms of benches have disappeared from modern shops.

Don Weber is currently hard at work on a Sidney Barnsley hayrake table, as well as on some tables in iron and wood (he's a blacksmith as well as a woodworker) for the timber-framed home he's building in Garrard County, Ky. In this issue, he writes about building a "bicycle lathe" on page 64.

Judy Ditmer With this month's column on turning multiples (page 76), Judy celebrates her third anniversary as the turning columnist for *Popular Woodworking*. She's been turning since 1985, and has written two books on the subject in addition to many articles. She teaches and demonstrates her skills throughout the United States and Canada.

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BY CHRISTOPHER SCHWARZ, EDITOR

The Curse of the Creepy Kleenex

The first time I ever became concerned about dust collection I was sitting on the couch with my toddler daughter on my lap.

All day long I had been sanding cabinets that were destined for the addition we were building on our house. I was beat. I took a deep breath. I sneezed.

What ended up in the tissue sent my little girl squirming off my lap and set me to wondering about the health problems that come from breathing dust.

It was alarming because I thought I had done enough to fight airborne dust. I had a shop vacuum with a premium filter that I attached to my sanders. My table saw, jointer and planer all were ducted to a single-stage collector with felted bags. I even kept the door to my shop open whenever I worked.

But all that wasn't enough to prevent my tissue from filling up with stuff that looked like it attacked Steve McQueen in "The Blob." So I did three radical things that day.

I put away my large right-angle random-orbit sander. It was the sander that always seemed to send up a plume of dust when under load. I latched its case tight and haven't opened it now for seven years. If you need a big sander like that, drop me a line.

Then I bought a cartridge respirator for when I use my palm-grip random-orbit sander. I'll be honest: I hate the respirator. It's kind of heavy and gets slimy when I work up a sweat. But you know what? The thing works. Not just for keeping out dust, but also for lacquer fumes. I have a begrudging respect for the respirator, much as I loathe to don it.

The third thing I did was I resolved to use handplanes more. And this was the hardest of the three changes. Though I was already using planes quite a bit, I was still doing a lot of sanding. But I forced myself to finish my surfaces with planes, even though I was worried about ruining the project at hand.

That third decision turned out to be the best one. Handplanes turned the most dreaded part of every project (power sanding) into a task that was as enjoyable as the joinery. Yes, there was a learning curve. And yes, it cost me time and money. But I don't regret the decision.

In this issue, Scott Gibson takes a good look at dust collection in our Woodworking Essentials series in the middle of the magazine. You may not make the same decision that I did about how to deal with shop dust. But pretty much all of us need to do something to clear the air. If you're making terrifying tissues after your sanding sessions, remember this: Things that get clogged up (filters, planers, lungs) eventually stop working.

New Feature on Jigs

This issue we launch a new column: "Jig Journal" (it's on page 24). It's not your typical woodworking jig column with Rube Goldberg gizmos. These are jigs designed to be used every day. Check it out. **PW**

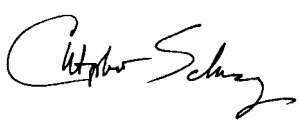

PHOTO BY AL PARRISH

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Safety Note

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

'Pile' Block Improves Any Leg Vise

The parallel guide bar in a leg vise is, in my humble opinion, a cruel joke perpetrated by some historical prankster. I have been using an angled leg vise for a couple years now, and removing the parallel guide bar was the first modification.

Instead, grab a piece of maple, cut it down to 1" x 2" x 3", and let it dangle on the bench leg with a foot of butcher's twine. When you open the jaws of the leg vise, just turn the block so the appropriate side acts as a standoff.

Wider stuff? Find a wider piece of scrap. Skinny stuff? Swing the block out of the way altogether.

It's infinitely variable, simple and bulletproof – and I can reach down and adjust my block of wood, left-handed, without even looking at it.

Please, I'm begging, don't let the Swiss-cheese-looking parallel guide insanity continue any further!

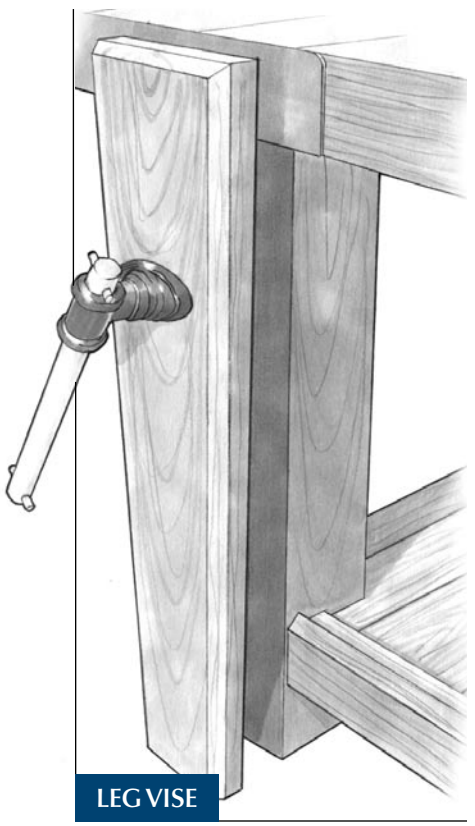
— Jon Pile, Foster City, California

I tried the "Pile" block (patent applied for) in my leg vise. I made it exactly as Jon described and tied it through a holdfast hole in the leg that I use when dovetailing.

The block works as advertised, which is no surprise. Levers and physics work as advertised. But I'm going to need to develop some muscle memory with the block before I rip out my parallel guide. The nice thing about the parallel guide is that I usually work in stock that is 5/8", 3/4" and 7/8" thick, so for the most part, I never move the pin in my parallel guide. It stays in the first hole and can clamp the usual stuff. (By the way, that sweet-spot hole in my guide is 1/2" from the inside of the vise jaw.)

A few other details: I wondered if the block would be handy with an angled leg vise (which is what is on my new English workbench). With that bench, the parallel guide prevents the jaw from spinning when you crank the vise's handle. Jon responded to that by saying that his leg vise was angled, and that he merely had the foot of the jaw resting on the floor, which kept it from spinning.

— Christopher Schwarz, editor



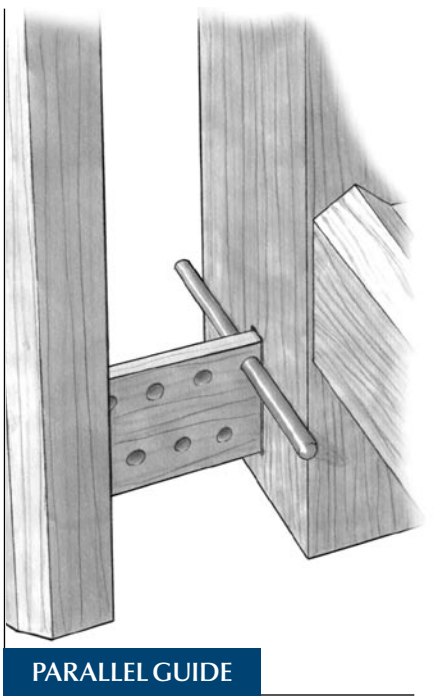


ILLUSTRATION BY HAYES SHANESY

In Search of Bench Dog Perfection

I'm currently building a traditional-style workbench with tail and face vises. I was hoping you could offer some advice on the drilling of bench dog holes. I will be using round bench dogs (3/4"). I am sincerely hoping that there is a way to do them on the drill press before laminating the top, because I have had difficulty drilling perfectly vertical holes with a brace in the past. I would be using my brace due to the shank size of my 3/4" bit.

Do you have a process for drilling these large holes and keeping them true?

— Jeff Hallam, Kingston, Nova Scotia

I've done it two ways:

One: Laminate a few boards for the top, drill the holes on the drill press as shown below then laminate the rest of the top around that. The technique works great.

Two: Make a simple jig. It's a bit like a doweling jig and is made with three pieces of stock. One thick piece guides the drill bit, one piece registers off the front edge of the workbench like a fence. And the third piece is a flat piece of plywood that ties them both together.

It looks a bit like a bench hook with an oversized fence.

Either way, I use a 3/4" auger bit and a corded drill (or a brace and bit if I'm feeling frisky).

— Christopher Schwarz, editor

Mitered Frame Construction Must Allow for Seasonal Movement

I am building a couple tabletops with the largest measuring approximately 36" x 36". I would like to have a mitered frame and then fill the inside with solid wood as well. I am using sassafras (this is what I have the most of), but I am concerned about gluing or joining all of the pieces because of expansion/contraction. The wood has been stored in my basement, which is heated and fairly dry, for about four years. Do I need to "float the insides" or can I glue it all together?

— Jim Somers, Sparta, Ohio

The mitered frame surrounding a solid panel is something many people want to do, but you need to keep in mind that the solid panel will expand and contract with seasonal changes in relative humidity. Sassafras is fairly stable, but you could still expect movement of 1/8" per 12" of width, or about 3/8" in your 36" x 36" top. If you don't allow for this, the top will self-destruct.

When I lived in the Cleveland area, the dead of winter was the driest time of year. If you made this top in the winter, it would expand the following summer and would force the joints apart at about the time the Indians are eliminated from the pennant race.

If you put the top together in July or August, when the wood has reached its maximum moisture content, it would start shrinking when the furnace came on in the fall and would crack by the time the Browns get the first pick in the following year's NFL draft.

You can float the top in grooves in the frame, but you will need to leave a gap between the panel and the frame. The size of this gap will depend on the moisture content of the wood in the panel and whether it is likely to shrink or expand. You could also hold the individual boards in the top together with splines in grooves, leaving gaps in between the boards. If you want a nice tight joint where the panel meets the frame I would recommend veneering a plywood or MDF panel.

— Robert W. Lang, senior editor

Why No Biscuits in Laminations?

In researching designs and techniques for a workbench, I noticed that you do not use biscuits to align the laminations when gluing up narrow boards to make a benchtop. I'm sure there is a reason for this but I seem to have missed it. Can you please explain?

— Ted Mock, Toronto, Canada

I don't use biscuits when gluing up long-grain joints. They do not add strength (the bond is already stronger than the wood itself). And I have found that user error can or will create alignment problems that the biscuits were supposed to help avoid. I just glue and go. Clamp from the middle of the lamination and work out. Shift the boards around until they are aligned. Be done with it.

However, if you like to use biscuits, are comfortable with them, and are accurate with them, then also know that they won't hurt the joint's strength.

— Christopher Schwarz, editor

What's the Best Angle of Attack For Planing Figured Woods?

I own a Lie-Nielsen low-angle jack plane, a Lie-Nielsen shoulder plane and a Lee Valley cabinet scraper. I am building a bedroom suite and my skills have evolved significantly as I have slowly built this collection of furniture. On my last piece, I was determined to use my hand tools to eliminate as much sanding as possible and improve my overall work flow.

Unfortunately, things didn't go well. I tuned up my jack plane and set to work. The tear-out on my curly maple was bad, and the swirling grain on my cherry went from great to unacceptable every few inches. Talk about frustrated.

My cabinet scraper gave me good results on the cherry but couldn't handle the fiddleback curly maple well enough to avoid all tear-out.

So, I'm going to a woodworking show and am planning to buy some more hand tools. I'm considering a Lie-Nielsen block plane and Lie-Nielsen smooth plane. But which smoother should I get? I love figured woods so I think a high-angle frog is a good option. I was thinking a corrugated base would help offset the extra effort of the high-angle frog. But should I get the No. 4 or the No. 4 1/2? Lie-Nielsen recommended a No. 4 1/2 but in your "Hand Tools In the Modern Shop" I recently ordered (available through the Store at popularwoodworking.com), I noticed you are currently using a No. 4. So, for a person with a limited arse-

nal of hand tools, would you still suggest a No. 4 over a No. 4 1/2?

I was also thinking about getting a second blade from my low-angle jack with a higher angle cut on it to help with more rough leveling on challenging boards – along the lines you have suggested in some of your blog entries.

— Steve Millican, Houston, Texas

I think you already have the solution in hand. The key to dealing with figured woods and exotic woods is to use a high angle of attack. I've found that the combination of a tight throat, a high angle of attack (about 62° or more) and taking a fine shaving (less than .001" thick) will conquer almost any wood.

So I would sharpen your low-angle jack plane with a really high secondary bevel – 50°. Add that to the 12° bedding angle and you should be golden.

But if I were going to pick up another plane … I really like both the No. 4 and No. 4 1/2 (shown above) with a high-angle frog. But these are planes designed for well-behaved domestics. If you like using curly woods, you should be investing in a bevel-up smoothing plane (such as the Veritas) and/or a scraping plane, such as the Veritas No. 112 or the Lie-Nielsen No. 85.

Bottom line: It takes a very high angle (beyond 50°) to deal with really, really tricky woods. Or scraping. Or sanding.

— Christopher Schwarz, editor

Staining Veneer Panels

I just read "Finishing Formulas" in the April 2007 issue (#161) and would like to try one of your procedures on a seven-drawer chest I am building for my wife. I will be gluing mahogany veneer to Baltic-birch plywood for the drawer fronts and case sides.

My question is: Will adding dye color to these veneer panels be done in the same puddling manner as for the solid-wood pieces or will it be different due to the thickness (or should I say thinness) of the veneer?

— Leo Van Wyk, Long Beach, California

Your question comes up a lot. Because of the thickness of the veneer you'll find that it will stain differently, but in depth-of-color only, not the shade or hue. The stain can only soak in so far due to the thickness of the veneer as well as the layer of glue, which acts as a barrier to the stain.

The key to getting consistent color on all surfaces is to offset the color variations, as slight as they will be, by wiping the excess stain from the solid hardwood after a shorter time than from the veneer.

That's all it takes to get an even staining job. As you move on to additional layers of finish, each one will diminish any perceptive variation.

— Glen D. Huey, senior editor

Use Small Bits of Wood to Fill Wide Gaps – and Next Time, Dry-fit First

I made an intricate cradle for my granddaughter, which has taken several weeks. However, when assembling all the pieces and parts today, I was shocked to see there are some 1/4" gaps in the joints where the rails meet the headboards.

It's too late to start over again, so I need to fill and sand the gaps. Can you suggest a good product that will fill some fairly wide gaps? I intend to prime and paint the cradle, if that means anything.

— Ed O'Rourke, Old Bridge, New Jersey

That's a pretty big space to fill, but since you're planning to paint you can likely get away with it. The best thing to do would be to fill the gaps with small pieces of wood with the grain oriented the same way as the adjacent pieces. These don't need to be a perfect fit, but they should be close. You'll likely still have some visible gaps that you could fill with spackling compound or automotive body filler (Bondo). If you try to fill that large of a gap with putty alone, it will likely fail in a year or two as the wood expands and contracts from seasonal changes in humidity.

Next time, I would highly recommend that you do dry runs (no glue) of your assemblies and subassemblies so that you can correct any problems before glue-up.

— Robert W. Lang, senior editor

Planing v. Sanding: Does it Make a Finishing Difference?

Can you notice the difference between using a smooth plane and sanding, once the finish goes on? Those who swear by sanding of course say that there is no difference. Those who use smooth planes say that there definitely is a difference. Or is beauty in the eye of the beholder? Please settle this debate.

— Gus Gianakopoulos, Toronto, Ontario

This simple (and fantastic) question has an answer that could fill a book. Planing v. sanding is more than a question of final aesthetics. It also is a question of differing methods of efficient material removal and furniture-making processes as a whole. And skilled labor v. unskilled labor.

However, to answer your narrow question: It depends. I find that if you use a clear finish on the wood then the difference between planing and sanding is slight to none. (I think I can tell a slight difference, but it's insignificant.)

When you get into pigments and dyes, however, there are differences. Planing and dyes don't play well together. A planed board will soak up dye unevenly compared to a sanded board.

With pigmented finishes, however, planing is superior in my opinion. The ground-up pigment will lodge in coarse sanding scratches and make the surface look more muddy to my eye. **PW**

— Christopher Schwarz, editor

Question? Comment?
We want to hear from you.

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

Though we receive a good deal of mail, we try to respond to all correspondence in a prompt manner. Published correspondence may be edited for length or style. All correspondence becomes the property of *Popular Woodworking*.

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Letters
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THE WINNER:

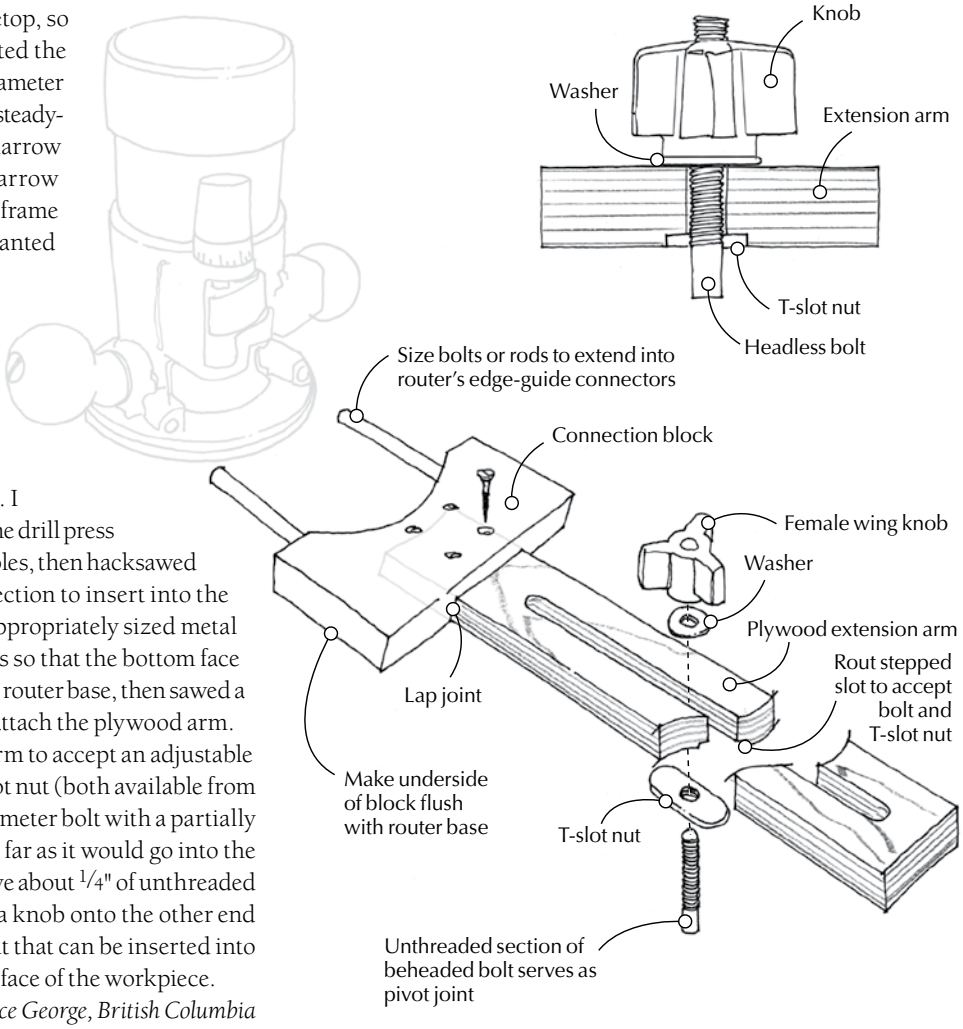
Dual-purpose Router Trammel

I recently needed to make a round tabletop, so I built a trammel to suit my router. I wanted the trammel to be long enough to rout large-diameter circles and be stiff enough to also serve as a steadying extension when routing the edges of narrow pieces. (For example, when routing a narrow frame, the extension rides on the opposite frame member to keep the router level.) I also wanted to be able to connect and disconnect it quickly. This trammel serves all three purposes nicely.

The unit consists of a plywood extension arm and a solid-wood connection block that attaches to the router with a couple long bolts that slide into the router's edge-guide attachment holes. I drilled the bolt holes into the block using the drill press for accuracy, threaded the bolts into the holes, then hacksawed off their heads, leaving an unthreaded section to insert into the router. (Alternatively, you could epoxy appropriately sized metal rods into the holes.) I positioned the holes so that the bottom face of the block aligned with the bottom of the router base, then sawed a lap joint in the underside of the block to attach the plywood arm.

I routed a long, stepped slot into the arm to accept an adjustable pivot pin with a female wing knob, a T-slot nut (both available from Lee Valley; 800-871-8158), and a 1/4"-diameter bolt with a partially unthreaded shank. I threaded the bolt as far as it would go into the T-slot nut, then cut off the bolt head to leave about 1/4" of unthreaded shank to serve as a pivot pin. Threading a knob onto the other end creates an infinitely adjustable pivot point that can be inserted into a 1/4"-diameter hole drilled into a hidden face of the workpiece.

— Gary Dean, Prince George, British Columbia



Cash and prizes for your tricks and tips!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a $250 gift certificate from Lee Valley Tools, good for any item in the catalog or on the web site (leevalley.com). (The tools pictured at right 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 (either by mail or e-mail) you must include your complete mailing address and a daytime phone number. If your trick is selected for publication, an editor will need to contact you. All entries become the property of *Popular Woodworking*. You can send your trick by e-mail to popwoodtricks@fwpubs.com, or mail it to Tricks of the Trade, Popular Woodworking, 4700 E. Galbraith Road, Cincinnati, OH 45236.

TRICKS COMPILED BY PAUL ANTHONY; ILLUSTRATIONS BY MATT BANTLY

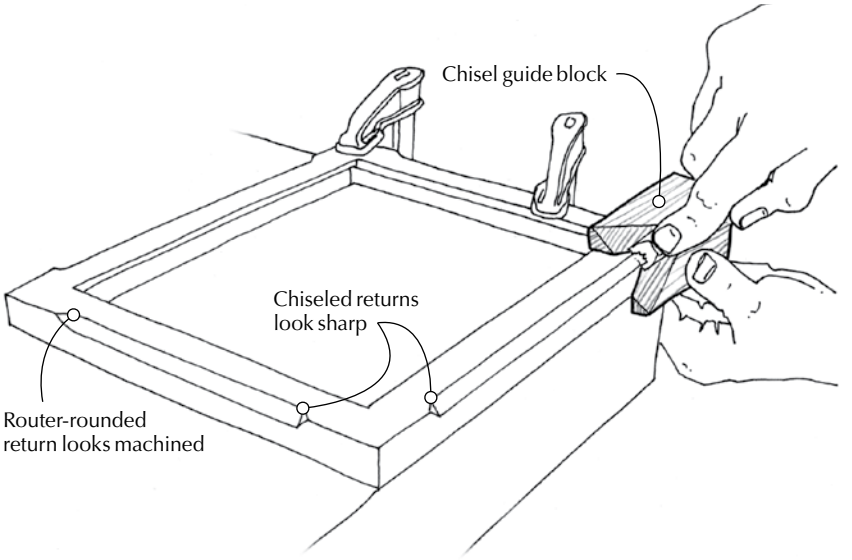
Handcrafted Stop-chamfers

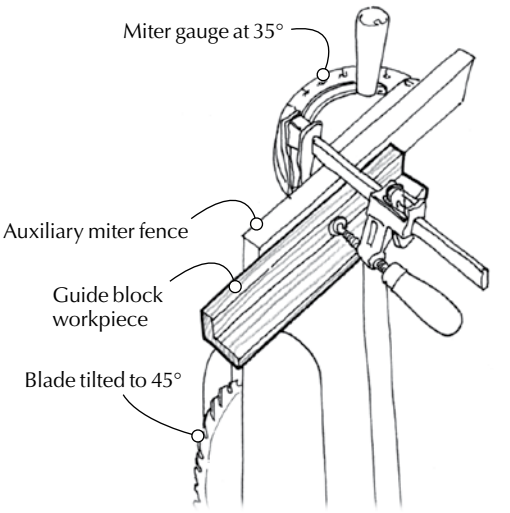
I like to use stop-chamfers as design elements in my work, but I don't like the rounded, machined "returns" that the router creates at the beginning and end of the cut. To create a more hand-worked look, I trim each return flat with a chisel guided by a ramped block that ensures a neat, consistent 35° cut.

To make the guide block, I begin with a 1¾"-square hardwood block about 12" long. After ripping a 1" x 1" rabbet in the block, I adjusted my table saw miter gauge to 35°, and attached an auxiliary fence that extends to the blade for maximum workpiece support. I cranked the blade over to 45°, clamped the block to the fence for safety, then cut the angle on the block. Afterward, I crosscut the angled block to about 4" long.

To use the guide block, simply clamp or hold it in place, centering a sharp chisel on the ramped face, and then chisel the return flat. Finish up by chiseling the chamfer from the opposite direction to neatly meet the return.

— Rick Herring, Stowe, Vermont



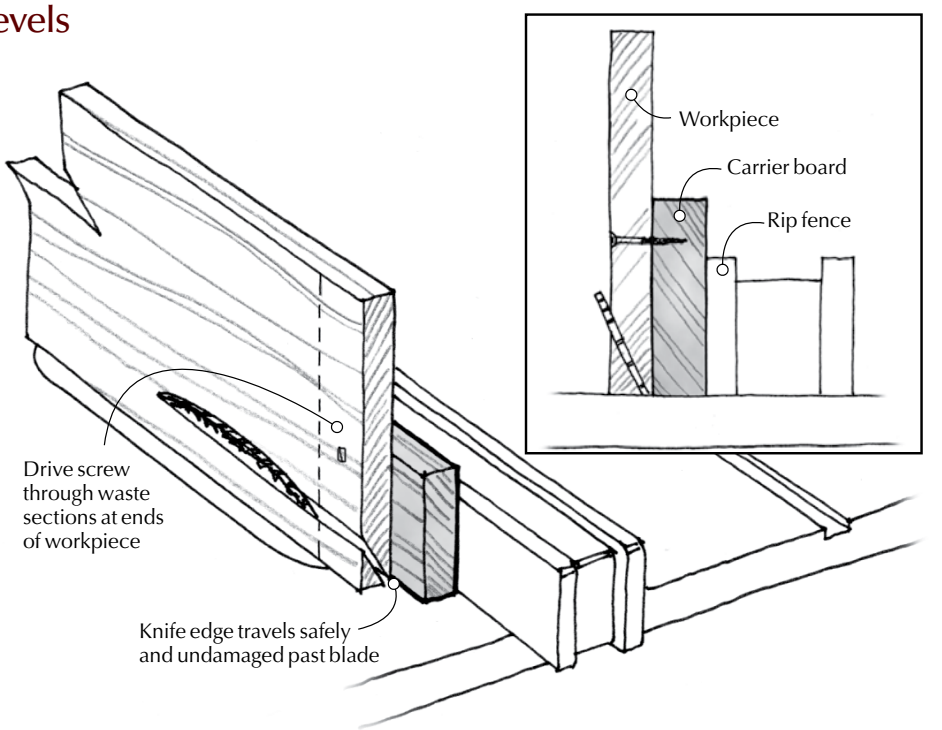


Ripping Steep Knife-edge Bevels

There are times when I need to rip a neat, knife-edge bevel that's more acute than 45°. Because a table-saw blade won't tilt more than 45°, the workpiece can't be laid flat on the saw table to make the cut. Ripping such an acute angle requires feeding the workpiece vertically against the rip fence. Unfortunately, this makes for a somewhat dicey operation and, because the board exits the blade traveling on the knife edge, it's subject to damage.

In a case like this, I use a thick, squared-up carrier board to do the job safely and securely. Although the workpiece can be clamped to the carrier board, I prefer the less cumbersome approach of making the workpiece a bit oversized in length, then screwing it to the carrier board at both ends. I cut away the screw holes later. **PW**

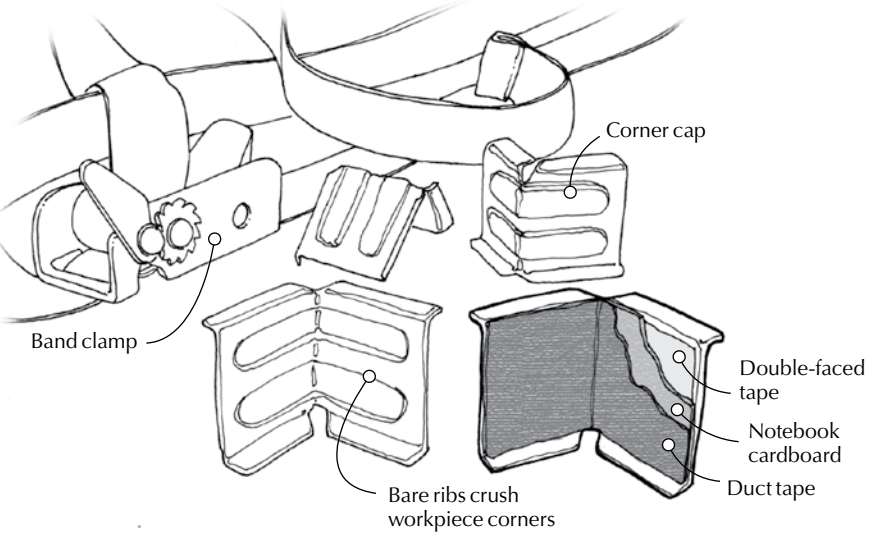
— Paul Anthony, PW contributor



Crush-free Corner Clamping

When assembling a mitered frame, I like to use a standard band clamp because it helps pull the joints together. The only problem is that the ribbed surfaces of the metal corner caps can slightly disfigure the frame's corners. To prevent that, I cover the bearing faces of the caps with 1/32"-thick cardboard from the back of a writing paper tablet, adhering it to the caps with double-faced tape. As a final touch, I face the cardboard with duct tape to protect it from excess glue.

— Max Swenson, Louisville, Kentucky

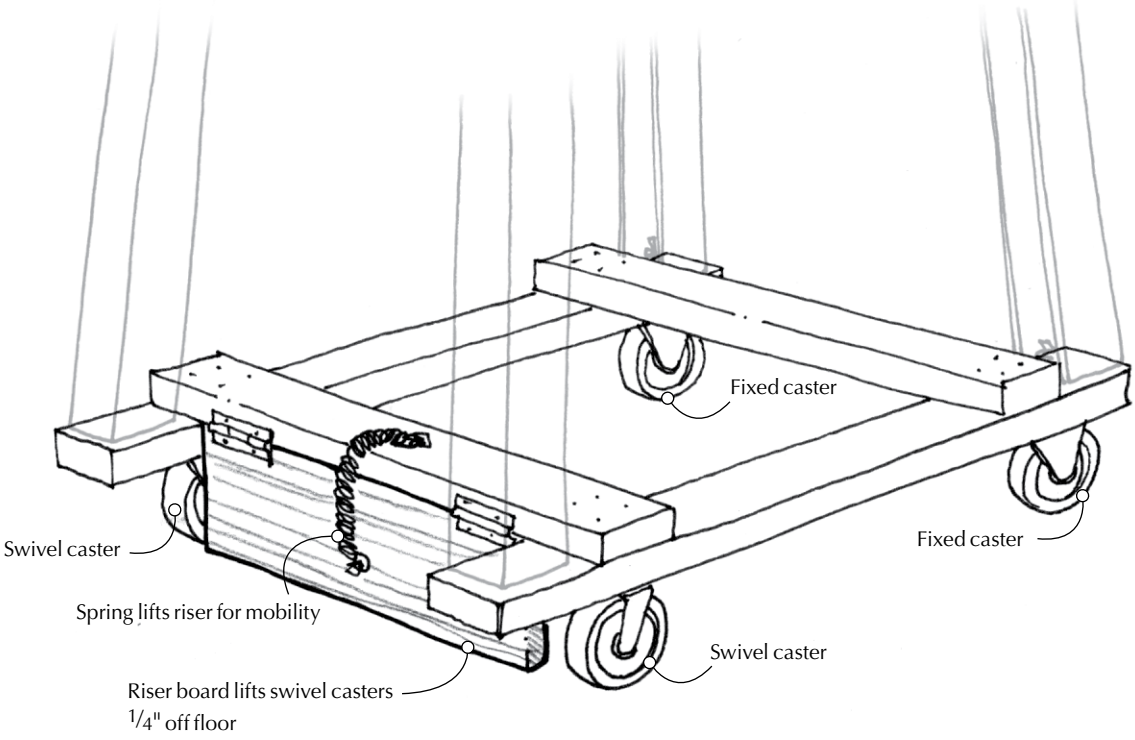


Shop-made Locking Mobile Bases

In my cramped shop, almost all my machines are on simple mobile bases that I make myself. I cobble each one from construction lumber, sizing it to fit the particular tool stand, and glue and screw the frame pieces together for strength. For mobility, I attach two fixed casters and two swivel casters. For safety, I like to be able to secure the base in place when in use. For this, I make and install a thick riser board that can be dropped down between the swivel casters to lift them off the floor.

To fit the riser board, I simply measure the distance between the frame and the floor, and add 1/4". I rip the riser to this width, and then hinge it to the frame. For easy return, I attach a spring between the riser and the base. That way, all I have to do is tug the machine in the direction of the fixed casters, and the riser lifts up out of the way. When arranging the casters and riser board, consider any working pressure against the tool in use. For example, install the swivel casters and riser at the rear of a table saw or jointer to resist stock feed forces. **PW**

— Andrew Louws, Bowmanville, Ontario

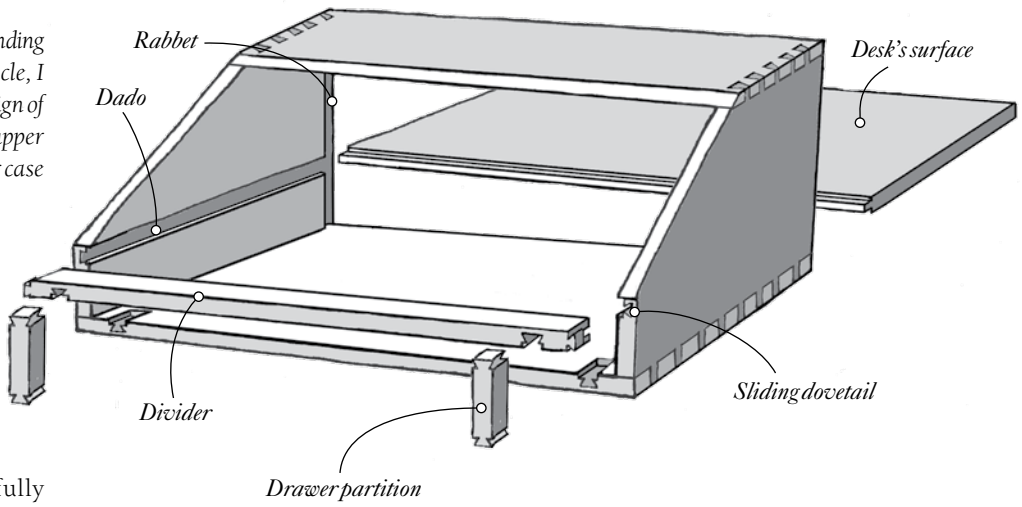


BY ADAM CHERUBINI

The Upper Case

Those who forget the past are destined to spend too much time making stuff.

This is part four in my series on building a standing desk for my workshop. In my previous article, I built the lower case, using the structural design of a baroque lowboy as the starting point. The upper carcase of my standing desk is like the lower case of an 18th-century secretary.



Stable construction. *The upper case of my standing desk exhibits typical 18th-century dovetailed carcase joinery, much in the same way the lower carcase is representative of joined cases from the period. The upper carcase is composed of wide boards that are joined with bold dovetails. Dividers with sliding dovetails secure the sides across the front opening. Backer boards (not shown) are nailed into rabbets in the back to stabilize the back of the carcase. The desk portion, which is similar to a full dustboard, is let into shallow dados in the case sides.*

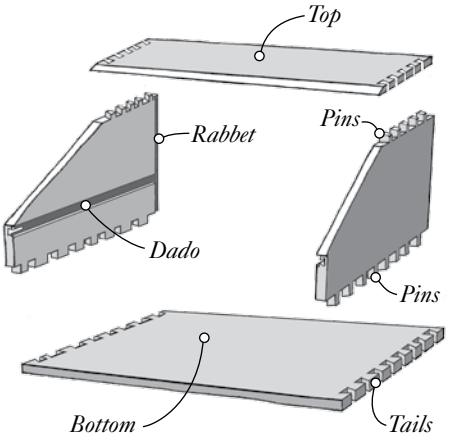
To begin, I needed stock in excess of 24" wide. I didn't have it, so I had to glue up something. Though period cabinetmakers did tend to use wide lumber, I've seen many cases with glued-up sides. Once the glue dried fully (one day), I faced my stock. I chose my stock carefully. The boards were sawn just off the heart of the tree so their propensity to cup is minimized. The sawyer followed the tree's straight grain so there's very little twist. I don't recommend using poor-quality lumber, but don't confuse this with National Hardwood Lumber Association (NHLA) grading, which is essentially meaningless to furniture makers working by hand. I hand-pick my boards based on where they were in the tree and what the grain is doing. So my facing effort focused more on cosmetics, removing any mismatch between the boards in the glue joint for example, than producing perfectly flat pieces. I can get away with this because my lumber comes to me fairly flat due to where it's sawn, but also because of the nature of dovetailed carcases. I'll talk more about that later.

Sawing

With the big bottom piece glued up and planed pretty flat, I sawed it to length. I sawed carefully, making a nice, square, straight edge. This is a long crosscut, so it can be hard to remain square. Remember this trick: Mark both the top and bottom and flip the board over if you have to. You can also restart the cut from the opposite end. I really focus on saw cuts like these because I simply don't want to plane end grain. Call me lazy.

Dados

With the parts sawn to size, the next step was making the dados in the sides. Though you can cut dados with a backsaw and a chisel, I prefer using a dado plane. It works faster and generally does a better job, but there are a few tricks. The dado plane has a nicker iron that scores wood fibers in advance of the plane's skewed blade. This is helpful, but doesn't guarantee you won't get tear-out where the plane exits the wood at the end of the cut. I began by pulling the plane backward for several strokes. This allowed the nickers to score the wood before any cuts were made. I also deepened the score marks on the far



Masked joinery. *For this project, I used through dovetails in lieu of half-blind dovetails because mouldings will cover the joints. You may notice in these drawings that the tails are on the top and bottom pieces. This is the way formal secretaries are constructed. However, in the following step photos you'll notice that I reversed the tails and pins in order to restrain my wide bottom panel.*

PHOTOS AND ILLUSTRATIONS BY THE AUTHOR

side of the cut using my chisel. Still, there's always a risk when you are working across the grain. I made sure the back of the piece was the back of the cut. So, if I broke some fibers, my mistake wouldn't show in the finished product.

Rabbets

The back of the case will be nailed on. As is typical, I've decided to rabbet the sides so the backer boards will not show from the side. I began the rabbet by marking its width and depth with my marking gauge. Using a square rabbet plane (you'd step over it if you saw it in the street), I planed the rabbet, using my fingers as a fence. There are other ways to make this simple joint. I could have used my fillister plane or plow plane. Both have integral and adjustable fences. But this unimportant joint doesn't deserve better planes and I think it's good to practice working by eye.

Carcase Dovetails

Now my boards were ready to be dovetailed together. I guess I feel enough has been said regarding dovetails. You don't need to hear from me on this subject. I sawed them, chopped them and put them together without paring a single surface. To me, that's what carcase dovetailing is all about. There are a lot of little tricks to doing this and you probably know more of them than I do. If I had to offer some advice, I'd say you need to be able to saw precisely, and to be careful when chopping at the baseline. Where you place your chisel is directly related to where you place your saw.

Sliding Dovetails

The drawer divider runs in a dado in the carcase side and ties the sides together at the front with a sliding dovetail. Period craftsmen had a variety of ways of doing this, all of them good and each with their own advantages and disadvantages. I chose to use a shallow dado with a sliding dovetail that extends deeper into the dado into the carcase side. This allowed me to make the dado the full thickness of the "desk's surface" (see the illustration at left). The problem with this approach is that it basically forces you to split the drawer divider into two parts.

This is also an advantage. Typically, period craftsmen made the longer front piece (labeled "divider") out of the primary wood, and the wide back portion (labeled "desk") out of secondary material.

These boards were sometimes glued, but more typically joined in only a tongue-and-groove joint.

Time and Money

Though it's hard to tell exactly because I had to stop to take photographs, the construction of this carcase took me about one long day. I know the long dovetail joints at the bottom each took about an hour or so. My experience tells me bigger cases don't take much longer to make. The dados go pretty quickly, so having multiple drawer openings isn't a problem. The sliding dovetails are time consuming, but on some 18th-century cases, not every drawer divider is dovetailed. So I think this sort of joinery is fairly quick to do, almost regardless of the size of the case.

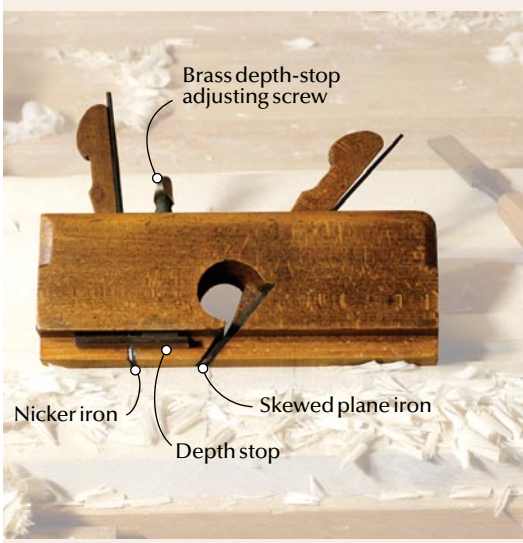
I hate to sound like a broken record, but accurate saw cuts were chiefly responsible for the quick and painless execution of this

Matching sizes. *I sawed the boards to shape, starting by matching the bottom board to the lower case. This allowed for a slightly irregular lower case (this lower case was surprisingly square, doubtless due in part to the match-planing of the legs). The sides and top were then matched to this board and to each other as required.*

Two dados at once. *To keep everything lined up, I prefer to dado both sides at once. The fronts are placed together so the plane exits at the back of the piece. A nailed-on piece of scrap wood serves as a fence.*

Anatomy of a Dado Plane

The dado plane is like an 18th-century woodworking machine. A brass adjusting screw allows for precise and reliable adjustment of the plane's integral depth stop. A single "nicker iron" with football-shaped ears scores the wood ahead of the skewed plane iron. So-called by tool collectors and dealers, BDS (brass depth stop) dado planes are available in a variety of widths. — AC



Rebates. *I'm using a square rabbet plane (which has a square, not skewed, iron) to "rebate" the back edge of my case to let in the backer boards. To ease the work, I worked 3/8" at a time. Taking narrower shavings gave me the control I needed to work to a scribe line using only my fingers to position the plane.*

carcase. Looking back over the article, you may notice many little, but important, saw cuts. Fifty tails and pins make up the basic box. Each pin and tail has two sides. That's 200 sawn surfaces to pare – or not. I pared none. I'm not proud of that anymore than I'd be ashamed if I had to pare a few. But if I had to pare even a quarter of these surfaces due to poor sawing, that four hours could have easily turned into the better part of the day.

Aside from the dado plane, I used fairly common, inexpensive tools: bench planes, a variety of saws and chisels and my trusty walnut straightedge. My fancy saws aside, I could have done everything thus far with only a few hundred-dollars worth of secondhand tools. Using comparable new tools would probably bump the cost to a few thousand dollars.

Conclusion

The joinery shown here is fairly typical, not just of 18th-century secretaries, but of all sorts of casework stretching over a century and a half or more. The construction is smart; the case dovetails allow the sides to move with the top and bottom. The backer boards (oriented horizontally in my case) hold the sides together at the back while the sliding dovetails of the drawer divider hold the sides together in front. It's no wonder furniture built this way has survived centuries. I think you'd be wise to leverage this successful structure regardless of the style you work in. It doesn't take very long to build a dovetailed carcase by hand with 18th-century joinery. There are tricks and shortcuts to be sure. But don't decide it's too much work before you try it. **PW**

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

Flattening. *The bottom board in this case is 24 1/2" wide. That's the widest carcase I've ever made. I've been telling you how I don't flatten stock. This piece was out of flat by about 3/8". So I clamped it flat to the front of my bench before I marked the pins. I generally orient carcase sides heart-side out so any cupping stresses are directed to the middle of the carcase instead of the ends.*

Trimming the tail. *I simply saw out my sliding dovetails. You can see I've cut away the back portion. This helps me align the divider when I mark the case. That back portion will slip into the dado.*

Cutting the socket. *Using a crosscut-filed backsaw, I sawed the sides of the dovetail into the carcase. I've let the saw cuts run long to reduce the amount of chiseling. These saw cuts look pretty crooked to me. They should have been parallel to the sides of the dado.*

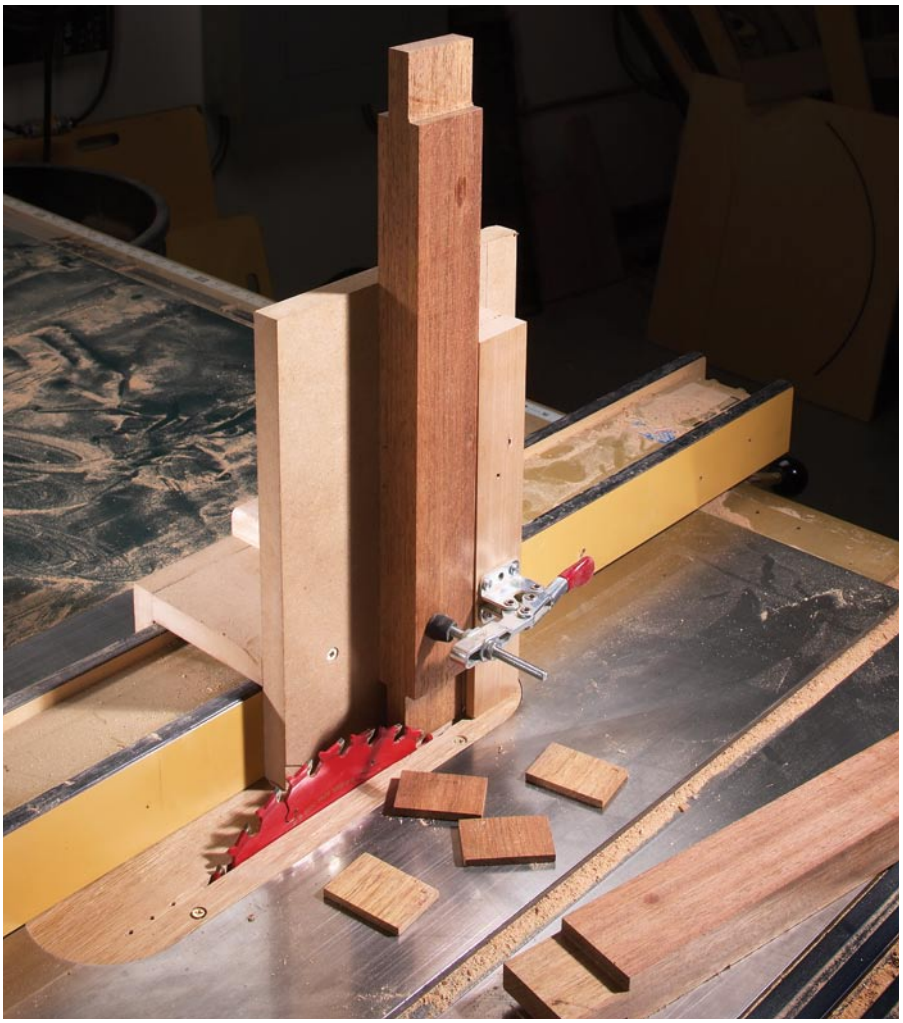
Trim to fit. *I've chiseled out the waste, corrected the out-of-square condition, and deepened the dado for the shoulder. I think this last step is a good idea. Making the divider's shoulder a little deeper than the dado seems to help get a nice tight fit.*

The home stretch. *I'm not going to drive this all the way home until I'm ready to lock this case up. I pared away a little of the end grain on the divider. As I tap it in, the gap at the end will close. This keeps the shoulder and angled portion of the tail tight.*

BY ROBERT W. LANG

Table Saw Tenon Jig

With five pieces of wood and a clamp, you can make vertical cuts safely.



Nothing wrong with simple. *This tenoning jig performs one task, and does it safely and accurately. It costs little, and makes use of the existing table saw fence for fine adjustments.*

Most magazine articles about jigs miss the point entirely. Jigs exist to make work easier, safer and more accurate. They shouldn't be complicated projects in and of themselves – they should be something simple you can put together quickly so you can get on with your work.

We admit to falling into this trap ourselves in the magazine's shop. The corners of our shop are home to jigs that were built for articles about jigs. We can't throw them out because the amount of hardware and time that went into making them has us convinced that they're valuable. The problem is, we almost never use them. They're too big, heavy and complicated to bother with.

Instead, we use a handful of truly useful jigs that we've put together quickly to meet a need. This new column is all about this kind of jig. We've made some promises to ourselves about the kind of jigs we're going to present. For starters, we're going to keep it simple. Most of the jigs we really like only do one thing, but they do it very well.

And we're going to focus as much on how to use the jigs as on how to make them. You won't see a cutting and hardware list that takes up more than a line or two, and we'll let you decide whether to get a sheet of Baltic-birch plywood or use whatever you have.

We will show you sound principles and simple techniques that we have used over and over again. If your hobby is making jigs, you may be disappointed; if you want to work smarter, we think you'll be pleased.

This table saw tenon jig is a good example of what we mean. There are only five wood parts to it, and you don't really need the hold-down clamp. A "C" or "F" clamp will work just as well, but it will slow things down. You can make precise tenons as long as the maximum depth of cut of your saw, and there are probably a thousand variations to the jig.

This jig enables you to safely make a cut on the table saw with the workpiece held vertically as it moves over the blade. I've seen this done freehand on television and it always makes me cringe. The chances of the piece catching and kicking back are too big to risk.

Smooth Moves Make Tight Joints

The key element in making this jig is to get it to slide nicely along your table saw's rip fence. It needs to be free to move, but not sloppy. This depends on the width of the horizontal piece that goes on top of the fence, between the two vertical pieces. If you screw the pieces together without gluing them, you'll be able to make some trial runs and get it just right.

Changing the width of the horizontal piece changes the fit, so if you're not sure of the exact width you need, start big and trim

LEAD PHOTO BY AL PARRISH; ILLUSTRATION BY MARY JANE FAVORITE

a little off at a time. Trial and error is a good process, but it's wise to structure it so that an error doesn't ruin the part.

I made this jig from 3/4"-thick MDF, but it could just as easily have been made from a decent piece of plywood. Stay with the 3/4" thickness so there will be room to drive screws without splitting the wood.

After getting the width of the horizontal piece right, put glue on the two long edges, set it on top of the fence, then put the vertical pieces in position on either side. Use clamps to hold things in position and drill countersunk holes for #8 x 1 1/2" screws. The large vertical piece is 3/4" x 8" x 12", but this can be varied to suit your needs. The smaller vertical piece that captures the jig on the fence is wide enough to reach from the top of the saw table to the top of the horizontal piece.

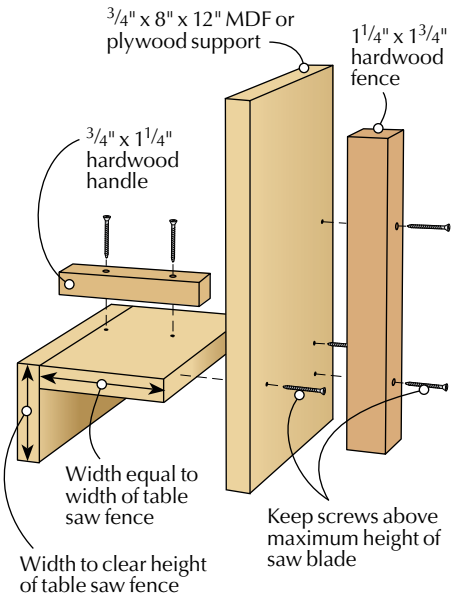
Get on the Fence

When the screws are in place, remove the parts from the saw fence and clean up any excess glue on the fence, or the inside of the jig. After the glue has dried, rub some paraffin on the inside to help it slide smoothly.

The fence can be made from any hardwood. I used a 1 1/4"-thick by 1 3/4"-wide scrap of cherry. These dimensions are also arbitrary, but this size works well to mount and use the clamp on material between 3/4" and 1 1/4" thick. It was 12" long originally, but the bottom became ragged from use, so I cut the end off and remounted it. No glue is used to hold the fence on, only screws so it can be replaced as needed.

Locate the clamp above the highest position of the saw blade, and screw it in place. Adjust the arm on the clamp to firmly hold the material. Add a handle to the jig to make it easier to push.

Start low and move up. *Set the height of the saw blade to the shoulder line by sighting from the edge of the table. Make sure that one tooth is at top dead center, and make your initial setting slightly lower than you think you should. It will be easier to move up after a test cut than it would be to move down.*



EXPLODED VIEW

The advantage to a jig like this is that once it is set up, you can quickly make a bunch of identical tenons. Layout work and fussing is minimized by making a few extra pieces for test fitting. Setting up the cuts is an easy, two-step process.

Cut the tenon shoulders first, then clamp a part in the jig and move the fence next to the blade. A rip blade will make easier cuts than a combination blade, but either will work. Raise the blade until it is just below the shoulder line.

Start wide and move in. *When you're satisfied with your height setting, set the fence. A zero-clearance insert on the saw will make it easier to set the blade to your layout line.*

Setting the width is next; a zero-clearance insert on the saw makes this easier as well as safer in use. Slide the fence over until your layout line is on the edge of the kerf in the insert. Set up so that the scrap falls to the left. Make a test cut and examine the result.

If the blade is too low, there will be a ridge of material left between the cheek and shoulder of the tenon. If the blade is high, it will show as a nick in the shoulder line. With most saws the blade is likely to drop from backlash in the mechanism if you lower the blade. Starting with the blade low allows you to raise the blade a tiny bit at a time.

Adjustments in the thickness of the tenon are made by adjusting the rip fence. Start outside the layout line and make a cut on both cheeks. Measure the mortise with a pair of calipers, and check the thickness of the tenon with the outside jaws. When you think you're close, check the fit of your test tenon in a mortise and tweak as necessary. Make a final test cut in a new piece of stock. If you're just shaving a bit off, the blade can deflect, affecting the size of the tenon. **PW**

Bob is the author of "Shop Drawings for Craftsman Furniture" (Cambium) in addition to other books. More information is available at his web site: craftsmanplans.com. Contact him at 513-531-2690 x1327 or robert.lang@fwpubs.com.

Don't trap the scrap. *Push the work through the blade in one smooth motion. My right hand is on the handle, and my left hand is well above the clamp and saw blade. Because the cut is made on the side away from the fence, the scraps fall harmlessly out of the way.*

BY THE POPULAR WOODWORKING STAFF

Bridge City's Variable-pitch Plane

A unique tool that allows you to plane at high or low angles, with a bit of a steep learning curve.

Bridge City VP-60

Bridge City Tool Works ▪ 800-253-3332
or bridgecitytools.com

Street price ▪ $1,500

For more information, circle #147 on Free Information Card.

Say what you will about a handplane that costs $1,500, the variable-pitch plane from Bridge City Tool Works is so well made and engineered that its mere existence is an impressive feat.

Unlike other handplanes, the VP-60 has a frog that tilts forward and back, and this allows you to set the cutter at any angle between 30° and 90° to the sole of the tool. As a result, you can set the tool to really low cutting angles (great for end grain and softwoods) or to an ultra-high scraping angle to produce tear-out free cuts in difficult woods.

We borrowed a VP-60 from Bridge City for a couple months and found that the tool performed exactly as advertised. But this isn't a tool that you should expect to master the first day. The tool has parts that will be unfamiliar, and it takes time to understand them, set them properly and master their subtleties.

Let's start with the frog. By loosening a hex-head knob behind the frog, you can adjust the frog angle anywhere between 30° and 60° to the plane's sole. This allows you to set the tool to any of these planing angles with the bevel of the cutter facing down. By flipping the cutter over so the bevel faces up, you can achieve the higher scraping angles.

Pick an angle, any angle. *The frog moves forward and back to change the tool's angle of attack.*

The depth adjuster is among the most precise I've ever used, with little backlash in the mechanism. The way you laterally adjust the iron to center the cutting edge in the mouth is unusual and took some getting used to. There are two wide wheels on either side of the frog, and you snug them up against the sides of the cutter. These adjust and hold its position to prevent it from skewing.

The lever cap is actually the most unusual piece of the tool. It articulates and folds to accommodate all the different planing angles, which is cool to watch. At the end of the lever cap is an adjustable steel "pressure bar," which is quite interesting. You adjust the bar so it's close to the cutting edge of the tool. When you cinch down the lever cap, this bar bends the cutter a bit, pre-loading the cutting edge against planing forces.

A couple other unusual features: The plane has two sole plates, one in front of the mouth and one behind, so you can close things up as tight as necessary. And the cutter is cryogenically treated A2 steel and optically polished on the unbeveled face. It's ready to go out of the box. All of these unusual parts add up to a tool that commands your full attention when adjusting it. Changing the plane's angles takes time at first because you have to switch around several settings. However, once set, the plane does do an excellent job and works at all the angles. After trying the VP-60 at a bunch of unusual settings, however, my favorite angle for the VP-60 was 45° – the standard angle of attack for Stanley planes. Old habits die hard, I guess.

As we went to press, Bridge City told us there is a forthcoming VP-55 version of the plane that will be less expensive.

— Christopher Schwarz

Sole of a new machine. *The VP-60 has two sole plates to close up the mouth for any planing situation.*

PHOTOS BY AL PARRISH

Hitachi Nailer – More Than Premium Features

If you think a 15-gauge finish nailer is a bit more tool than you'll need in your workshop, think again. Every woodworking shop should have this size finish nailer in its arsenal of air-powered tools.

A 15-gauge nailer is the right tool when constructing workshop cabinets, adding face frames to a piece of paint-grade furniture, installing door and window trim or just cobbling together cabinets that are nailed at inconspicuous places.

Hitachi's version of the 15-gauge finish nailer, the NT65MA3, uses nails ranging from 1¼" to 2½" in length and it has a new feature that will make your job easier.

That feature is a thumb-activated blow nozzle located just above the grip and behind the top cover. Clearing dust and wood chips from your work has, until now, required a swipe of your hand or a stiff brush.

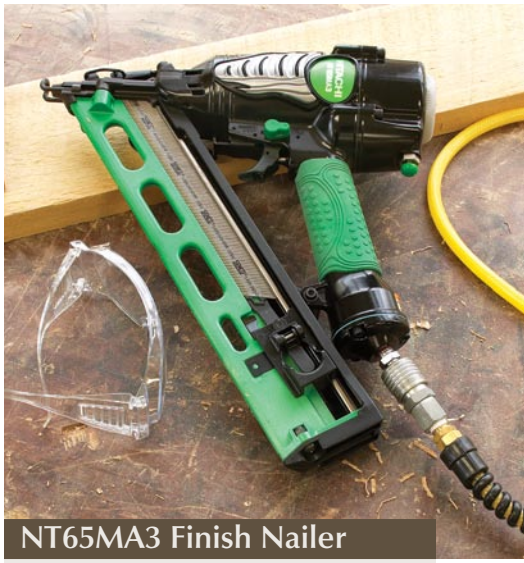
With the Hitachi finish nailer, all you need to do is point and push. A push of the nozzle blows air out the front of the tool, directed at any area you need cleared.

Other premium features from Hitachi include dialing the firing exhaust in different directions by rotating the top cover, and a switch to adjust the operation from single fire with each pull of the trigger to rapid-fire nailing with each tap of the tool's nose.

I particularly like the adjustment to tweak the depth of the nail as it's driven into your workpiece. A few turns and you can dial right in so the nail is flush with the surface or set just below awaiting filler.

I also like the body-grip handle for comfort. Another handy feature is the nail stopper. It keeps remnant nails from falling out of the magazine as you load additional nails.

— Glen D. Huey



NT65MA3 Finish Nailer

Hitachi ▪ 800-706-7337 or hitachipowertools.com

Street price ▪ $200

For more information, circle #148 on Free Information Card.

Grizzly Band Saw Extremely Well Done

This new version of the popular 14" band saw is more old than new, but in a good way. Its mass and power make it feel more like an older American-made machine than a new imported model. Much of this is due to an abundance of cast iron. In addition to the frame, solid computer-balanced cast iron wheels and an enclosed steel stand make this saw weigh almost 50 pounds more than Grizzly's open-stand "Ultimate" 14" band saw.

The motor is also heavier – 1½ hp, which is a significant upgrade from most saws in this category. This combination makes for a machine with a solid feel, plenty of power and little vibration. We were able to resaw consistent veneers up to the maximum height capacity using the stock blade without the machine bogging down or complaining.

The main table tilts 10° to the left and 45° to the right, and there is an auxiliary table to the left of the main table that does not tilt. A 6" riser is available to increase resaw capacity to 12". The ball-bearing guides are easy to adjust, and the upper guide doesn't shift laterally when raised and lowered. The dust-collection port works well, keeping most of the dust out of the inside of the saw.

In addition to covering the basic functions as well as any saw in its class, Grizzly has added a number of extra features that move this model to the top of the heap. An extruded aluminum fence is included, and it can be mounted in either of two positions: tall for resawing, and short for other work. The fence is adjustable for blade drift, but the saw we tested cut straight and true without any fiddling on our part.

There is a quick-release blade tensioner, a built-in work light, and an enclosed steel stand with storage below. I would rather see the door to the cabinet on the front of the saw, but this is a minor complaint. Fit and finish are very good. The paint is powder coated, and the cast iron table is flat and smooth. We had the machine assembled and ready to work in about an hour without encountering any problems.

This old form of band saw may not look as sleek and sexy as the newer steel-frame models (such as the ones we tested in November 2006, issue #158), but there is real value to be found in this one. It performs as well or better than a steel-frame saw, at a significantly lower price. Powerful, smooth running and quiet, this saw is capable of cutting thick hardwoods quickly and accurately. It is a solid, well-made machine with no compromises that I could find.

This saw has earned a spot in our shop.

— Robert W. Lang

G0555X 14" Band Saw

Grizzly Industrial ▪ 800-523-4777 or grizzly.com

Street price ▪ $595

For more information, circle #149 on Free Information Card.

Sight and Sound Protection as One

I've never been able to wear sound protection and safety glasses at the same time in the woodshop. The problem is, if you're wearing glasses and then add earmuffs, you get pinched at your temples from the pressure on the arm of the glasses. And, the hearing protection isn't effective because the arm of the glasses breaks the seal between the earmuffs and your ear.

FullPro Protective Gear has combined the two most critical pieces of personal protection in the shop into one product – SoundVision Eye Protection. We tested the Eye Protection Kit with Earmuffs that's complete with Peltor H9 earmuffs, two pairs of self-adhesive hook-and-loop patches and SoundVision lenses with flexible hook-and-loop straps.

I know; I hear you. "That's crazy." I thought so too, until we had them in the shop.

They couldn't be easier to use. The patches stick to the outside of the earmuffs and the hook-and-loop glasses straps hold firm to them. There are no arms to pinch or break the seal of the earmuffs around the ear and, as a result, no loss of hearing protection. They're easy to adjust and comfortable to wear.

And they work. The Peltor H9 earmuffs (different rated earmuffs are available) have a noise-reduction rating of 25 decibels. That covers the majority of the tools in the woodshop. The adjustability is infinite. They will fit you correctly.

The safety glasses are labeled Z87+ which meets or exceeds the standards set by the American National Standards Institute (ANSI) for high-mass impact, high-velocity impact, drop-ball impact and penetration tests. Also, there are three choices of lens options – clear (for indoor use), smoked (for bright environments) and amber (for high-contrast requirements. You can get the lenses to fit your needs for $20 each.

I'm a believer. Whenever I'm milling lumber or working with machinery in the shop, I protect both my eyes and ears with SoundVision Eye Protection. — *GH*

SoundVision Eye Protection

FullPro ▪ 888-873-8557 or fullpro.com

Street price ▪ $38

For more information, circle #150 on Free Information Card.

Machine Sharpening – Maybe It's Not Scary

Many of us are not hand-tool aficionados but we still need sharp tools. Nonetheless, we delay sharpening and continue to work with dull tools. That increases the chances of injuries. Or, we turn to machines to get the tools in working order.

The sharpening task became easier when Professional Tool Manufacturing, the company best known for the Drill Doctor, introduced the Work Sharp. Work Sharp is a dry sharpening system – no watery mess – that allows you to shape and hone woodworking tools using a single machine. It simplifies the process and provides repeatable results.

How does it work? It begins with a double-sided tempered glass wheel – two such wheels are included with the tool – to which adhesive-backed sandpaper is attached. Any 6" abrasive discs will work or they can be purchased through Work Sharp.

Work Sharp suggests you work through four steps, depending on the condition of your cutting edge as you begin. Use P120 grit for basic grinding and shaping of tools in bad condition, move to P400 grit for the sharpening step, on to P1,000 grit to hone the edge then finish with micro mesh 3,600 to polish. And if you're "old school," a leather honing wheel is available to develop a highly polished edge ($30).

A chisel slides into the abrasive-covered wheel (spinning at 580 rpm) from below and is positioned on a sharpening port (adjustable to four angles – 20°, 25°, 30° and 35°) that captures the chisel and holds it square to the disc. Sharpening requires you to slide the tool repeatedly into and away from the wheel.

The heat-sink design cools the tool as it sharpens. While using P1,000 grit, I experienced a slightly higher temperature – 4° on our infrared thermometer during a typical operation. You can also flatten the chisel back on top of the disc.

For sharpening tools other than flat, Work Sharp has a slotted wheel (and matching abrasives available only through the company) that allows you to see through the wheel as you sharpen from below.

The Work Sharp addresses my needs, delivers sharpness to my tools and is better than similar tools I've used. It's found a home in my shop. **PW** — *GH*

Work Sharp

Work Sharp Tools ▪ 800-597-6170 or worksharptools.com

Street price ▪ $200

For more information, circle #151 on Free Information Card.

BY MEGAN FITZPATRICK

Canted Wall Box

Adapted from a 19th-century example, this wall-hung shelf is perfect for displaying your treasures.

Male tchotchkes. *This 19th-century primitive wall box is a perfect place to display some of your treasures … or a hang it by a door for use as a handy receptacle for mail, keys and other small items.*

Adapted from an 1840s piece, this canted wall box is scaled up from the one you'll find in John A. & Joyce C. Nelson's "The Big Book of Weekend Woodworking" (Lark). Making it just a wee bit bigger allowed me to make use of $\frac{1}{2}$" x 6" poplar (which is actually only $5\frac{1}{2}$" wide) without having to make any rip cuts.

Cut Your Pieces

First, cut the two sides to length with your miter saw, then draw the side pattern on one piece. Clamp the side pieces together, then clamp them flat to your workbench so the offcut area is overhanging the edge. (To help control the two pieces from slipping, you could use carpet tape to help keep them together.) With a jigsaw, carefully cut to the pattern, leaving your lines intact. (If you need instruction on proper jigsaw use or any other step to construct this project, visit ICanDoThatExtras.com and download the free manual.)

Unclamp the sides from your workbench, but not from one another. Clamp them cut-edge up in your Workmate then use a rasp, file and sandpaper to refine and smooth the curve, then set them aside.

Now cut the back to length and lay it flat on your bench. Lay out the arcs using the pattern to the right, or mark them out with a compass. Each arc is a half circle; the top radius is $2\frac{3}{4}$", the side radii are 2". Cut with a jigsaw then refine and smooth the arcs.

While you can certainly cut the shelves and bottom to depth according to the cut list, it's beneficial to first cut them a little oversized (the shelves should for now extend past the front of the piece), then do a dry fit of your pieces as shown in the picture at left, and carefully mark the final size. That way, you'll get a custom fit; your shelf edges will match with the front edge of your box. You'll need to do this for the top shelf anyway because you must mark the angle on the front edge to match the side curves. Cut the angle with a jigsaw, then refine the cut as necessary. Use a file to clean up your saw marks. You could, however, forgo the jigsaw altogether for this cut, and instead use a rasp or block plane to establish the angle, then refine it with your file and sandpaper.

Fit before nailing. *Dry fit your pieces before cutting the shelves and bottom to final size. Notice that the sides overlay the bottom and back, and that the back sits on top of the bottom piece.*

Dry Fit Your Assembly

Now that all the pieces are cut and shaped, do your final sanding prior to assembly. Then dry fit the pieces together as shown, with the back flat on your workbench. Glue isn't necessary for this project because it's small and nails will provide sufficient hold, but you can use glue if you wish. Clamp across the

LEAD PHOTO BY AL PARRISH; ILLUSTRATIONS BY MARY JANE FAVORITE

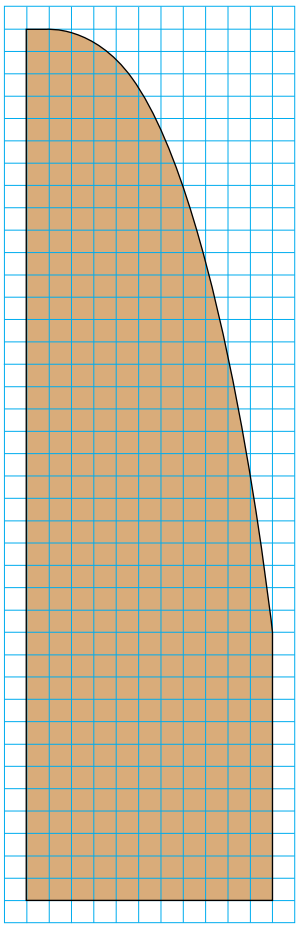
sides at the bottom and at each shelf, snugging the bottom and shelves into place. Be careful not to move the pieces as you tighten the clamps, especially the bottom. It's crucial that the bottom piece be situated properly, as it determines the fit of the back piece.

Using a 1/16" standard twist bit, drill pilot holes for 4*d* nails through the sides and into the back. Be very careful to keep your drill steady; 1/2" stock has little forgiveness for sloppy drilling. Now drive your nails through the sides. Then, drill pilot holes through the sides and into the bottom, and through the bottom into the back, and drive your nails.

Before attaching the shelves, make sure they're exactly where you want them. If they've moved, simply unclamp the workpiece and resituate the shelves. With the back, bottom and sides already nailed in place, you needn't worry about reclamping; you can simply hold the shelf in place with one hand as you drill your pilots through the sides then drive the nails. Once that's done, for added strength you may also wish to drill pilots and drive nails through the back into the shelves.

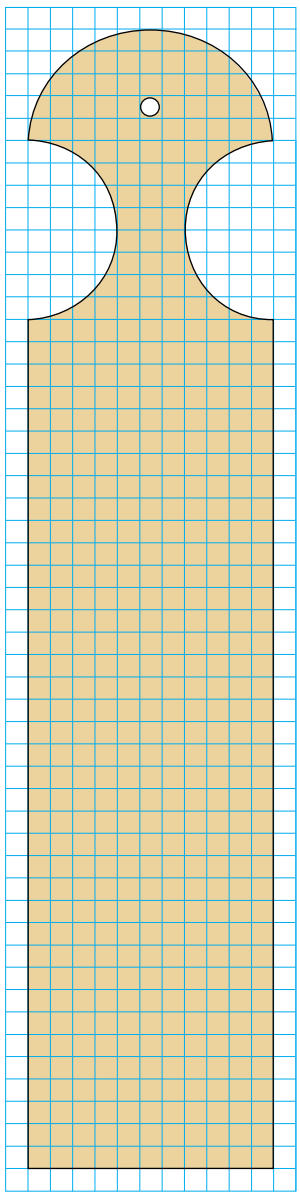
Now, drill a hanging hole centered 1 3/4" down from the top edge (I used a 1/4" bit), then prime and paint the wall box the color of your choice. **PW**

Comments or a question? Contact Megan at 513-531-2690 x1348 or megan.fitzpatrick@fwpubs.com.



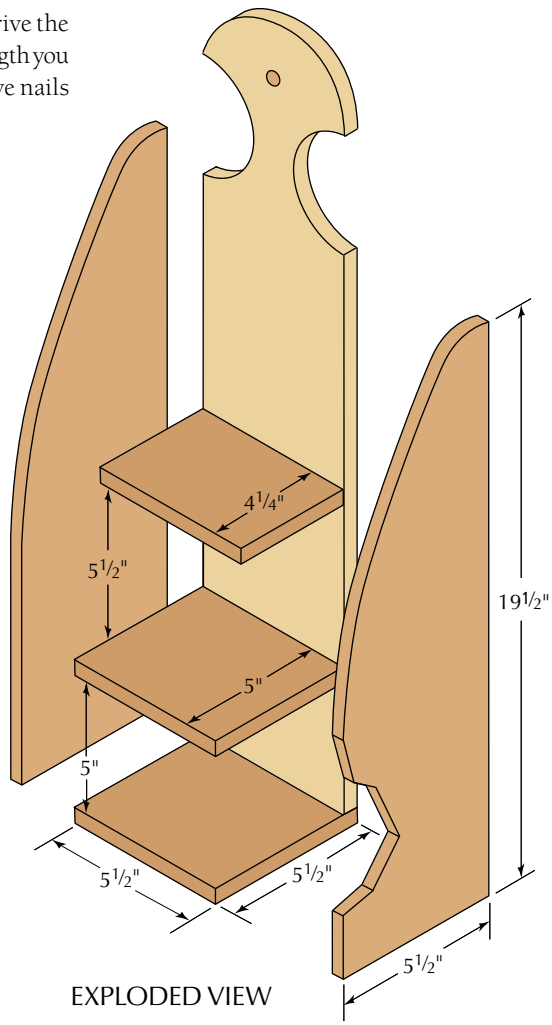
1 Square = 1/2"

SIDE PATTERN



1 Square = 1/2"

BACK PATTERN



EXPLODED VIEW

Canted Wall Box

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Back	1/2	5 1/2	25 1/2	Poplar
❑	2	Sides	1/2	5 1/2	19 1/2	Poplar
❑	1	Bottom	1/2	5 1/2	5 1/2	Poplar
❑	1	Middle shelf	1/2	5	5 1/2	Poplar
❑	1	Top shelf	1/2	4 1/4	5 1/2	Poplar

About This Column

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

Visit ICanDoThatExtras.com to download the free manual.

Authentic Shaker Clock

BY ROBERT CASEY & GLEN D. HUEY

Erastus Rude was the craftsman of this clock in 1811. It still strikes a bell with us today.

While attending an East Coast tool show, Editor Christopher Schwarz was handed a photograph of this clock. Recognizing the Shaker clock, Chris decided to talk with the builder, Bob Casey. Chris heard his tale and knew we had a story at hand.

Rather than have Casey come to our shop to work, or us travel to his home in Mattydale, N.Y., we decided to relate his story and build the clock from his drawings and instructions.

A Shaker tall clock was dominating Casey's mind one cold winter's day. He'd seen a clock that was exactly what he was looking to build. It was an 1811 clock built by Erastus Rude and was part of the collection at the Shaker Museum and Library in Old Chatham, N.Y.

With a phone call to Sharon Koomler, the museum's director, Casey was granted access to the clock for measurements. There's nothing like going straight to the original for sizes.

Casey was in the midst of assembling a cut list when he discovered that there were a few measurements he still needed. I would've missed a few measurements too if I'd been surrounded by fine Shaker craftsmanship and standing at the foot of the original tall clock.

Back to the museum to gather the missing figures, another lunch with friends, then on to the shop to build a clock.

A Slim Waist Starts it All

The clock begins at the waist, so cut the four pieces for the face frame and mill the waist sides at the same time. These pieces form the middle section of the clock.

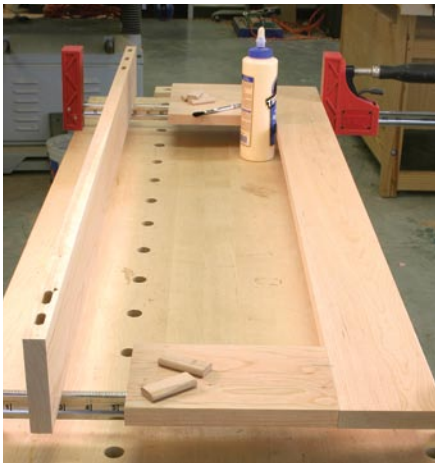
In our shop, we're having a go at the Festool Domino, and the loose-tenon joinery for assembling the rails and stiles of the face frame was a perfect test.

When working with the Domino, I've found I like two "fixing holes" (a tight fit to the Dominos) into both ends of the rails and two long holes (slight gapping at each end) for the stiles. Add glue and assemble the face frame.

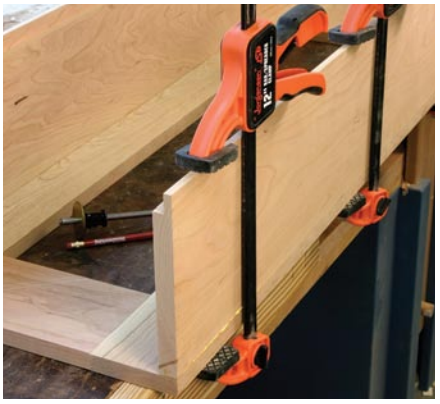
If you don't own a Domino you can use pocket screws, biscuits or a mortise-and-tenon joint (remember to add the extra length for the tenons to your cut list sizes).

Work on the waist sides is minimal. Cut a $^{7}/_{16}$" x $^{3}/_{4}$" rabbet along the back edge of each side using a two-step process at the table saw. Next, notch the rabbet from the bottom to the 3" mark. A line squared across the sides shows the amount of overlap when attaching the base.

The waist sides and face frame are joined to complete the waist. This edge joint is plenty strong with glue only.



Loose-tenon construction. *Cutting the mortises with the Domino is quick work. Select the best face for the waist frame of the clock.*



Forming the waist. *Glue is all that's necessary for this assembly, but have enough clamps ready and work from end to end while applying pressure.*

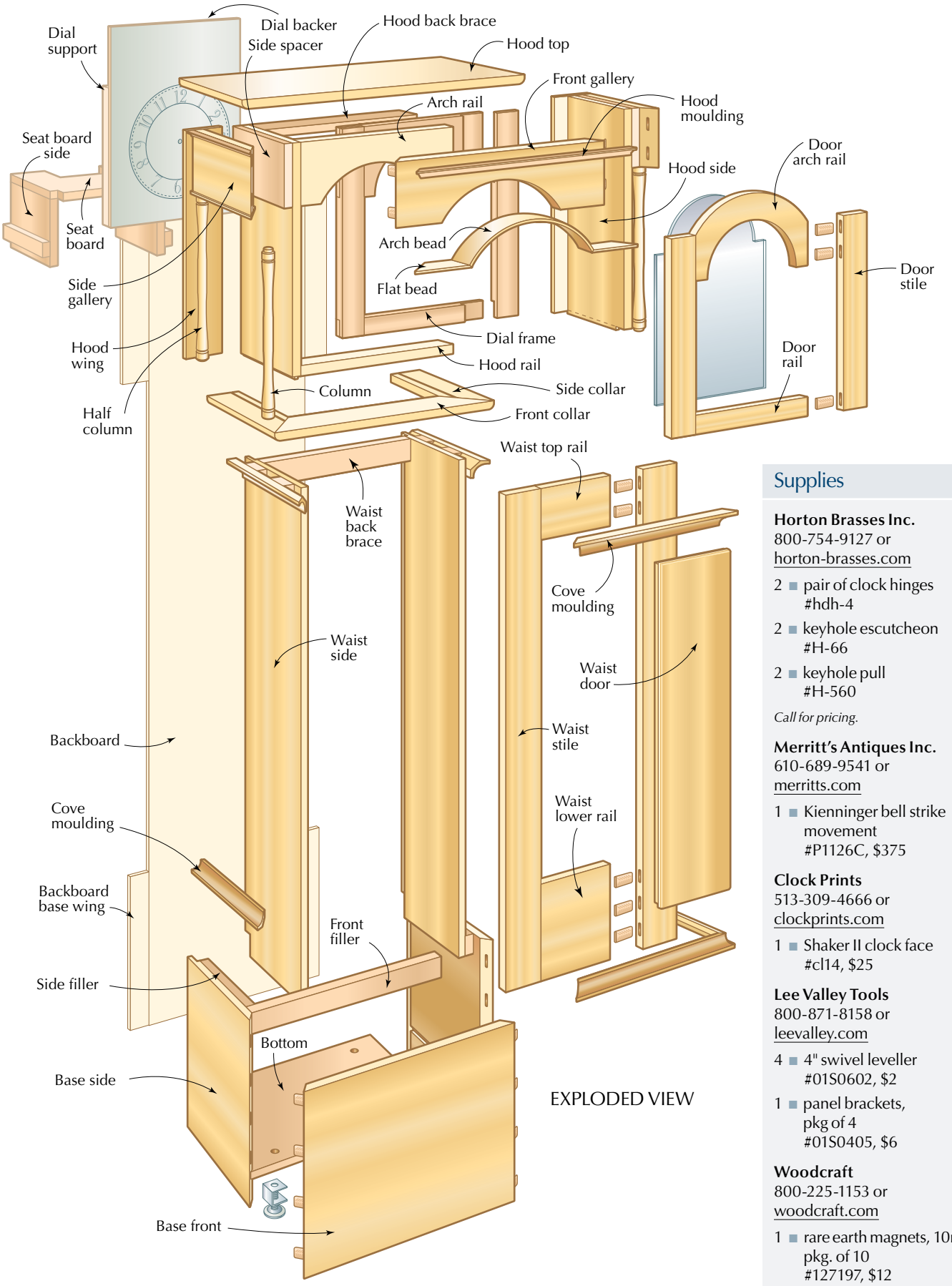
LEAD PHOTO BY AL PARRISH; ILLUSTRATIONS BY LEN CHURCHILL

Online EXTRAS

For more information and to watch a video that shows how to make the split column turnings for the clock hood, go to:

popularwoodworking.com/aug07

All in good time. *This Shaker Clock stands proud with any room decor and next to any furniture style presented.*



EXPLODED VIEW

Supplies

Horton Brasses Inc.
800-754-9127 or
horton-brasses.com

- 2 ■ pair of clock hinges #hdh-4
- 2 ■ keyhole escutcheon #H-66
- 2 ■ keyhole pull #H-560

Call for pricing.

Merritt's Antiques Inc.
610-689-9541 or
merritts.com

- 1 ■ Kienninger bell strike movement #P1126C, $375

Clock Prints
513-309-4666 or
clockprints.com

- 1 ■ Shaker II clock face #cl14, $25

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

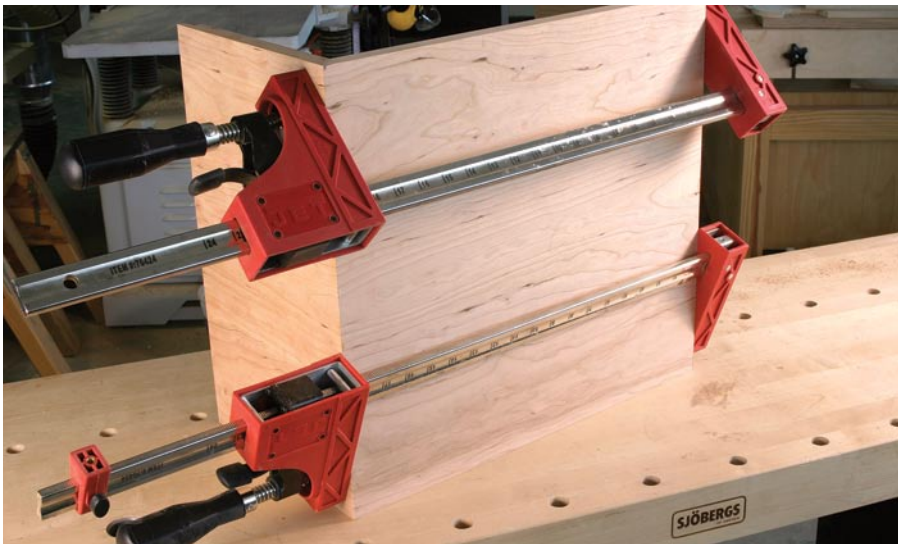
- 4 ■ 4" swivel leveller #01S0602, $2
- 1 ■ panel brackets, pkg of 4 #01S0405, $6

Woodcraft
800-225-1153 or
woodcraft.com

- 1 ■ rare earth magnets, 10mm pkg. of 10 #127197, $12

Prices correct at time of publication.

Last cut for the front panel. *The left-tilt table saw is great for cutting the 45° miters for the base pieces. At a right-tilt saw, use a panel-cutting jig or sliding table attachment.*



Dominos do the trick. *Two clamps keep the joint locked in place. You'll need additional clamps if you attach the mitered corners with a spline. If you use splines, keep the splines back from the outside edge so the mouldings cover them.*

The Size of the Waist Determines the Base

The material for the base sides and front panel requires a good grain match. This is a focal point of the clock. The fact that the grain changes directions from the waist to the base calls particular attention to this area.

Determining the length of the panels for the base is a matter of measuring the waist, adding the width of the spacers and cutting to the correct length.

The base panels are mitered at the corners. Therefore, take the width of the front of the waist, add 1 3/4" (the two side spacers at 7/8" thickness each) plus 1 1/2" (two times the thickness of the side panels) which gets you to the outside edge of the base front panel.

The same measuring steps are followed for the side panel lengths: the depth of the waist sides plus one 7/8" spacer, then add 3/4" for the thickness of the base front.

Square the ends of the glued-up panel. Then set the table saw blade to 45° and cut one base side that's 1/8" longer than the required length from each end of the board. Taking a cut from both ends keeps the grain running continuously around the entire base. Make the two cuts with a squared end against the fence.

Slide the fence toward the blade to the finished cut length and trim both panels. The second cutting provides a clean, accurate edge.

The middle panel needs to have the miters reversed in order to fit to the side pieces. Use a sliding table or panel-cutting jig at the saw for one end. Next, place that newly beveled cut against the fence (set to the appropriate dimension) and make a second cut to provide a perfect match to the beveled side panels. If you have a right-tilt saw the operation is different.

Next, install a dado stack at the table saw and dial in a width of 3/4" set to cut 3/8" deep. Position the fence to cut a groove 2 1/2" up from the bottom edge of the panels. All three pieces receive the groove for the bottom.

Plumb is peachy. *The levelers hold the clock plumb when it sits on a non-level floor. Adjusting the levelers through the bottom requires drilling access holes in the bottom of the base.*

Make a level connection. *Attaching the waist properly to the base is important to the standing of the clock. If the waist isn't square to the base the clock will lean back or pitch forward. Bring the waist level before adding the screws.*

To complete the work on the base panels you need to cut a rabbet on the end of the sides for the clock's backboard. It's the same operation as the rabbet for the waist.

I returned to the Domino to see how it works with miters. I was surprised. Placing the fixing holes in the base front panel and the long holes in the side panel, allowed me to align the top edge easily. No spline to worry about. Add glue and the assembly is a snap.

Mill and fit the bottom into the groove. Make sure that you're able to remove the bottom because locating the holes for the adjustable levelers is next. Position the leveler against the base and bottom, mark the location then drill the 1/2" holes at the drill press. Slide the bottom into the groove then drive nails through the bottom and into the base sides to affix the bottom into the base.

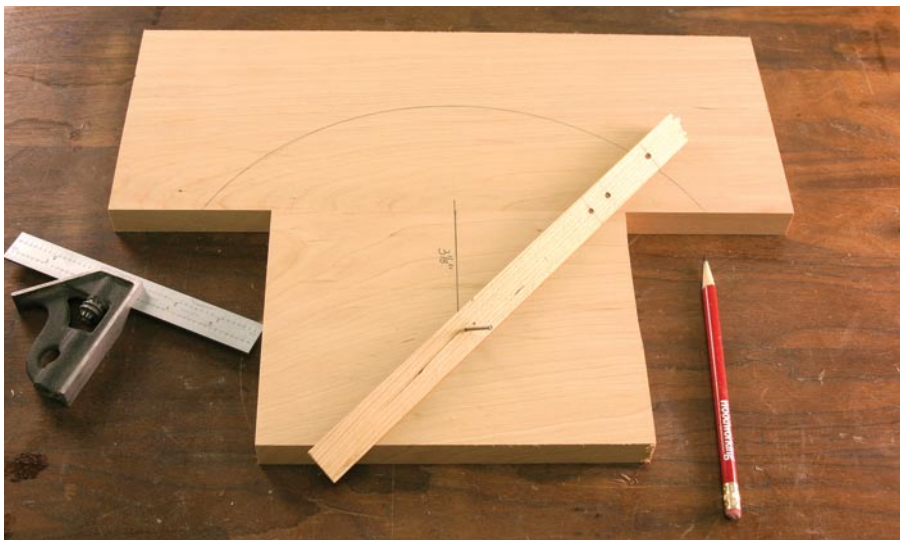
Slip-fit the Waist and Base

Next, cut the fillers that fit around the inside top edge of the base. Because the grain direction matches all around the base, the fillers are glued in place and held with brads. These parts fill the area between the base and waist and add the support needed to firmly attach the two clock sections.

Position the base front down on the bench and slide the bottom of the waist assembly into the top of the base. Prop up the top of the waist to the same amount raised by the base and spacers. This aligns the notched area of the waist with the top edge of the base and squares the

Sculpt the mouldings. *Incremental steps in blade height are used when cutting the cove. Then cut the 45° bevels on the long edges.*

Fitted blocks support the hood. *Scrap pieces cut with a 45° bevel, when glued in place, add support for the cove moulding and carry some of the load from the hood.*



A shop-made compass jig. *Drawing the arches for the clock is simple with this jig. The piece held at the center of the rail allows you to adjust the arch with each use.*

Fine-tune the gallery. *Taking the time to check the fit of the gallery assures a proper fit. After the gallery is assembled the spacers can be manipulated to specific thickness.*

waist to the base. Install three screws along the interior front of the waist into the front spacer. Set two screws through the waist sides into the spacers. These screws are set in oversized holes to allow for wood movement and to deal with the cross-grain issues.

Cut and fit the back brace at the top of the waist setting the 2" face toward the back of the clock. The brace is used to hold the waist square, to add support and to attach the backboard with screws. Remember to hold the piece flush with the rabbet.

The cove moulding that eases the transition from the base to the waist, and from the waist to the hood, is next. Mill your lumber to size and set up the table saw to create the cove. Clamp an auxiliary fence to the saw on a 27° angle to the blade and 3/16" from the front edge of the blade when the blade is raised to 1/2" above the tabletop. Cut the moulding in several passes. (For more information on cutting cove moulding at the table saw see issue #117, October 2000.)

Sand the case to #180 grit and ease the sharp edges of the base prior to installing the moulding. Fit the cove to the sides and front. Use brads to attach the cove moulding.

The same cove moulding profile is used for the transition from the waist to the hood, but this moulding is nailed to the waist only. Flip the clock onto the bench to stand the piece on its top. Now you can fit and attach the moulding using the waist and benchtop for positioning. Don't forget to sand the edges and add glue at the corners. Brads hold this moulding, but to add strength install a few angle blocks as shown above.

Top it Off With the Hood

Building the hood begins with the collars. Mill the pieces for the front and side collars to size and miter the ends. Before joining the pieces with a spline or other method, make a 1/4"- wide x 1/4"- deep groove in each side collar, set 3/4" in from the inside edge. The groove receives a matching tenon formed on the hood sides. Two passes at the table saw complete the groove. Assemble the U-shaped unit then route a 1/2" roundover profile along the bottom edge.

Mill the material for the hood sides. At the table saw cut a rabbet for the backboards along the back edge then cut a second rabbet leaving a 1/4" x 1/4" tongue on the bottom inside end of each hood side. Remove 1" of the tongue from the front edge of the sides.

To arrive at exact measurements for the

hood rail and arch rail, set the hood sides into the grooves in the collar and measure between the two sides. Cut the two rails to size. Each rail is joined to the hood sides using a Domino – of course you can use other joining methods. The hood sides are not attached to the collar at this time. That step is completed after the finishing.

Lay out and cut the arch on the rail before any assembly of the hood. Find the center of the rail, move below the rail 3 1/8" and draw the 6 3/8" radius as shown on page 36. Save that offcut; you'll put it to use in short time. Sand the edge at the spindle sander. Create the joinery for the rails and hood sides and assemble the four pieces.

Next, mill the side spacers and gallery parts. Make the 45° cuts on one end of the side gallery pieces and both ends of the front gallery, fitting them to the hood and spacers. Assemble the gallery parts with either a spline or Domino.

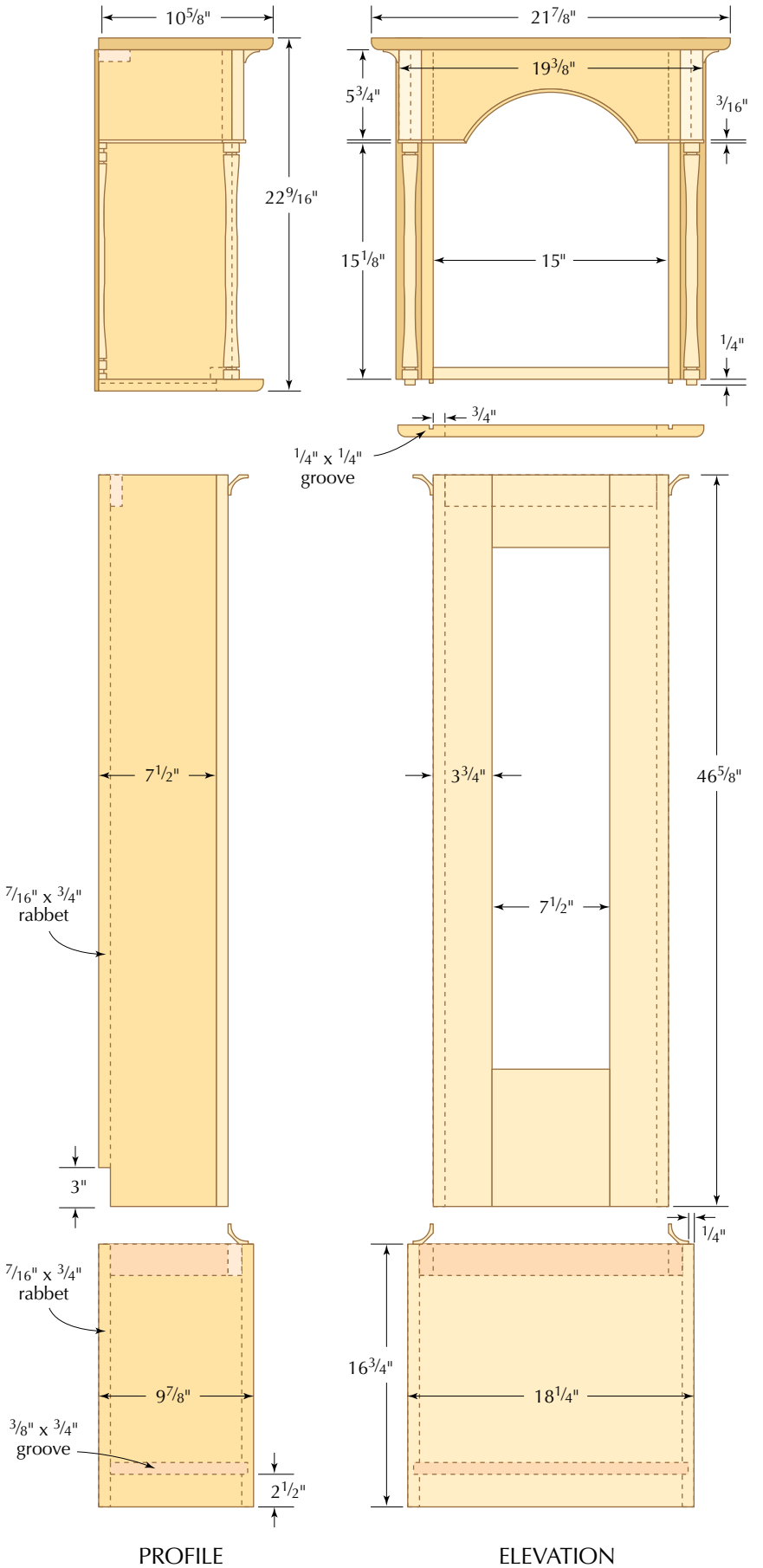
Slide the assembled gallery over the hood and check the fit of the side spacers. If everything fits, add glue to the spacers and attach them to the gallery. Use brads to hold the spacers in place.

Slide the assembly over the hood again. This time we have cross-grain construction; the grain of the gallery/spacers is horizontal while that of the hood sides is vertical. Attach the hood and gallery from inside the hood through oversized holes – two screws toward the front and two screws near the back of the hood sides. The larger holes compensate for any future wood movement.

The arch and the bottom edge of the gallery have a 3/16" bead detail. The arch bead is the difficult piece. You can soak or steam a piece to get it to fit to the arch, but I elected to laminate two pieces, each 3/32" thick (the thinner stock bends easily). The arched bead pieces are cut wider than the balance of the bead. If the pieces slide during the process you'll still have usable stock.

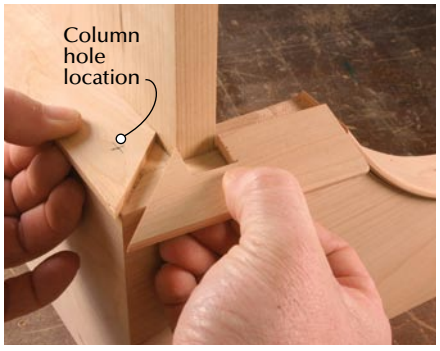
To make the laminations, add glue to the two mating surfaces then wrap with a couple pieces of tape to keep things from moving as you clamp. Set the pieces on the arch, add the cutoff to the stack and clamp tight. Allow the glue to dry completely. There will be a small amount of spring-back when the clamps are removed. Don't worry. The bend returns and is held tight with glue and brads.

Joint one edge then cut the laminated bead to width. The band saw is the right machine. Set the fence to 1 1/2" and trim with the jointed edge to the fence. Use sandpaper to form the

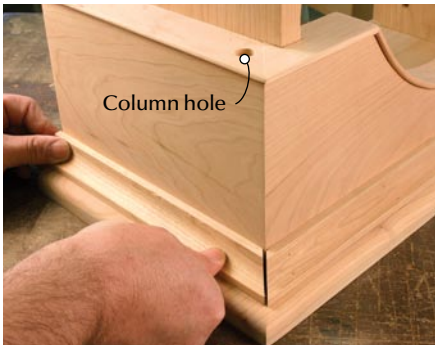


Two strips make one bead. *The offcut from the gallery front is an excellent caul for clamping the laminated bead into the profile. Small spring clamps close any gaps between the pieces.*

Handwork finishes the bent bead. *Trim the bead to width at the band saw, but the majority of the work of matching to the flat bead is completed with chisels. Carefully angle the ends of the bead to fit those of the matching corner pieces.*



Finesse is required to fit the flat bead. *Locate and trim the notch with a handsaw then cut 45° miters at the end. The holes for the columns are centered in the flat bead and held flush with the front edge of the hood side.*



Small cove finishes the hood mouldings. *This moulding is created at the router table with a 1/2" cove bit. The bit is slightly raised with each pass, creating the irregular profile.*

bead detail on the outside edge. Trim the bead to get close to a fit then add glue to the bead and the arched area. Position the bead in the hood, keeping the interior edge flush. Then add clamps and allow the glue to set. Cut and fit the balance of the pieces that finish the bead, remembering to locate and drill the hole for the tenon on the columns.

That same hole is mirrored in the collar of the hood as well. Locate and drill the two holes at this time.

The work on the hood is complete with the addition of the top, the hood/back brace and the mouldings. The top is cut to size, routed on three edges with a 1/2" roundover bit and attached to the hood with screws through the top into the hood sides. The hood/back brace fits between the sides and is attached with glue and nails to the underside of the top. Finally, the mouldings are wrapped around the hood and attached with brads.

Next, turn the columns and fit to the hood. For online features including patterns and videos , go to popularwoodworking.com/aug07.

Framing the Dial

The dial frame fits inside the hood flush with the back face of the arched rail; it rests on the hood rail. The frame is attached to the hood with 1/2"-square x 2"-long glue blocks that are visible only from inside the hood. The frame is joined with half-lap joints.

Start with 1/2" material sized from the cut sheet then create the half-lap joints. Most of the joints are rabbets cut in two steps. The exception is for the dial frame arch rail. Because of its width you need to nibble the waste material from the stiles.

Cut the rails first. Set the blade height to 1/4" and the fence to cut for the width of the stiles. Select the best face of the rails and position that face down so when the frame is viewed from the front, the stiles run from top to bottom and the rails appear to run between the stiles. Make the first of two cuts at each end using the miter gauge while holding the stock against the fence.

Next, the stile cuts require two fence positions – one for the lower rail and the second for the wide arch rail. Set the fence for the width of the lower rail and make one cut at the bottom end of each stile keeping the stiles face up. Change the fence to the width of the arch rail and make another cut at the top end of each stile. Nibble away the material for the wide arch rail with repeated passes over the blade. Don't exert pressure on the piece (which would bend it into the blade). Remove any saw marks with a chisel or scraper.

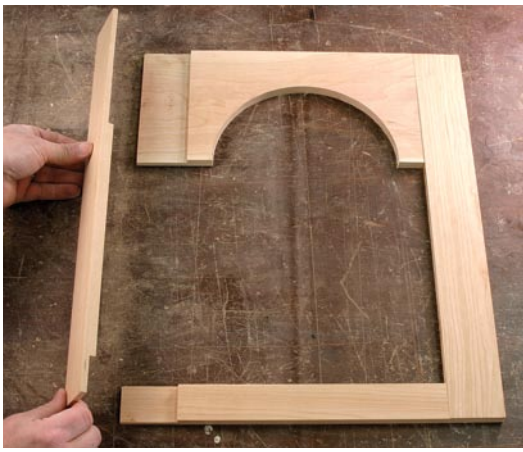
The remaining cuts, those that complete the half laps in the rail and stiles, are made with the stock held vertical with a tenon jig (See "Table Saw Tenon Jig" on page 24.)

Draw the 4 1/4" radius on the arch rail, cut it at the band saw and sand the edge. Add glue to the joints. Spring clamps hold the joints tight, but also add a clamp across the frame to pull the stile edges tight to the rails and one to pull the rails tight to the stiles. Set aside to dry.

How About the Door?

The Domino makes this door easy. Mill the rails and stiles to size. The compass jig used to form the arch for the hood spacer is used again for the arch of the door. This time move below the stock 1" instead of 3 1/8" as before.

The lower door rail is flush with the bottom edge of the stiles and the arch door rail extends above the stile by 4 1/8". Position the pieces then draw the 4 1/8" inside radius and 6 3/8" outside radius arches on the stock. Also mark 1" in from the ends of the stiles for the location of the Dominos and cut the mortises. Cut the inside arch at the band saw, smooth any cut lines then assemble the door.



Half-lap the dial frame. *The joints for the frame are half-lap and are rabbet cuts created in two steps. Check the setting by placing two cut pieces together. The faces are flush if the depth of cut is correct. Make any adjustments then finish the remaining cuts.*

Fit the hood door. *Once the outer arch is cut, the door is fit to the hood. Fit the door in position then fine-tune the fit to create an even reveal around the door.*

Prep the door for glass. *The inside corners are left rounded by the rabbeting bit and need to be squared with chisels. Cut the end grain using the force provided from a mallet while cutting the side grain with only hand pressure. Too much force can crack the face of the door.*

Next, cut the outside arch of the door frame. At the band saw you'll find a small problem getting started with the cut. There is no direct access to the cut line, so nibble in a few times before turning the blade to cut the arch. Hand-work cleans the cut.

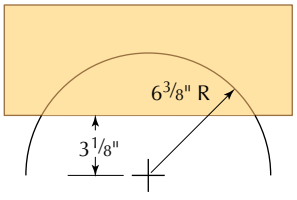
Fitting the door to the hood requires some finesse. Once the door is in position make small adjustments to the frame until you achieve a consistent reveal around the door; I prefer a nickel gap.

The last construction necessary on the door is to cut a rabbet for the glass – that's a job for the router table and a 3/8" rabbeting bit. Pay attention when cutting the arched rail. This is an area to climb cut to reduce tear-out. Once the rabbets are formed, square the corners with a chisel.

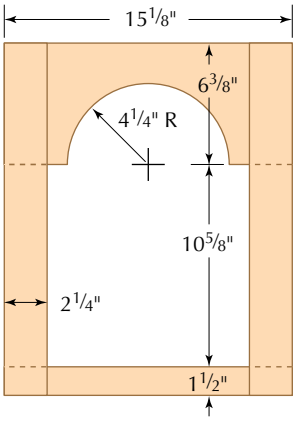
The interior sharp corners of the arch rail are eased for fitting the door glass. The glass is secured with Durham's Rock Hard Water Putty (waterputty.com) after the finishing is complete. Use a chisel to trim the corners.

The door for the waist is milled to size, has the edge routed with a 1/4" roundover bit then the top, bottom and non-hinged edges have a 3/8" x 1/2" rabbet. The hinge side of the door receives a 1/8" x 1/2"rabbet.

Finally, install the hardware on both doors. The hood-hinge installation is straightforward: put the longer leaf of the hinge in the door frame. To install the hinges in the waist door you have to remove some of the 1/8" lip. Mark the hinge area, remove the lip then use your chisels to set the hinge leaf flush to the door edge. The longer leaf extends into the case and is set flush with the waist stile edge. Both doors are held closed with rare-earth magnets.



GALLERY ARCH DETAILS



DIAL FRAME

Ease the fit of the glass. *Leaving this sharp corner square makes fitting the glass nearly impossible. Breakage is imminent. Rounding the area to the radius of a quarter keeps you from working with more than one piece of glass.*

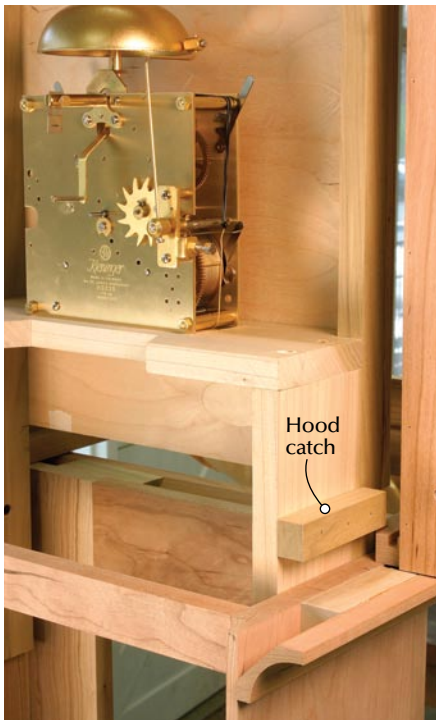
Holding the Movement

We're using a Kienninger bell strike mechanical movement from Merritt's Antiques. The mechanical movement requires a seat board and a few other necessities. The seat board raises the movement into position and allows the dial backer to be attached. The paper dial is from Clockprints.

To create the seat board, use the pattern available online at popularwoodworking.com/aug07 then cut the two 3/4" x 1" notches for the dial supports. To build the seat board assembly (the U-shaped member that slides between and attaches to the waist sides) connect the two seat board sides to the seat board. Hold the back edges flush to the seat board with a butt joint – two screws per side do the job. Then, attach the two dial supports to the assembly holding the bottom edges flush. Install two screws in each support. Once it's inside the case, slide the assembly to the correct position (based on your movement) and drive two screws per side through the seat board sides into the waist sides. The dial backer is held to the supports with four screws, one in each corner.

Hood catches keep the hood from tipping when removing or installing it onto the clock. Attach the hood catches to the sides of the seat board assembly holding them just above the collar. Secure with brads.

If you elect to use a quartz movement, attach



Positioning the movement. *The seat board holds the movement in the correct orientation to the dial allows the weights to hang as needed. The cutout in the seat board is for the pendulum and the blocks attached to the sides keep the hood from tipping forward.*

the dial backer and paper dial directly to the back face of the dial frame.

The backboard for the clock runs vertical to the case. Mill a panel to the width of the waist and as long as the clock base, waist and hood. Figure the wing pieces, those that bump out and fill the additional width at the base as well as for the hood. Glue the pieces to the backboard. Once the clock is finished the back is attached to the braces and into the rabbeted sides with screws or nails.

Given the time, I'd finish the clock as Casey did – a few coats of oil and let nature take its course. But, to hasten the aged appearance, I used my favorite finish – aniline dye, glaze and shellac. The Dark Antique Sheraton dye is the basis on which to build the finish. To resemble the look of an antique clock, I've glazed the piece after the first layer of shellac, locked that layer with another two coats of shellac then added a topcoat of dull-rubbed effect lacquer. (For more on my finishing method see issue #161, April 2007).

Install the movement (download directions at popularwoodworking.com/aug07) and reinstall the hardware. Then you're ready to move the piece into the house for keeping time through the 21st century and beyond. **PW**

Authentic Shaker Clock

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
Waist							
❑	2	Stiles	3/4	3 3/4	46 5/8	Cherry	
❑	1	Top rail	3/4	4 5/8	7 1/2	Cherry	
❑	1	Lower rail	3/4	8 3/4	7 1/2	Cherry	
❑	2	Sides	3/4	7 1/2	46 5/8	Cherry	
❑	1	Door	3/4	7 3/4	33 7/8	Cherry	
❑	1	Back brace	3/4	2	13 1/2	Poplar	
Base							
❑	2	Sides	3/4	16 3/4	9 7/8	Cherry	45° angle one end
❑	1	Front	3/4	16 3/4	18 1/4	Cherry	45° angle both ends
❑	2	Side fillers	7/8	2	7 1/2	Poplar	
❑	1	Front filler	7/8	2	16 3/4	Poplar	
❑	1	Bottom	3/4	8 3/4	17 1/2	Poplar	
❑	4	Cove mouldings	3/4	2 1/2	22	Cherry	Two complete sets
Hood							
❑	1	Front collar	3/4	3	19 1/2	Cherry	45° angle both ends
❑	2	Side collars	3/4	3	10 1/2	Cherry	45° angle one end
❑	2	Sides	3/4	8 1/2	21 1/4	Cherry	
❑	1	Arch rail	5/8	5 3/4	15	Cherry	
❑	1	Hood rail	3/4	1 3/8	15	Cherry	
❑	2	Side spacers	5/8	5 3/4	8 1/2	Cherry	
❑	1	Front gallery	3/4	5 3/4	19 3/8	Cherry	45° angle both ends
❑	2	Side gallery	3/4	5 3/4	9 3/8	Cherry	45° angle one end
❑	2	Arched bead	3/32	2	16	Cherry	Trim to 1 1/2
❑	2	Flat bead	3/16	1 1/2	16	Cherry	
❑	1	Brace	3/4	2	15	Poplar	
❑	1	Top	3/4	10 5/8	21 7/8	Cherry	
❑	2	Wings	1/4	1 5/8	21 3/4	Cherry	
❑	2	Moulding	13/16	1	23	Cherry	Under hood top
❑	2	Half columns	5/8	1 1/4	17	Cherry	Turn to 15 9/16
❑	2	Columns	1	1	17	Cherry	Turn to 15 9/16
Dial frame							
❑	2	Stiles	1/2	2 1/4	18 1/2	Cherry	
❑	1	Rail	1/2	1 1/2	15 1/8	Cherry	
❑	1	Arch rail	1/2	6 3/8	15 1/8	Cherry	
Door							
❑	2	Stiles	3/4	2 7/8	15 1/8	Cherry	
❑	1	Rail	3/4	2 1/4	10 3/4	Cherry	
❑	1	Arch rail	3/4	5 1/2	10 3/4	Cherry	
Movement support							
❑	1	Seat board	3/4	4 1/2	13 3/8	Poplar	
❑	2	Seat board sides	3/4	3 1/2	10	Poplar	
❑	1	Dial backer	1/2	13 3/8	17	Plywood	
❑	2	Dial supports	3/4	1	20	Poplar	
Back							
❑	1	Backboard	5/8	14 3/8	80	Poplar	
❑	1	Base wings	5/8	1 5/8	14 1/2	Poplar	Makes two pieces
❑	1	Hood wings	5/8	3	21	Poplar	Makes two pieces

Bob has been studying, making and selling Shaker furniture in the Northeast for more than 15 years. He occasionally demonstrates at Shaker museums. Contact him at woodnutbob@hotmail.com. Glen is a senior editor of Popular Woodworking, *a published author, the host of the Woodworker's Edge DVD series and teaches woodworking classes and seminars. Contact him at 513-531-2690 x1293 or glen.huey@fwpubs.com.*

WOODWORKING ESSENTIALS

BY SCOTT GIBSON

CHAPTER 7

Setting Up Shop: Dust Collection

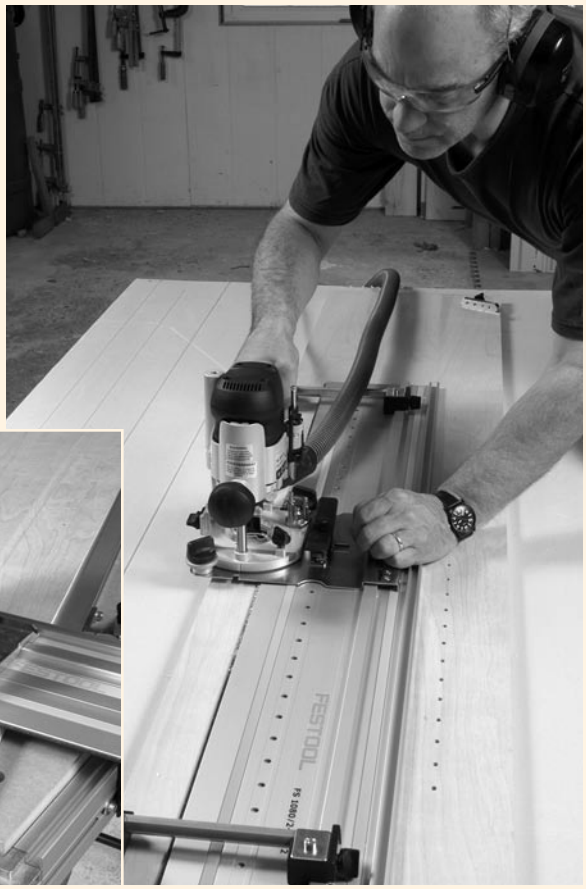
It's tempting to think of sawdust as little more than a nuisance, a housekeeping problem like mud tracked across a clean kitchen floor. Sawdust is more ominous than that. It does seem to get in every nook and cranny in the shop, clogging machines, filling pockets and eventually finding its way into the house. But sawdust poses real health risks to anyone who regularly spends time in a woodshop.

Exposure to sawdust can cause a variety of health problems, including dermatitis (inflammation of the skin), respiratory problems and a type of nasal cancer called adenocarcinoma. With that in mind, controlling dust is one of those necessary if unglamorous basics of setting up a shop. It's better not to ignore it.

It's hard to eliminate sawdust completely. Unless you do nothing more than whittle spoons with a jackknife, sawdust is an inevitable part of virtually every part of woodworking. Most power tools produce plenty of the stuff but it is the very small particles, those up to about 1 micron in size, rather than big chips that do the most damage. Effects vary by species, with a number of domestic and exotic hardwoods causing the most potential problems.

There are a variety of ways of controlling dust. Strategies can be broken into three broad categories: controlling dust where it's produced, clearing the dust that escapes into the shop air, and, finally, protecting yourself with a good dust mask or respirator.

Norm Abram's workshop includes a central dust-collection system that keeps the shop both cleaner and a lot safer. No matter what the equipment, dust collection is important in any sized shop.



Festool's approach makes dust collection an integral part of tool design. Its full line of portable power tools can be connected to a shop vacuum. Even the circular saw has a built-in dust-collection port.

It's unrealistic to think that dust collection can be covered in a single magazine article. We can look at the basics, but it's a topic worth studying in some detail as you're setting up your shop or when you decide to upgrade dust-collection equipment you already have. Look for books on the topic, such as Sandor Nagyszalanczy's "Woodshop Dust Control" (Taunton Press) or visit the U.S. Department of Labor's web site (osha.gov/SLTC/etools/woodworking/wood_dust.html).

It will be worth your time.

Big Machines Mean Lots of Dust and Chips

Almost all woodworking equipment jettisons chips and dust, some of them a surprisingly large amount. The faster a machine is designed to hog through wood, the more dust and chips it will throw into the air unless you're ready to intervene. Really prolific producers such as shapers, thickness planers and jointers tend to produce big, fluffy chips (assuming the knives are sharp) while sanders produce very fine dust. Dust-collection equipment effective for dust may not be as effective with large chips.

The first line of defense is to capture sawdust where it is produced – right at the machine. That's much more effective than trying to clean a shop's worth of air. (That said, room-sized air cleaners can be helpful in collecting what does get away. We'll cover those later.)

As much as that seems like common sense, many tools are remarkably ineffective in helping you capture the dust they generate. While many random-orbit and orbital block sanders come equipped with dust filters or bags, for example, some sanders have no dust-gathering capabilities at all, nor is there an obvious way of making one. To take another example, contractor-style tablesaws (the ones with open-frame bases) are notoriously difficult to fit with effective dust collection. There are simply too many ways for the dust to escape.

Conversely, some European tools seem far ahead of their American counterparts on this score. Over-the-blade dust collection on table saws, which is very effective, is readily available on some European saws but is not standard on saws produced here or those made in the Far East and sold here.

Festool makes a line of portable power tools that are designed to work with the company's shop vacuums. Routers, circular saws sanders and even jigsaws all are equipped with dust-collection hoods or adapters that make it easy to connect the tool to the vacuum. Best of all, the systems actually work.

So one rule of thumb is to think about dust collection when you buy a tool. It may not be the only deciding factor, but it's worth throwing in the mix. To go back to table saws, a cabinet saw with an enclosed base and an integral dust-collection port is inherently more effective than a contractor's saw. Not perfect, but a lot better. It's one of the safety features you get by spending a little more money.

In the end, tools that have been designed with this feature in mind tend to do a much better job than those with something that's been cobbled together after the fact.

Shop Vacuums Are Better Than Bags or On-board Filters

Shop vacuums do an admirable job of gathering dust from tools that create a low volume of dust, such as sand-

This Fein Turbo III Dust Extractor is typical of a well-designed shop vacuum that can be used for low-volume dust collection. Set to an automatic mode, the vacuum will turn on at the same time as the tool plugged into it.

A router with a dust-collection port will keep shop air much cleaner. And without all those chips flying around, it's a lot easier to see what you're doing.

This shop-made blast gate for a shop vacuum allows two tools to be connected at the same time. A simple toggle switch opens one inlet port at a time.

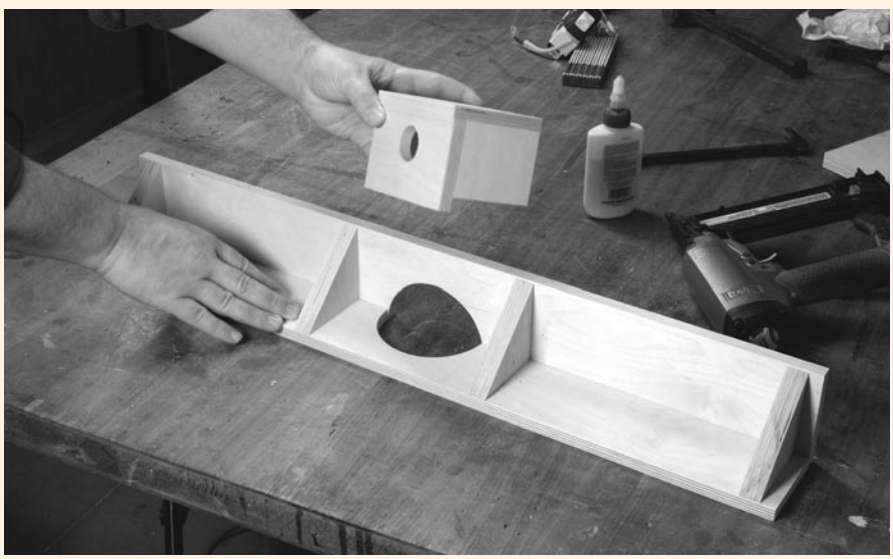
ers, routers and circular saws. They are probably not going to be enough for a table saw and other stationary machines that produce higher volumes of chips and dust. Some tools come with dust-collection adapters, making it easy to take advantage of a shop vacuum for dust collection. But this is not universally true and for some tools you may have to fashion your own or look for alternate dust control options.

I discovered how effective a shop vacuum can be a couple years ago after I inadvertently stepped on the rigid dust filter that came with my random-orbit sander. I was too cheap to buy a new filter so I connected my vacuum to the sander. If the dust filter was moderately effective, the vacuum was a revelation. It sucked up every speck of dust. Shop air stayed perfectly clean. And it takes a long time to fill up a shop vacuum bag with dust from a random-orbit sander.

The arrangement worked so well that I chucked the dust bag that never worked on my biscuit joiner and switched to the shop vacuum. It's somewhat awkward to be tethered to a vacuum, but the arrangement works beautifully from the standpoint of dust.

Good shop vacuums aren't cheap, but they are more efficient and quieter than bargain-basement machines. Look for one with a feature allowing you to plug the tool directly into the vacuum. The vacuum turns on automatically with the tool and shuts off a few seconds after you release the trigger on the tool. This feature is very useful when the vacuum will do double duty as dust collector as well as shop cleaner.

The other area of concern is the filter. It doesn't do any good to pay for a good-quality vacuum and allow it to spew dust back into the air because the filter's mesh size is too big to trap small particles. Filters can be made from either fabric or paper, or come as a



Dust collection can be designed right into jigs and fixtures. This router fence includes a tightly fitted dust-collection hood for efficient pickup.

pleated element. Just look for one that traps particles down to about 1 micron. You may have to buy an aftermarket filter, but it will be worth the cost.

Hose and duct diameter is one critical factor in the efficiency of a dust-collection system. Large diameter duct moves more air at a lower static pressure.

A Portable Dust Collector Can Roll to Wherever it's Needed

When it comes to machines that produce a high volume of sawdust and chips, a shop vacuum will quickly be overpowered. They are not powerful enough or large enough for these tools – you'll have to turn to a dedicated dust collector. A portable, single-stage dust collector may be the right answer for a small shop. These machines, made by a number of manufacturers and widely available, cost about $250 to $350. That's about the same price as a top-quality shop vacuum.

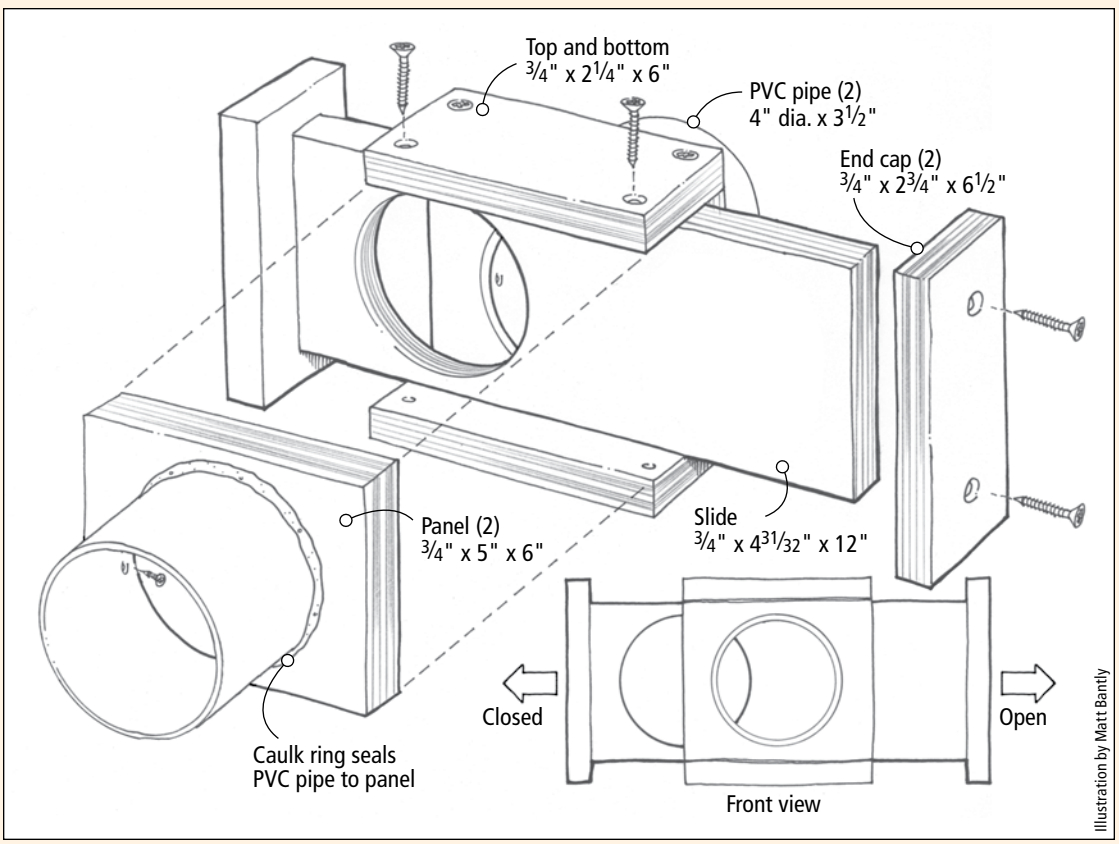
Single-stage collectors draw debris through an impeller and send it into a collector. Typically, the collector consists of a pair of fabric bags, one above and one below a central collar. The idea is that big chips will accumulate in the bottom bag and the upper bag will trap finer dust.

In contrast, a more expensive two-stage dust collector separates chips and dust before debris encounters the fan's impeller. One way of making one-stage collectors more convenient (and behave more like a two-stage machine) is to add a separator in the duct between the tool and the dust collector.

These devices are pretty simple: they consist of a plastic lid that fits over a metal garbage can. The lid has two ports – one for the incoming duct from the tool and the other to carry what's left to the collector. They are designed to separate larger chips from finer dust and reduce the load on the impeller in the collector. They're available through mail order suppliers.

Single-stage collectors typically run on 120-volt (v) current and have 1½

Blast gates control air flow from a chip-producing machine to the dust collector. They are readily available from woodworking supply dealers, or they can be made with a minimum of material.



horsepower (hp) motors. They can be wheeled around the shop and connected to whatever machine is running, or connected to a series of closely grouped machines that are equipped with blast gates to control the flow of air. This class of dust collector is really suited to a single machine running at a time, not a shop's worth of tools all generating chips and dust simultaneously.

There are two important benchmarks for dust collectors. One is the volume of air the machine can draw, measured in cubic feet per minute (cfm); the other is how quickly the air moves, which is described in feet per minute (fpm). According to books and magazine articles on the subject, to keep up with a 12" thickness planer (a big chip producer) the dust collector should move at least 600 cfm of air at between 3,500 and 4,000 fpm. A larger planer will require a minimum of about 800 cfm. Some of these machines are capable of that.

Another important factor in dust-collector efficiency is the size of the ducts. Portable, single-stage machines generally have inlet sizes of 4" to 6". Larger-diameter hoses are more efficient because they move a greater volume of air at a lower static pressure (resistance) than small diameter hoses. Performance goes downhill as the number of sharp bends and overall length of the run goes up. Shorter and straighter runs of duct will make for a happier dust collector so get the collector as close as you can to the machine it's servicing.

Finally, there's the filter itself. As is the case with shop vacuums, unless the filter can capture particles down to about 1 micron in size, a lot of harmful dust will simply be returned to the shop air and, inevitably, delivered to your lungs. Some machines come equipped with a 1-micron bag and some do not, but it is definitely a factor in choosing a machine. If the collector comes with, say, a 30-micron bag you should replace it with a felted fabric bag or a more effective cartridge-type filter. That will add $100 or more to the cost of the collector.

This gigantic dust collector services a big woodworking shop at Cerritos College in California. Small shops can use the same type of equipment – only a lot smaller in size.

Larger Systems Cover An Entire Shop

For larger shops, or woodworkers with larger budgets, a central dust collector that handles all tools in the shop through a system of fixed ducts is a big step up in terms of convenience if not efficiency. This is the kind of system you'll find in a production shop, but they also can be sized to meet the needs of a smaller woodshop.

In a central system, a two-stage collector pulls chips and dust through a duct system to a collector where fine dust and larger chips are separated. Chips go into a barrel or similar collector and dust is filtered through one or more cloth bags or a cartridge-type filter. In these respects, a central system is doing just what a portable collector does. But the more powerful motors can pull chips and dust over greater distances while the more efficient collectors (particularly the cyclone collectors) are better at separating debris. And you don't have to move the collector from machine to machine.

A good cyclone collector for a small shop – something like the 2hp model from Oneida Air Systems or Grizzly – is several times the cost of a portable collector. But it has some real advantages, including a large cartridge filter, magnetic controls that can be operated remotely and a blower that can move air at a rate of more than 1,300 cfm.

Duct layout is an important – and complicated – part of designing a system. Everything from the type of duct (smooth metal vs. flexible plastic) to the size of branch and main lines have an effect on the efficiency of the system. Some companies that sell this equipment will also lay out the ductwork – a helpful bonus when spending more money. If not, you'll have some homework to do in designing your own duct system.

However the ductwork is installed, it's important to ground it properly to reduce buildup of static electricity, which can decrease efficiency. Smooth metal pipes offer less resistance to air flow than flexible plastic, and they're easier to ground – good reasons why they're considered a better option.

This cyclone collector from Oneida Air Systems efficiently separates chips from fine dust and has a motor powerful enough for most small shops.

George Jaeger put his dust collection system in a bump-out along one wall of his Kentucky workshop. Windows let in the light and a removable panel gives him access for cleaning.

Central collectors can be located either inside or outside the shop. Getting it outdoors saves floor space in the shop, reduces noise and is cleaner. But in a cold weather climate, such a design will also expel heated shop air. A system located inside doesn't have that problem, but it does make good filtration all the more important.

Air Cleaners, Down-draft Tables And Open Windows

Some tools are just plain hard to connect to a collector. A power miter saw is one of those. Most seem to come equipped with dust bags designed not to capture any of the sawdust these saws produce in such prodigious quantities. Cabinet saws usually have built-in ports for dust collection, but that doesn't pick up the chips and dust thrown from the blade over the top of the saw.

The end result is that even in a shop with a good central collector and a diligent woodworker who's never too busy to use it, some dust is going to escape.

Ambient air cleaners certainly can help. These ceiling-mounted boxes, made by several companies, have two types of filtration: a flat filter that gathers large dust particles as it enters the cleaner and an inner filter bag that picks up finer particles. Fans may have several speeds as well as a remote control so you can flip on the machine from across the shop and control fan speed to suit conditions. It's more or less like using a television remote.

They are quiet enough to be left on while you're in the shop, and some have timers that can be set to clean the air for up to several hours after you're done for the day.

One downside is that filters are not cheap. On the machine I have, for instance, ordinary hardware-store furnace filters don't quite fit the box so I have to mail order the manufacturer's own brand or use shears to cut standard filters down to size. Its inner bag is difficult to clean thoroughly and a replacement costs $40. Even so, these air cleaners are an excellent auxiliary collector and a shop will be cleaner for having one.

If you want some of the same benefits without spending the $250 or so that an air-filtration unit costs, make your own. A $20 box fan and some furnace filters will re-circulate shop air and remove some of the larger debris. Just keep in mind that very small dust particles with the most potential for causing health problems will not be trapped by a makeshift air cleaner. Even spending $250 doesn't guarantee that. Air filtration systems may remove particles only down to the 3-micron size but leave damaging smaller particles suspended in the air.

But prop that box fan near an open window and dust can be jettisoned from the shop completely. Obvious cautions apply (not a good solution when you live in a cozy neighborhood, for example, or next door to someone with a chronic respiratory problem). But out in the country where a bit of airborne dust will do no harm, this low-tech approach to dust control is very appealing. And cheap.

A down-draft table is an excellent way of controlling sanding dust if the sander doesn't have a collection port

for a shop vacuum or if you're sanding by hand. It's simply a working platform with holes drilled in it and connected via duct to your dust collection system. When the collector is turned on, it draws air (and dust) down through the top and carries it safely away.

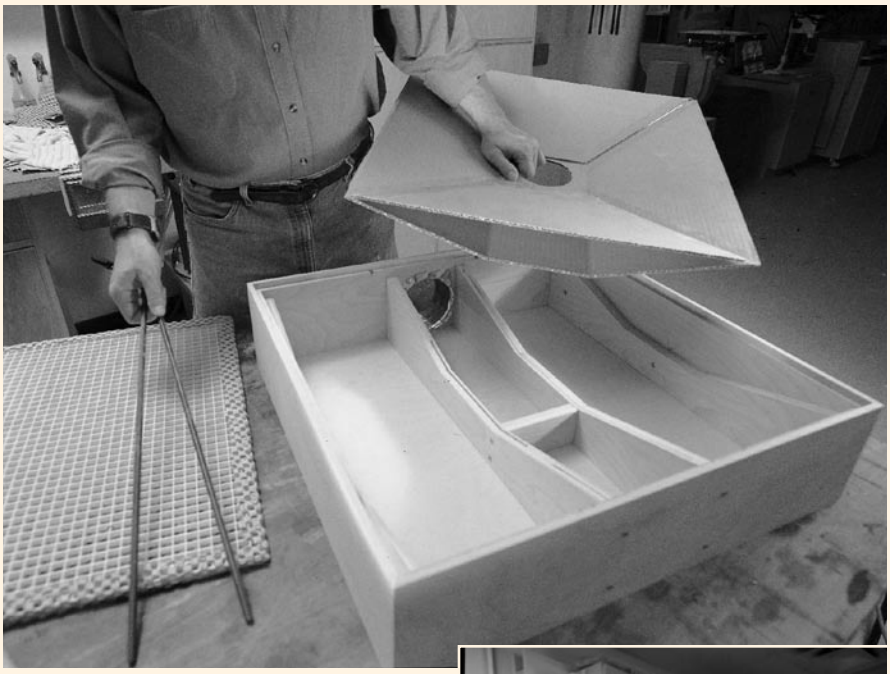
If nothing else seems to work, use your imagination. Temporarily clamping the end of the duct at your bench with a spring clamp, for example, can be an effective way of capturing dust as it is created.

Protect Yourself with a Good Dust Mask or Respirator

Is it only the belt-and-suspender crowd that would think of using personal respiratory protection in a shop already equipped with central dust collection and an overhead air cleaner? Not really. According to one article I've read, the American Conference of Industrial Hygienists says dust concentrations should be no higher than 5 milligrams per cubic meter – about the concentration you'd get if you dispersed a teaspoon of dust in a 560-square-foot shop.

That fact raises the question of why you wouldn't want to invest in a good dust mask or respirator.

This Trend Airshield provides a steady flow of filtered air from a battery-powered motor that runs four hours between charges. Turners find this type of respirator especially useful because it combines a full-face shield with respiratory protection.



A down-draft table is a great way of capturing airborne dust. Connected to a portable collector, this table will pick up dust the sander's integral dust collector is bound to miss.

At the low end are economical paper dust masks with a single elastic band that fit around the head. These are probably better suited to keeping out pollen or cat dander than the very small dust particles we should be more concerned with. Better versions have two elastic bands for a better fit, and some have small valves in the center of the mask that make it easier to exhale.

These masks offer good protection against airborne dust, providing they fit snugly. Look for a mask rated by the National Institute for Occupational Safety and Health (NIOSH)—a N95 mask will remove 95 percent of the particles in the air, but if you're working with potentially hazardous dusts you may want to bump that up to a N100 rating. Throw away the mask when it gets clogged, obviously dirty or contaminated with a substance other than dust. They're relatively inexpensive so don't make heirlooms out of them.

A cartridge-style respirator or a dust mask with a rubber gasket that fits against the face will probably provide a more secure fit than most disposable paper masks. These cost more, but the mask itself should last a long time and the filters for dust are not very expensive. Moreover, with different cartridges, a respirator also can be used for a variety of other jobs, like spraying finishes or working with solvents.

Some woodworkers prefer hooded respirators, which work on a different principle than masks. A hood or helmet and clear plastic mask cover the face and create a protected pocket of air that

is supplied by a small, battery operated pump and kept clean by means of a filter. The system creates positive air pressure right around the mouth and nose and keeps airborne dust at bay. This equipment is relatively expensive, and not everyone will like working in the confines of a hood or helmet. Yet many who have them swear by them.

Special Concerns: Indoor Heating Equipment

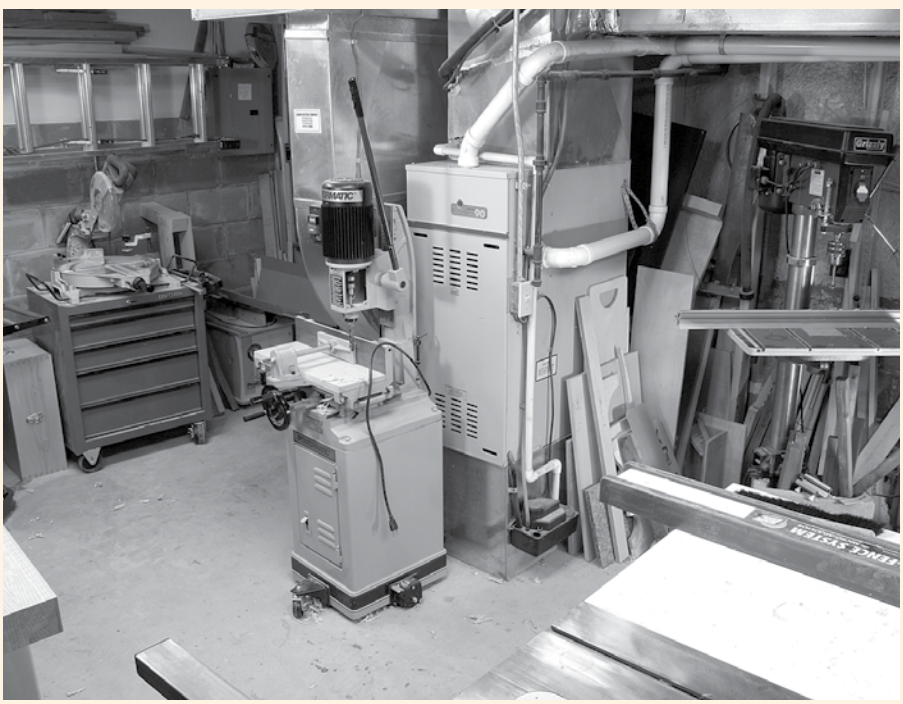
Dust can create special hazards in shops that share floor space with heating equipment. This is often the case in basement shops where a woodworker might be sanding a tabletop a few feet from an oil-burning furnace that is laboring to operate under less-than-ideal conditions.

By itself, a high concentration of dust can be a fire hazard. Dust also will interfere with the operation of heating equipment that draws combustion air from inside the shop. Dust can clog and ruin the burner, requiring you to call a technician on the coldest night of the year.

Direct-vent space heaters are vented to the outside via a double-walled pipe rather than a chimney. Vent pipes are formed by two concentric layers of steel, creating a pipe within a pipe. Combustion air is drawn through the outer perimeter of the pipe; exhaust gases go out through the middle. The clever design not only keeps the stack cool but it means that no shop air is used for combustion. These heaters typically run on natural gas, propane or kerosene.

If you have a conventional oil or gas furnace in the basement, call your service company and ask for the installation of a duct from the burner to the outside. That will accomplish the same thing. It won't cost that much and will save you a lot of trouble in the long run.

Electric heaters should be inspected regularly and cleaned when the heating elements show a buildup of dust. A blast of compressed air should take care of it. **PW**



Having a furnace in or near your shop can be a headache. The dust from the equipment can clog the burner. And fine sanding dust can be a hazard with some furnaces. So check with an HVAC professional.

What You Don't Know About European Saws

BY KELLY MEHLER

A well-mannered machine. *This Felder table saw and shaper has replaced my U.S.-made saws.*

Because of their unfamiliar features, unusual appearance and higher price tag, many Americans don't even consider buying a European saw. Here's why they should.

Unusual but effective. *Features of European saws rarely seen on U.S. models include riving knives, blade guards with dust collection and sliding tables.*

Perhaps when you think of table saws, the names that first come to mind are ones such as Delta, Jet, Grizzly and so on. Perhaps you're unfamiliar with brands such as Rojek, Felder, Mini Max, Laguna or others from Europe. Or maybe you're unaccustomed to the look of the European machines, the features or the price tags.

How are European table saws different than U.S.-style table saws? In this article we take a look at the real differences between these types of saws so that we can understand our choices. We will consider differences in the features that affect efficiency, effectiveness, user-friendliness, safety and cost. By understanding which table saw features are possible and which ones are desirable to woodworkers, we may encourage table saw manufacturers to make changes that benefit the end users – you and me.

General Differences: Electrical Safety Specs and Table Saw Power

There are many power-tool accidents that happen when the cutter runs longer than necessary. There are a couple of regulations for table saw electrics required in Europe that we don't have pertaining to table saw safety. On European saws the blade is required to stop in less than 10 seconds from the time the stop switch is engaged. The saws accomplish this by either an electronic or a mechanical stop to the motor.

The power and stop switches are required to be positioned at the front top-left corner of the cabinet. On larger panel saws they can also be on the top-left side or above the saw. We have no such requirements and until recently many saws had the switches on the right front. We typically work at the left side of the saw so it makes sense to have the controls in easy reach. I always felt vulnerable when I used an older Unisaw and had to reach over the machine with my face in line with the blade at table height. Additionally, European table saws are required to have a separate power switch that cuts all power to the tool and can be locked with a key or a lock. The off button is fairly standardized as a largish round red button and once it is depressed it has to be intentionally released before engaging the start button. These requirements aren't inconvenient and they help protect the user.

In Europe 220 volts (v) is standard, as is more-efficient three-phase power. In the United States, 110v is the standard voltage for contractor and portable saws that are typically under 1½ horsepower (hp). The 220 voltage is the minimum for over 2 hp. A table saw user benefits from having the additional power for the larger motor that 220v offers and the added cutting power that such voltage allows, particularly when cutting hardwood stock.

Safety at the Blade

European table saws have a workable guarding system at the blade that is standard issue. U.S. table-saw regulations call for three devices for our safety at the blade. They are a blade cover, anti-kickback pawls and a splitter. U.S.-made table saws have chosen to implement these regulations into one device that is commonly known as "the guard." The guard comes on all U.S. table saws. As readers of this article may know, many woodworkers don't use this device. From my years of teaching about the table saw, anecdotal feedback has informed me that the overall average for woodworkers using the guard on U.S. table saws seems to be around 5 percent. The necessity to remove the guard for many cuts and then reinstall the device means that many people just don't bother. Even though the guard is not the most workable design for everyday woodworking, it does work for its intended safety purposes. (I believe that most woodworkers don't use the guard because they have been conditioned not to do so through seeing examples in many settings of professional woodworkers using an un-guarded table saw. But that is another discussion.)

Superior switches. *European switches are placed at the top left of the cabinet, a convenient place for the user. This switch has an extra "on" button for the saw's scoring blade.*

On guard. *A U.S.-style guard actually on the saw is a somewhat unusual sight. Here you can see the splitter and blade cover.*

G0460 SAW PHOTO COURTESY OF GRIZZLY INDUSTRIAL, INC.; REMAINDER OF PHOTOS BY AL PARRISH

The European table saw has a more workable blade-safety system. It consists simply of a riving knife and a blade cover. Let's clarify some misunderstandings about the purposes of splitters and riving knives. The first is that there seems to be a need for clarification on the actual job that these devices do. It is widely believed that the sole purpose of the splitter and riving knife is to keep the kerf open after the cut, therefore keeping the wood from closing on the blade. This purpose is even described as such in the regulations that govern the manufacturing of table saws. In reality, the main job of these pieces of metal behind the blade is to deny the workpiece access to the back of the blade. Without a roadblock the back teeth of the blade can – and often do – bite into the workpiece, pick it up, and throw it toward the user at speeds of up to 120 miles per hour. Many woodworkers have experienced kickback and the number of accidents from this one phenomenon is astronomical. The use of a riving knife or a splitter makes kickback a non-issue.

What is the difference between a riving knife and a splitter? A splitter is attached to the carriage assembly behind the blade. The carriage assembly on U.S. table saws does not rise and fall with the blade. Two problems arise with this arrangement. A splitter is designed to be very close to the back of the blade when the blade is raised to its full height. The distance between the back of the blade and the splitter increases as it is lowered. The usual working height for cutting 4/4 stock leaves about a 2" gap between the blade and the splitter. This unprotected gap isn't ideal, but it is still better than no splitter. The second issue is that a splitter stands above the top of the saw blade thereby forming a barrier when making non-through cuts. Therefore the splitter, along with the rest of the device, needs to be removed from the saw when performing non-through cuts.

In contrast to the splitter, a riving knife is attached to the arbor assembly so it moves along with the saw blade. This means that once the riving knife is adjusted close to the blade, it always stays in this same relationship. Typically, a European riving knife can be adjusted in its closeness to the back of the blade and also in relationship to the blade height. When the riving knife is adjusted the least amount below the top of the blade, it is not an impediment for non-through cutting.

The first industrial table saws made in the U.S. had riving knives. American table saws are just beginning to come back to using a riving knife. A Standards Technical Panel at Underwriters Laboratory, one I have been a member of for a number of years, recently passed a proposal for new safety regulations for the table saw. The new regulations specify that, starting in 2008, all newly designed table saws will incorporate a riving knife in the design of the saw. Additionally, after 2014, the regulations require a riving knife on all table saws of the designs currently being manufactured. In both cases the riving knife is required to be below the top of the blade.

Follow the action. *The riving knife behind the blade moves up and down with the blade. The knife prevents kickbacks and doesn't have to be removed for typical operations, such as cutting joints.*

A few U.S. front-runners now offer table saws with their versions of a riving knife. The SawStop, Powermatic PM2000, and a Grizzly 12" are the first. On these saws, one difference from European riving knives is that instead of having one adjustable knife, two riving knives are offered. One of the riving knives, when attached, is taller than the top of the blade and holds the blade cover. The other, shorter, riving knife is offered without a blade cover for non-through cuts. The regulations call for a knife that is lower than the top of the blade, and so Powermatic added a second riving knife to the PM2000 after realizing the need. Powermatic has made the blade cover come off easily from its taller knife, but I do not see that there is a need for this. All three of these new table saws offer a quick release for the riving knife that makes the changes effortless.

Blade Covers

The blade cover is a necessary part of safety at the blade. It is a barrier between our hands and the blade, whether or not the blade is running. On European table saws there are a couple requirements for the blade cover. The maximum outside width of the cover is 40mm ($1\frac{1}{2}$") when it is mounted to a riving knife. The narrower the blade cover the less intrusive it is on your work. The amount of space between the fence and the blade cover becomes especially precious when ripping narrow work.

You cannot make non-through cuts on the table saw when a blade cover is attached to the riving knife. European regulations therefore made it mandatory for the blade cover to be able to be removed or reattached in less then 10 seconds. Compared to current U.S.-made saws, the ease of removal is significant. On U.S. saws the blade cover is permanently attached to the three-in-one guarding assembly. There are no size requirements for the blade cover and consequently they vary widely. When a non-through cut is needed, the whole guard assembly is typically removed.

Quick-change artist. *By twisting a knob and pulling upward, you can remove the blade cover in just a few seconds. Most U.S. saws have no such feature.*

Anti-kickback Pawls

Anti-kickback pawls are placed on both sides of the splitter on U.S. saws as a purported safety feature. The addition of the pawls is an attempt to address wood ejection problems. However, the only time wood can be ejected straight back is when you are cutting narrow strips less than 2" and the strips are not pushed beyond the back of the blade. Otherwise the pawls do not serve their intended purpose and, in fact, are a reason some people remove the entire guard system since the anti-kickback pawls actually get in the way of making narrow cuts.

There are no anti-kickback pawls on European table saws. In eliminating the requirement for anti-kickback pawls, European design reflects that the minor benefit that may accrue from the addition of pawls is not a good trade-off for the awkwardness of their use.

The new regulations will still require anti-kickback pawls and the regulations will also require that the pawls be able to be removed or reattached in less then 20 seconds without the use of a tool.

Dust Control

There are currently no dust-control regulations for U.S. table saw, and they typically have minimal dust collection. We are now increasingly aware of the health hazards of dust to woodworkers. Classified as a carcinogen, wood dust is responsible for a significant increase in respiratory diseases and nasal cancers as compared to the general population.

U.S.-style cabinet saws, at best, have what I call chip containment and inefficient dust collection. On both cabinet saws and contractor's saws the majority of dust and chips are thrown below the table by the front teeth of the saw blade. There is no efficient way on either type of U.S. saw to direct the dust and chips to a dust collector. Some newer U.S. table saws and most portable table saws do have a better system for collecting sawdust. Like the European table saw, the portion of the blade below the table is shrouded and then ported to an external connection port. The throwing force of the blade directs the sawdust toward the port, which is not only efficient but requires less suction.

European table saws also have a dust port above the table on the blade cover. No U.S.-style saws offer dust collection on the blade guard. Some after-market table saw blade covers offer this option although it does little good unless you have good dust collection below the table first. For effective protection from dust particles, a table saw needs dust ports above and below the saw.

Table Saw Rip Fences

By now you may not be surprised that there are also regulations in Europe that pertain to the rip fence. The regulations say the rip fence must offer two positions and be adjustable in length. There is a high position (50-90mm) and a low position (5-15mm). If you have seen a Delta UniFence you have seen a European-style rip fence. The high fence position, the one that U.S. table saws typically use, is for tall or wide work. The low position is for narrow work, allowing room for you to push the work through and still use the blade cover. European table saws have primarily right-tilting blades and the fence in the low position allows the blade to be tilted toward the fence without coming into contact with it. With an adjustable-length fence, the fence can be made shorter, which is especially handy for ripping short pieces.

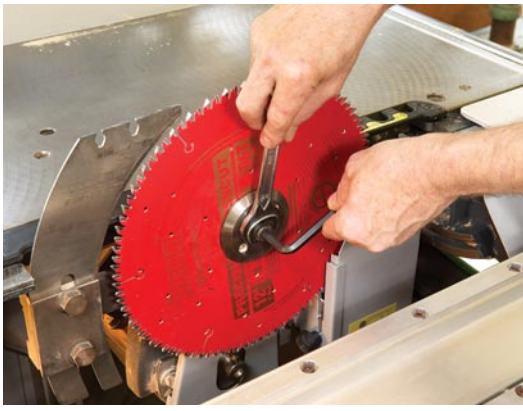
The Biesemeyer-style fence has become the standard for table saws in the United States. European fences generally seem less rigid when compared to the Biesemeyer-style fence. An extremely rigid fence is advantageous when cutting large panels. However because European table saws have depended more on the sliding table, not the fence, for accuracy when cutting sheet goods and large panels, the rigidity of the fence is not an issue.

Crosscutting

U.S. table saws use a miter gauge for crosscutting. The miter gauge is limited in its capacity and accuracy. We have had to resort to shop-made and aftermarket solutions and additional machinery to make up for the shortcomings of the miter gauge. Nearly all professional woodworkers I know who have a U.S. table saw have had to add a crosscut sled for cutting wide and heavy panels. In addition, I have found that aftermarket sliding tables are typically not sufficiently accurate and take up a lot of space. The addition of a miter saw in the woodshop has replaced the less accurate radial arm saw,

Anti-kickback pawls. *These toothed, spring-loaded devices are supposed to stop work from flying back at the operator. However, most woodworkers remove them.*

Another sucker. *In addition to dust ports in the cabinet, European saws also have a dust port on the blade cover to catch debris flung from the blade.*



Pop the hood. *You change the blade by sliding the table back, giving you lots of room to work. At the bottom right of the blade is an adjustable shroud that attaches to the dust-collection system.*

The advantage of a low fence. *When ripping narrow stock, the low fence gives you lots of room to work safely.*

but the miter saw is still limited in its capacity to cut wide boards. That leaves the necessity of using crosscut sleds. I had a large array for my U.S. saws.

European table saws commonly use a sliding table for crosscutting. Early U.S. table saws had this feature. A sliding table carries work of all sizes and weights. The sliding table is guided close to the saw blade resulting in increased accuracy. Additional tables and fences of all sizes can be attached to the sliding table and removed. I believe it is the most important component that is missing from U.S. table saws. The DeWalt hybrid (also made for the European market) and the Jet Supersaw are U.S. table saws that do incorporate a small sliding table as an option. Grizzly is starting to offer European-style table saws with sliding tables on some of their saws.

When ripping and crosscutting on a European sliding table saw, the user stands to the front left side of the stationary table for most cuts. This means that you are operating the saw similarly to how you would feed a workpiece on a router table. It takes a little getting used to, but once you become accustomed to this stance you will find it feels much safer and you have more control of the workpiece—especially after the cut. The sliding table is frequently used for ripping as well. For example a waney-edged board can be held on the sliding table for making a straight rip. There are also sliding table fence accessories that allow parallel ripping on the sliding table. A sliding table has at least one miter-type slot for other accessories such as hold-downs.

Dado Cutting

We have come to expect dado-cutting capacity on U.S. table saws, and so our saws offer arbors that can accept the standard $^{13}/_{16}$" stacked dado. Dado cutting is in reality a shaping cut

Crosscutting. *European saws have an array of fences for the sliding tables in different lengths. These can be used for mitering, crosscutting and compound cutting.*

Difficult cuts made easy. *Ripping the wane off a board or ripping a board with a crook can be a challenge. But with the European-style shoe attached to your sliding table, you can rip difficult woods with little effort or risk.*

Ripping looks unusual. *With a European saw you work to the side of the blade when ripping (above). This different body position allows you to pull your work from behind the blade (right). And the safety equipment allows you to keep your hands quite close to the blade with little risk (below right). This increases your control.*

and European standards prohibit dado cutting on table saws based on the belief that it can be a dangerous operation because it is difficult to guard. It is better done with a shaper or router. Because the U.S. market has become used to having dado capacity on table saws European saws that are marketed in the U.S. now have adapted these saws for dado cutting and now offer this feature to the U.S. market.

Scoring

Scoring is making a shallow precut with a small-diameter blade rotating opposite to the main saw blade. Scoring eliminates tear-out and is especially desirable when cutting veneered sheet goods and products such as Melamine. The solid wood woodworker can find it useful for clean crosscutting. This built-in feature is common on large commercial U.S. panel saws and is offered on most European table saws. Scoring can be done on a European saw, but no U.S. saw other than panel saws offer this as an option.

Throat Plates

U.S. table saws allow up to a $^{3}/_{4}$" opening on throat plates. The size of this opening is problematic because narrow pieces of wood can drop into the opening and be thrown back out or can be stuck and thereby tempt the operator to reach for the stuck piece when the blade is spinning.

European table saws allow no greater than a $^{1}/_{2}$" opening on throat plates and a $^{1}/_{8}$" space on the fence side thereby minimizing the hazard of narrow pieces becoming lost or lodged in the spaces.

Space Considerations

In Europe space and energy are at a premium. That fact has driven the design and manufacture of some efficient table saw combination machines. Combination woodworking machines are common in Europe, from a table saw/shaper combination to a full combo-sliding table saw, shaper, jointer, planer and mortiser with three motors. These combination machines are not like a ShopSmith that is lathe-based. These combination machines are table saw-based and no change in tools takes more than a minute.

There are many advantages for space, energy and dust collection. A full combination machine takes up no more space than a U.S. cabinet saw with typical extension tables. As an added bonus, the shaper gets full use of the table saw's sliding table.

Mobility is as necessary on European tools as it is here for the garage and basement woodworker. The difference is that European tools typically have two wheels on one end and a yoke that accepts a wheeled lever on the other. U.S. table saw manufacturers typically install

the machine on a mobile base. The PM2000 has a unique solution that allows the table saw to sit on its cast base until it is jacked up on its internal wheels.

Table Saw Types: Contractor Saws and European Site Saws

Contractor's saws were originally developed for the housing boom after WWII for building contractors. The motor was put on the outside of the saw with quick-release holders so it could be removed for easier transport. This table saw was never intended to be used inside a woodshop where an open back and bottom and a motor extended to the rear are not necessarily desirable features. In Europe there is a saw for the construction jobsite called a site saw of all things. Typically it has at least a 12" blade that doesn't tilt. Primarily designed for ripping, it has a stand, usually with foldable legs and a foldable outfeed table. Because it is intended for outside use, the saw is not required to have dust collection. The saw assembly is enclosed below the table and there is a chute for the sawdust below the table.

Cabinet-style Table Saws

European and U.S. cabinet saws both have a large cast iron top mounted on a steel cabinet-style base. The U.S. style has been pretty much based on a Delta Unisaw design which dates back to 1939.

Generally there is a difference in the way that the saw assemblies work. Both the U.S. and European assemblies are mounted to trunnions at the front and back of the cabinet; these allow for tilting. For adjusting blade height, U.S. saws incorporate an arbor assembly that swings up in an arc independent of the carriage assembly. On the majority of European saws, the whole assembly travels vertically and tilts. I don't see any particular advantage either way except there is less complication for the manufacturer when designing a riving-knife assembly on the European saw.

Right Tilt, Left Tilt

An ideal table saw would allow the user to choose either a right-tilting or a left-tilting blade position. However, since this situation exists only in a limited market the questions you might have are: "Which is better?" and "Does it make a difference?"

Many U.S. saws have moved to having a left-tilting blade while the typical European saw has a right-tilting blade. As a rule, you will be safer and will get cleaner bevel cuts by tilting the blade away from the workpiece being cut. When ripping bevels it is better to have the blade tilt to the left because the fence is on the right. With a miter slot on either side of the blade on U.S. saws, the user has the option of using whichever slot is appropriate for blade tilt when crosscutting bevels. Because European saws have a sliding table affixed to the left side of the saw, having a right tilting blades works best for crosscutting bevels. Other than when making bevel cuts, the blade tilt is not particularly significant.

(The two contradictions are the DeWalt 746 and the Jet Supersaw which, when outfitted with a sliding table to the left of the blade, still have a left-tilting blade.)

Cost Differences

European table saws are generally more expensive than U.S. saws, depending on the number of features or additions on the saw. European saws have many desirable built-in features that woodworkers later add to their U.S. saws to improve them, including sliding tables, improved guarding and superior dust collection to name a few. Once you factor in these extra features, the price difference between European- and U.S.-style saws is reduced, and the European saws look more competitive. For me, after spending lots of money on aftermarket accessories and time building shop jigs for the table saw the price differences did not seem so substantial. Additionally, the increased accuracy and safety of the European saws outweighed the initial cost and have ended up paying worthy dividends.

Your budget, frequency of table-saw use, purposes for which you use the saw, and your expectations about the performance of the machine are all factors that weigh into your decision about which table saw to use. Fortunately for you, finding and using a table saw that suits your needs and purposes is very possible in both the U.S.-style saw market or the Euro-style saw market. Hopefully this article has provided you with some information that will enable you to make an active and informed choice so that you will be a safe and effective using the table saw of your choice. **PW**

Kelly is the owner of the Kelly Mehler's School of Woodworking and author of "The Table Saw Book" (Taunton).

Sources

Felder
866-792-5288 or felderusa.com
- Hammer
- Format 4

Grizzly
570-546-9663 or grizzly.com

Laguna Tools
800-234-1976 or lagunatools.com

MiniMax
866-975-9663 or minimax-usa.com

Rojek
800-787-6747 or rojekusa.com

Tighten up. *Stock European throat plates are much narrower than those on U.S. saws, providing more support around the blade.*

Working together. *The right-tilting blade tips away from the operator when crosscutting and prevents the blade from cutting into the crosscutting fence.*

The Sindelar Tool Collection

BY CHRISTOPHER SCHWARZ

After collecting tens of thousands of the world's most beautiful tools, cabinetmaker John Sindelar is ready to show them off in a new tool museum.

John Sindelar stands in front of a door at the back of his thriving cabinet and millwork shop in Edwardsburg, Mich. The door opens into blackness and Sindelar turns around for a moment before entering.

"This room," he says with a sly grin, "is like church to me."

He flips on the light and walks into the small paneled room. The room is filled with antique tools. No, strike that last sentence. The room is filled with tools that you never thought existed or that you would see in person. Tools that you have only heard about, seen in auction catalogs or drooled over in Sandor Nagyszalanczy's books "The Art of Fine Tools" or "Tools Rare and Ingenious" (Taunton).

A real handful. *John Sindelar's tool collection focuses on one-of-a-kind woodworking tools, including this armload of quite rare craftsman-made handplanes.*

PHOTOS BY AL PARRISH

Mostly plow planes. *The rear-most room of Sindelar's collection. This room contains an impressive array of plow planes and a wooden lathe that Sindelar brought back from a trip to Italy.*

A nice gift for yourself. *An ivory plow plane made by Jim Leamy (jimleamyplanes.com) to commemorate Sindelar's 25th year in business.*

The scraping snake. *An unusual European ivory-handled plane. The plane shows signs of use (lots of hammer taps on the wedge), and its construction suggests it is a scraping plane.*

And not just a few tools. Hundreds and hundreds of vintage tools lined up on tables, shelves and a display case made from a harness for an elephant. Few of the tools are under glass. In addition to the tools, there are two comfortable chairs against one wall and under a panel of stained glass. And that is a good thing because I have to sit down.

This is just one of the five rooms filled with tools. Sindelar has so many tools ("Probably, tens of thousands," he guesses) that he keeps a significant number in storage. In one adjoining room there is a wheelbarrow filled with a stack of plow planes. In another room there's a wall of rare infill miter planes. In the front room – the biggest room – the walls are lined with vintage workbenches. Tools cover the benches, axes cover the walls, the floor is covered in boxes (that are filled with tools).

That this collection exists is remarkable. Getting to see it is something else. And what Sindelar has planned for it just might change your vacation plans someday. Sindelar is actively making plans to build a 30,000-square-foot public museum and woodworking school that will show off his collection and teach woodworking skills.

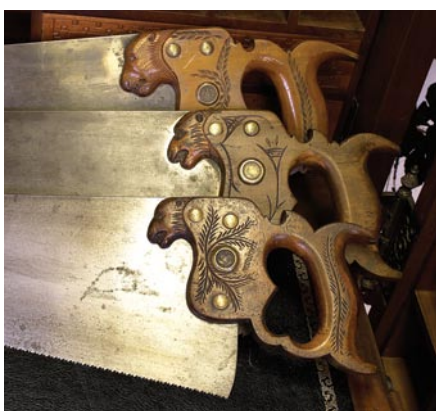
He has three locations in mind – near Williamsburg, Va., Harrisburg, Pa., or perhaps in North Carolina. He sketched up plans for the building, which would look like a French castle, and turned them over to an architect to develop. He wants the museum open for business by 2010.

Opening a tool museum on this scale sounds like an unlikely feat for anyone. But once you meet Sindelar and hear his story, you are unlikely to doubt that it could happen.

A Trained Farmer and A Block Plane Into the Drink

Sindelar, who is from that corner of Michigan near Chicago and Indiana, had a father who was a carpenter and contractor. Sindelar himself was helping him set nails by age 5 and built his first apartment building as a teenager.

But it was farming that spoke to him. As a young man Sindelar leased a 350-acre produce farm and then went to college to study agricultural management. He graduated and immediately got approved for a loan for $400,000 to launch his own farm.



Cat scratch fever. *One of the most sought-after saws is the Woodrow & McParlin panther saw. Most collectors are lucky to have one example. On the day we visited Sindelar, he had three.*

That night, he thought, "That was too easy." He says he started running the numbers and concluded that if he had one bad year on the farm, he could lose everything. He eventually decided to follow in his dad's footsteps as a builder, though he still yearns to farm and will occasionally volunteer to plow the fields owned by local farmers just to get his hands dirty.

So Sindelar entered the building trade, and as a young man of about 21, he found himself in Florida building high-end residential homes and working under a French-Canadian carpenter who had a taste for good working tools.

One day the French-Canadian carpenter told Sindelar that it was time for him to start buying his own tools. So Sindelar purchased a new standard-angle Stanley block plane, the kind you'll find in tool buckets all over the country. He presented the plane to his boss for inspection one day on a job site.

"He studied it for five minutes," Sindelar says. "He never used it. He threw it into the Intercoastal Waterway and said, 'You have to start buying good tools and learn to take care of them.'"

Sindelar obeyed. From that point on, he tried to buy a good tool every week, a practice that continues to this day, though now his tastes run more to mint Holtzapffel miter planes than hardware-store tools. And he also takes great

Fresh from the forest. *A French marking hatchet with a well-patinated leather sheath. Sindelar says this example is unusual in that the owners initials were still on the poll – those were usually ground off when the owner died.*

Just hold on to the neck and go. *An early adze with an unusual hand-carved handle showing a horse and rider.*

The ultimate stairsaw. *An English stairsaw, used for cutting dados in stringers. Note the ingenious depth stop by the blade.*

pride in tending to his collection. Every evening after finishing work at his business, Sindelar Fine Woodworking Co., he'll gently clean a tool or two in his collection.

His day job involves woodworking, though not the kind practiced by the tools he collects. Sindelar Fine Woodworking is a modern commercial cabinetshop filled with power equipment and a half-dozen employees. The company tackles jobs that range from outfitting high-end horse trailers, to remodeling the interiors of two state capitol buildings in Michigan and Ohio, to supplying wooden fittings to Georgie Boy RVs in neighboring Elkhart, Ind.

When you walk in the front door of the shop you're between the company's spray booth and the sanding area. The machining area spreads out before you; a warehouse beyond that is stacked to the ceiling with bunks of lumber. Sindelar's office doesn't even offer many clues as to his tool-collecting passion – there are piles of paperwork, shelves of trade catalogs and modern office furniture. But once you pass through the back door of the office, everything changes. The hum of the machinery disappears and it's just rooms and rooms of tools.

This tool cache hidden in the back rooms of an industrial park is an apt metaphor for Sindelar's life as a collector. Though he has been a collector of tools for many years, few people knew of him until about eight years ago. Sindelar tried to keep a low profile in the collector world as he quietly fed the back rooms of his business with vintage tools.

That introverted approach – common among collectors – all changed when Sindelar met Roger Phillips, a long-time collector in La Jolla, Calif. Phillips also came up in the trades – his woodworking enterprise had a reputation for outfitting the interiors of banks, corporate offices and casinos. Phillips had been collecting since 1945, and when Sindelar saw his collection, he says he could think only one thing: "Wow. I want this."

With Phillips's guidance, Sindelar kicked his collection into high gear. He went from buying $100 tools to $10,000 tools. He sold his collection of Stanley tools and began buying one-of-a-kind tools in Europe.

"It's an obsession," he says. "I need to get into an AA program."

When other tool collectors go to Europe, they have secret spots to hunt for old tools that they share with no one. But when Sindelar told Phillips he was going to Europe, Phillips handed him a list of all his favorite haunts.

"Roger is just so open about everything," Sindelar says. "It really changed my life."

He also took a cue from Phillips when he decided to get involved with other tool collectors and open his collection for inspection. In the process, Sindelar has also developed a reputation as a collector who likes unusual tools with an artistic flair. Fellow collectors pull him aside during auctions and say, "Hey, I've got something you have to see."

And as a result, Sindelar's collection has evolved into something that is filled with some of the most recognizable vintage tools that have appeared in recent books on tool collecting, plus newly made tools, such as a fleet of plow planes made by Jim Leamy, and infill planes made by Bill Carter and Wayne Anderson.

A lot of vintage tools have tall tales behind them – antique collecting is like that – but Sin-

And in this tool chest … *Tool chests line the walls of the rooms housing Sindelar's collection, and all of them brim with tools.*

Not in any tool catalog. *Some of the unusual planes that Sindelar acquired through a middleman. Little is known for sure about the planes, except that they look like nothing else. The bench planes (above) include a plane with a hefty fence integrated into its design. The other grouping (left) shows a fixed-sole compass plane and an unusual plane that was designed to plane boards to one specific thickness.*

delar says that he stays focused more on the form of the tool than its particular provenance or the myth behind it.

He shows off a tool chest that is covered in handplanes that look like nothing else that has ever been manufactured. The planes are ornate: brass sides, steel soles, shapely totes and knobs. The level of detail on some of them is outrageous for a working tool.

So where did they come from? The story, Sindelar says, is that they are from Germany. He buys them from a guy who gets them from another guy. And that guy says they came out of a school for blacksmiths and silversmiths. When the students left the school, they would leave one of these example tools behind, where it would be displayed on the wall.

Does Sindelar believe the story? He shrugs. "Tool collectors have a lot of stories," he says. "I like the planes." They are attractive tools and have odd labels: A. Stohr & Son, Schuhstopsel, Hildesheim, Durchmesser.

Not all the tools are so mysterious. There's a shapely French marking hatchet in a leather sheath. The sawyer's initials are cast into the poll of the hatchet so he could mark the felled tree as his own. There's a Phillips Plow Plane, patented in 1867, with an ornate cast iron frame. There's an English stairsaw with a depth stop that works like a depth stop on a fillister or dado plane. There's even a Stanley jointer plane that's painted gold. "That's a private joke I have with another collector," Sindelar says.

A Place for the Past and Future

And now Sindelar wants to show it all to the public. He envisions a museum that will also have a woodworking school. His initial plan was to build it near Williamsburg, Va., to take advantage of the history-seeking tourists there. Since then, he also started considering the Harrisburg, Pa., area. And since his plans for his museum have gotten out, he's been contacted by officials in North Carolina who think the museum, the school and the state's furniture-making history would be a good combination.

Sindelar says he thinks the museum would be a winner because it would appeal to people beyond tool collectors. Many tool museums and collections tend to focus on manufactured tools. Tools that have been patented are hot items these days. Old Stanley tools have always been a popular item for collectors.

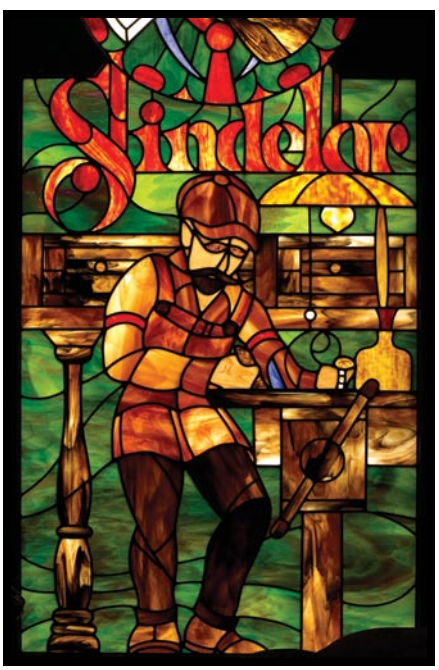
But Sindelar's collection is all about the artistic form of the tool. He's more interested in buying something that will take your breath away rather than a collection of all the patented tools from 19th-century Connecticut. And that's why he thinks the museum would succeed.

Sindelar regularly escorts people through his collection and even opens his doors to the public on occasion to benefit a charity. When he shows people around, they are overwhelmed by the tools, no matter if they are woodworkers, collectors, young or old.

"I've especially been amazed at how women, in particular, like the tools," he says. "And it's because they're all one-of-a-kind.

"They're . . ." and Sindelar pauses as he looks for the right word, "just pretty." **PW**

Comments or questions? Contact Chris at 513-531-2690 x1407 or chris.schwarz@fwpubs.com.



Watching over the collection. *A stained glass window in one of the rooms housing Sindelar's collection. When all the lights are off this is the only source of illumination.*

More Photos and Information on the Sindelar Collection

You can download a free slide show of a tour of Sindelar's collection from our web site. Visit popularwoodworking.com/aug07.

To contact John Sindelar to provide ideas or donations for the museum:

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Tusk-tenon BOOKRACK

BY ROBERT W. LANG

Hand and power tools work together to make signature Arts & Crafts joints.

The dividing line between hand-tool woodworking and machine-tool woodworking doesn't exist for me. Although I'm not fond of noise and dust, I have an appreciation for what machines can do – make work faster and repeatable. I also know there are times when the right tool for the job is powered by what my grandfather called elbow grease.

This small bookrack can be made entirely by using hand tools, or entirely by using machines. I used both, and as we go through the steps of making it, you will find out why.

Machine precision, hand-worked details. *This bookrack features tusk tenons. Blended techniques make it simple to build.*

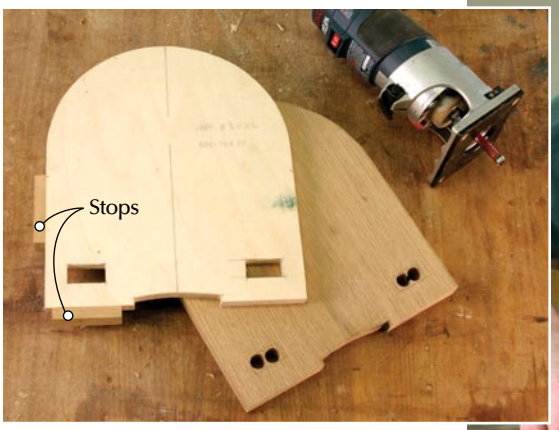
The key elements in this project are the through tenons that connect the shelf to the ends. I based the design on an early 20th century example from the Roycroft community. It's an ideal way to learn this method of joinery – it only takes a few board feet of material and each of the steps is an opportunity to improve your skills.

A project like this is enjoyable if the parts go together with a minimum amount of fuss. That means that the mortises and tenons need to be in the right places, and at the right sizes.

I used a pair of templates and a router with a flush-trimming bit to locate and size the joints. This way, the work of getting things to fit has to be done only once, when making the templates. Work on the real parts goes quickly and if I want to make this piece again, or make a batch of them, I'm well on my way before I even begin building.

The patterns are made from 1/2" Baltic birch plywood. MDF would also work, but the plywood's edges hold up better over time. You can enlarge the drawing on page 63 or you can download a full-size version on our web site popularwoodworking.com/aug07 and print

LEAD PHOTO BY AL PARRISH



Form and function. *The first template generates the shape of the ends and the through mortises. The oak blank below it is cut 1/16" oversize, and the holes minimize the work for the router bit.*

Guided by the kerf. *One precise cut establishes the size of the tenon. This L-shaped jig attached to the miter gauge is simple and safe.*

Nothing to chance. *The saw kerf in the horizontal part of the jig shows exactly where the blade will cut. With the layout line at the kerf line, clamp the piece to the jig.*

it yourself. Before cutting the outer shape, lay out and make the mortises.

There are many possible ways to make the mortises. I used a 5/8"-diameter straight bit in a plunge router, guided by the router's fence. With the pattern blank firmly clamped to my bench I plunged the router within my layout lines to make the cut.

Make the Templates

The advantage of the router is that it removes a lot of material quickly, making smooth mortises with parallel sides. The disadvantage is that it can't make a mortise with square ends. But two hand tools – the chisel and the rasp – solve this problem quickly. First on the template and then on the real parts.

Because I had to square the rounded ends of the mortise slots by hand, I didn't bother setting any stops for the ends of the mortises. I did it by eye, starting and stopping about 1/16" inside the lines.

After chopping away most of the waste in the corners with the chisel, finish the mortises with a rasp. With those done, cut the outer shape of the pattern with the band saw or jigsaw, and smooth the perimeter with the rasp before adding the stops as seen in the photo above. A dab of glue and a couple 23-gauge pins hold the stops in place.

The shelf template is made from the template for the ends. Line up one edge of the shelf pattern blank to the end of one of the mortises in the other template and transfer mortise locations. The 3/8" offset in the shelf pattern allows space for the edge that will be added to the back of the shelf after the bookrack is assembled.

Make the cuts that define the edges of the tenons on the table saw, as seen in the photo above. To do this, screw a couple pieces of scrap together in an "L" shape and attach that to the miter gauge of the table saw. This provides a reference for where the blade will be during the cut.

Clamp the shelf pattern to the miter gauge attachment to hold it in position and to keep your hands a safe distance from the blade during the cut.

To remove the waste between the tenons, make a rough cut on the waste side of the layout lines at the band saw then clamp a straight piece of plywood directly on the line. Then, with a flush-cutting bit in a router, trim the pattern back to the line and clean up the corners with a chisel. The goal at this point is to get the tenons on the shelf pattern to fit in width in the mortises of the end pattern, as seen at right.

When pattern-trimming mortises in solid wood parts like this, I always use the smallest diameter router bit available. This minimizes the curved waste left in the inside corners. I use the patterns to trace the shapes on the wood. I keep close to, but just outside the lines to reduce the material the router will remove. Then I cut all the parts to rough sizes.

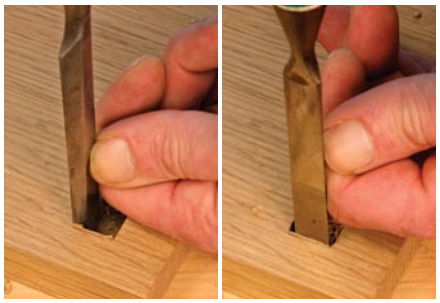
Good Reason to Go Backward

Hogging off a lot of solid wood is an invitation to chipping or tearing out the solid wood, particularly on the curves. Clamp the patterns and the parts securely to your bench and make the first pass moving the router counterclockwise around the outside of the pattern. Climb cutting in this way helps to reduce chipping and tear-out. Drill two holes at the mortise locations to allow the bearing on the bit to reach the pattern below.

Get this right and success will follow. *Take time to fit the tenons in the shelf template to the mortises in the end pattern. When the parts are routed to the templates, the joints will work.*

After routing the mortises, the corners have to be squared. I use a chisel and put the back against the end-grain edge of the straight part of the mortise. Holding the chisel flush, swing the corner down to establish a straight line.

Turn the chisel 90° to set the perpendicular line at the end of the mortise. Then, go back to



Built-in guidance system. *The flat area of the routed mortise acts as a guide for the back of the chisel. Rest the back against the cut and swing the edge of the chisel down to the corner (left). This shallow line will guide the tool in the next step of making the cut. With the edge of the chisel in the line, push straight down. Clean up both end-grain surfaces of the mortise and then finish the cut on the ends. The long-grain cuts tend to split, so shave off a little at a time (right). A few strokes with a rasp will finish the mortises.*

the end-grain side and force the chisel down as far as possible, cutting across the grain. After cutting the two opposite end-grain faces, make paring cuts with the grain.

The tenons will fit in the width of the mortise – or at least be very close – from the template. To get them to fit in thickness, and to establish a shoulder on the inside of the joint, trim half the difference in thickness off each cheek of the tenon, using the jig shown in the photo above right.

Before fitting the tenons, chamfer the ends. This makes starting the tenons in the mortises easier, and it prevents the tenon from doing any damage on the way out of the other side of the mortise. Start the ends in the mortises and push down. If they stop, look to see which face of the tenon should be trimmed.

Testing the fit. *Fine adjustments of the saw's fence allow a good fit. The tenon can be pushed in with hand pressure, and the mortised end can be lifted without falling.*

Cutting the shoulders. *Use the tenoning jig (story on page 24) to make the shoulder cuts on the through tenons. The clamp on the far end holds the workpiece to the jig.*

Insurance before fitting. *Chamfering the ends of the through tenons before fitting them makes them easier to start in the mortises and prevents damage on the way out of the other side.*

Tight But Not Too Tight

Aim for a snug fit. It's right when you can force the first part of the tenon into the mortise by hand, and are able to lift both pieces without the joint coming apart. Take a few licks with a card scraper or rasp to remove the saw and router marks from the tenon.

This loosens the joint just enough to get it almost all the way home with hand pressure. A few taps with a dead-blow mallet seats the shoulder of the joint. Mark a pencil line where the cheek of the tenon meets the face of the end piece. After all the work of putting the joint together, it's time to take it apart again to make the small mortises for the tusks.

The tusks pull the tenon into the mortise by bearing on the face of the mortised end. Locating the back of the mortise just behind the face ensures this. After offsetting the pencil line on the tenon 1/16" back, mark out a square, centered mortise and cut it with one stroke of a 1/2" chisel on the hollow-chisel mortiser. A block of scrap under the tenon holds it above the machine's table and prevents the back side from tearing out as the chisel exits. This mortise could, of course, be made by drilling a 3/8" or 7/16" hole and squaring the corners with a chisel if a mortising machine isn't available.

Just a bit behind. *The back edge of the second through mortise is back from the face of the end 1/16". The tusk will then be able to pull the joint tight.*

Taking Aim on the Angle

The outer edge of the mortise is sloped about 1/16" in the thickness of the tenon to match the angle on the tusks. This wedging action locks the joint together and if the tusks loosens from wood shrinkage, gravity or a tap on top will tighten the joint.

Holding the back of the chisel against the long-grain sides of the small mortise, swing the edge of the chisel down to nick the corners at the layout line.

Then, place the edge of the chisel on the line and push straight down. Don't push hard – just enough to make an incision along the pencil line. The edge of the chisel will fit in this slit; tilt the handle of the chisel toward you. Looking down the handle, aim for the edge at the bottom of the mortise. With the chisel

Eyeing the angle. *Set the chisel on the line and lean the chisel back until the edge is in line with the bottom of the mortise. Strike the chisel with a mallet to complete the cut.*

in position, a few taps with a mallet make the slanted cut on the inside of the mortise.

To make the tusks, mill some scrap slightly thicker than the 1/2" mortise and about 7/8" wide. Make lengths that are roughly two tusks long plus 1", and plane the tusks until they fit the mortise in width. Lay out two tusks, cut them to shape on the band saw then drive one end into the mortise.

The excess length on the tusks gives some room to fiddle with the fit of the angled tusks in the slanted mortise. A rasp followed by a card scraper removes the band-saw marks on the tusks. When the fit is good, mark the bottom of the tusks 1/4" up from the bottom of the end and 3/4" above the top cheek of the tenon.

Then mark the final outline of the tusks, trim them with the band saw and finish shaping with a rasp. When all four tusks fit, take the entire piece apart one last time to scrape and sand the surfaces. Sand the wide surfaces and exposed edges, but stay away from the through tenons and parts of the tusks that fit in the small mortises.

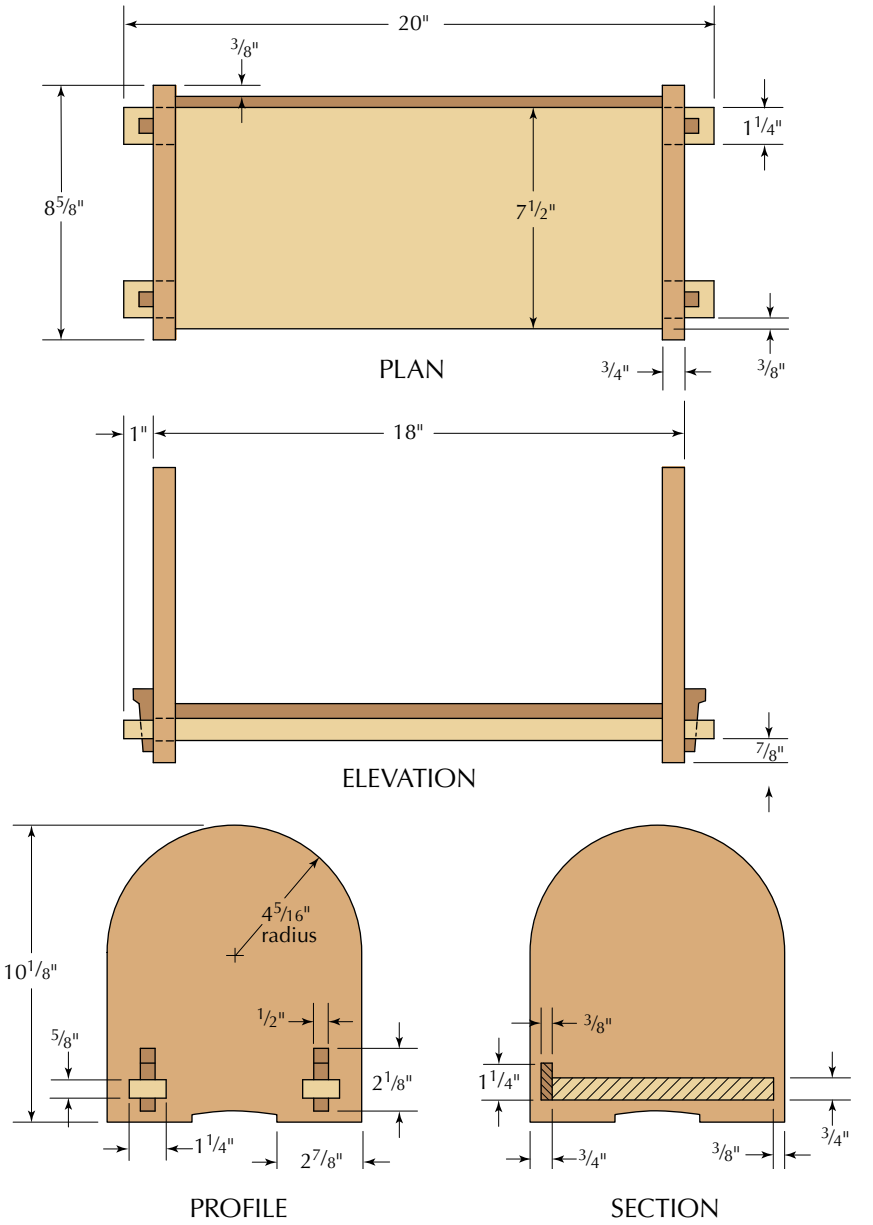
To Glue or Not to Glue

The original version of the bookrack was shipped in a flat carton, and assembled by the purchaser. Glue is an option, but not a necessity, to hold the tusk joints together. I don't bother with it – the joints are surprisingly strong on their own.

After final assembly, the exposed parts of the tenons and tusks are scraped and sanded. While quartersawn white oak is tough to cut, it is easy to sand. I generally go over the entire piece with a card scraper and only sand with #150 or #180 grit.

The back edge of the shelf is the last piece attached. After cutting it to size and sanding it, run a bead of glue along the edge of the shelf, and hold the edge to the shelf with a few clamps, then let the glue dry overnight. The next morning, off go the clamps and on goes the finish.

I usually put a darker finish on pieces like this, but every now and then I like to see a piece without any added color. On this shelf, I used two coats of amber shellac. After letting the shellac dry thoroughly, scuff it with a Scotch-Brite pad and apply a coat of paste wax. **PW**



Keyed-tenon Bookrack

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Ends	3/4	8 5/8	10 1/8	QSWO	Cut big, rout to size
❑	1	Shelf	3/4	7 1/2	20	QSWO	
❑	4	Keys	1/2	7/8	2 1/8	QSWO	Cut from longer piece
❑	1	Shelf edge	3/8	1 1/4	16 1/2	QSWO	

Bob is the author of "Shop Drawings for Greene & Greene Furniture" (Fox Chapel) and other books. More information is available at his web site: craftsmanplans.com. Contact him at 513-531-2690 x1327 or robert.lang@fwpubs.com.

Prototype. *Here's a look at the bicycle-gear lathe I built in my shop in Paint Lick, Ky. You can see the foot pedal below the lathe, plus the gear mechanism and the big flywheel at the back.*

A Bicycle Built for Bowls

BY DON WEBER

U.S. woodworkers design a foot-powered lathe for Honduran artisans so they can produce mortars and pestles for sale.

Take one 13-tooth bicycle sprocket, a bicycle chain and a heavy spring. Add to that some plumber's floor flanges, a few assorted nuts, Allen screws and wooden parts. And what do you have?

You might not believe it, but that's all you need to make a foot-powered lathe that can turn bowls or spindles.

I developed this machine (with some help and inspiration) to upgrade some spring-pole lathes in rural villages in Honduras. And last year I traveled to Honduras for 12 days to show a dozen villagers how to make the lathe, use it and to help them make tools from car springs (I'm also a blacksmith, you see).

Why would a Welshman who lives in Kentucky go to Honduras to build lathes? Our story starts 14 years ago.

Save the Rainforest by Making Projects There

In 1993, two chairmakers, Curtis Buchanan and Brian Boggs, and writer Scott Landis, launched a project to help preserve the rainforest. Originally called The Woodworkers Alliance for Rain Forest Preservation, it's now called the The Madera Verde Project. The idea was to limit slash-and-burn agriculture by giving rural communities a product they could make with hand tools and body-powered machines and then sell.

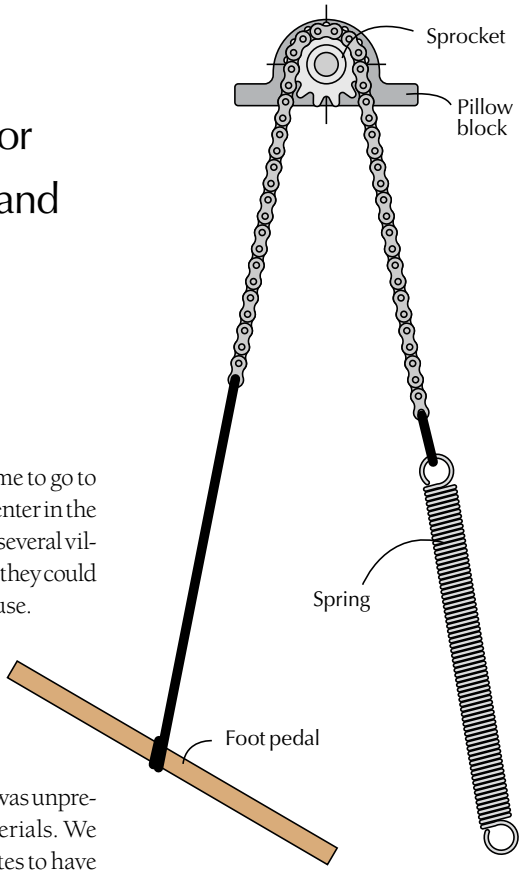
Eight years ago, Landis invited me to go to Honduras to help set up a training center in the city of La Cieba where artisans from several villages could come to learn techniques they could then take back to their homes and use.

For my first visit, the villagers were going to try their hand at chairmaking and needed help making shave horses and tools (both are a specialty of mine).

When I arrived in the country, I was unprepared for the lack of tools and materials. We are fortunate here in the United States to have hardware stores and lumber dealers at our beck and call.

The most frustrating part of working in developing countries is how much you have to wait to get something done. Just sending someone out for parts might take half a day. And for things we might expect to find in any hardware store, they might have to go to several just to find some rough Chinese equivalent. Tools are scarce and of poor quality.

During that first stay, we traveled up to El Carbon where the project started, and built shave horses and a box bellows to set up a forge for tool making. (The bellows ended up being used by the women of the village to help start their cook fires.)



How it works. *As you push down on the pedal, the chain turns the sprocket, and the hub engages and turns the flywheel. The spring retracts the chain, the hub disengages and the flywheel continues to turn on its own inertia.*

We then returned to La Cieba a few days later to continue working on a training center. And before I knew it I was back on my way to the United States.

Return to the Natives

Last year I returned to Honduras to upgrade the equipment and I was more prepared.

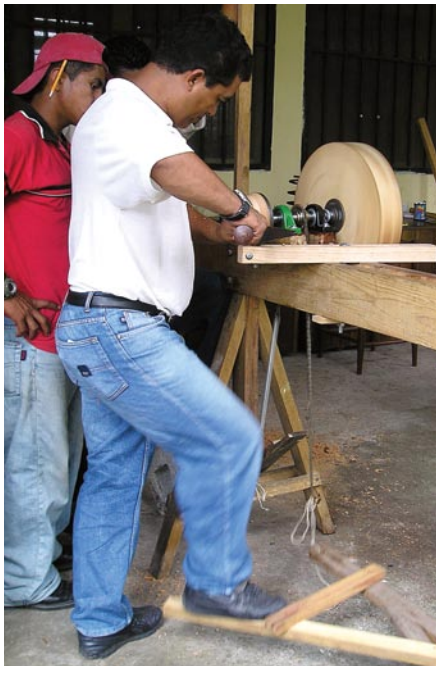
The plan for this trip was to improve the spring-pole lathes that the artisans were using

PHOTOS BY AL PARRISH AND THE AUTHOR; ILLUSTRATION BY MARY JANE FAVORITE

Fancy footwork. *I press the foot pedal down to the floor and that pulls the chain down with it …*

User's perspective. *The chain runs around this bicycle-gear sprocket spinning it (the flywheel behind helps keep the momentum up) …*

Power enough. *And that gives me enough rpm to turn end grain on this bowl.*



Trial run. *One of the Honduran artisans takes the new lathe for a spin.*

to make chair parts. These lathes were built like the chairmaker's lathes from Britain – they turn backward and then forward with each stroke. What I wanted to introduce was a unidirectional lathe. A lathe like this could be used for turning bowls (as well as spindles), and so we decided to teach them to make mortars and pestles that the artisans could sell. The challenge was that I had to come up with a lathe that could be built using parts that could be found in any hardware store in the world.

The solution was a bicycle gear-driven lathe from the drawings by Richard Starr in his book "Woodworking with Kids" (Taunton Press). I modified the plans to use some hardware that I knew I could get in Honduras. Then I tested the idea by making a lathe in my shop in Paint Lick, Ky.

The Bicycle-chain Lathe

As I mentioned, a spring-pole lathe moves in two directions: toward the user as he or she presses the foot pedal, and away from the user as the pedal returns to the up position.

The new lathe still has the foot pedal. But the foot pedal is attached to a bicycle chain (instead of the usual rope and springy bit of branch). The bicycle chain runs around the bicycle sprocket and back down where it attaches to the heavy spring, which is bolted to the wooden frame of the lathe.

When you push down on the pedal, the chain makes the shaft of the bicycle sprocket spin in one direction only. When the chain moves back, the shaft continues to spin in one direction. This is much like when you are riding a geared bicycle. When you pedal forward the bike moves forward. When you idle or pedal backward, the bike doesn't go backward – it continues to move forward.

The metal shaft that runs through the bicycle sprocket is attached to a large wooden flywheel on one end (the flywheel keeps the momentum of the shaft going) and to the faceplate of the lathe on the other where the turning occurs.

I used hardware store pillow blocks as bearings and to attach the shaft to the lathe. And I used plumber's floor flanges to mount the flywheel to the shaft.

Learning the Lathe

After arriving in Honduras there was – as usual – a lot of waiting involved in locating a truck, arranging to get to the hardware stores and getting the timber cut for the flywheel. But we eventually got there, and were underway. The artisans took to the idea of the new machine with great vigor.

The flywheel had to be made in two parts to have enough mass to turn large pieces of wood into bowls. This created a problem in boring the hole in the center of the flywheel, so we turned to ancient technology again for help. In an old book on blacksmithing, I found drawings of a beam drill (see photo at right) that solved the problem, even in the most remote villages.

The solution was a brace and bit held down with a piece of timber like the lever on a drill press.

We also managed to upgrade the old hand-cranked grinder on the premises by modifying a grinding wheel so it could be mounted on the lathe as well.

We had the new lathe up and running, the artisans and new apprentices had bowl blanks cut out with their new chain saw, and in no time they were turning the green wood into their first bowls. The hook tools I'd brought with me gave them some trouble so they stayed mostly with a

3/8" bowl gouge I'd brought as well. Whenever there was a problem, or a tool caught, there was a cry of "El Hook!" resounding throughout the shop. The artisans each turned out a fine mortar and pestle, several 8"-diameter bowls and tried their hands at goblets.

To make the mortar, we used cumbio, a wood I'd never used before. It's a reasonably dense, beech-like wood with pinkish and white stripes. It's a bit stringy. The pestle we made from celillon.

These products will be made by the artisans in their villages and sold in the country—they'd need to make a container load to export them. Working at the lathe isn't a full-time job for these lads. They also had their chores in the village life to tend to. But they are motivated.

During the time we were using the bicycle lathe at the training center, two of the more experienced artisans were constructing a new lathe made with parts located in Honduras. After having shopped at three different hardware stores, we were able to find some of the necessary parts but unable to locate a decent shaft, floor flanges or pillow blocks.

So we made do with 5/8" all-thread rod, a disk with a nut attached and wooden blocks as bearings. It didn't run as smoothly as the lathe made with parts I brought from the United States, but we got it working nonetheless. Because my stay was limited down there, we did not have the time to really look around for more parts.

Artist at work. *Here, an artisan hollows out the foot of a bowl on a traditional bow lathe.*

Old-fashioned ingenuity. *The beam drill in action. The downward force provided by the beam above the brace assists greatly in boring accurate holes.*

But by the time I left, at least one of the artisans had the idea for what we needed and he had already found in the yard of the compound some pillow blocks that were frozen with rust. Knowing the lads, they would try to take them apart and get them working to build lathes back in their own villages. **PW**

Don teaches chairmaking and blacksmithing from his shop in Paint Lick, Ky. You can learn more about his work at handcraftwoodworks.com.

Ready to turn. *The Honduran artisans check out the tool rest on the lathe. Note that one of them is holding "El Hook."*

Results. *A finished mortar and pestle, turned on a bicycle lathe in La Cieba, Honduras.*

21st-century Plane Wick

BY JOHN WALKOWIAK

This adaptation of an old benchtop standby is a slick lubrication solution.

Slick storage. *This plane wick is an excellent place to set your tool when it's not in use.*

Planing wood is fun – unless you have to do it to make a living. In the good old days, when every piece of wood was hand planed, it wasn't looked upon with the esteem it is today. Brother Henry DeWitt, a member of the New Lebanon, N.Y., Shaker community, noted in his diary in March 1854: "planed the leaf over &c. &c. Expect to smooth it sometime…." I think we've all been there. I have this quotation hanging in my shop and gaze at it when things are not going as quickly as I think they should. Anything that makes a planing job easier has always been welcomed.

The plane wick was a tool that sat on the top of the workbench back when woodworkers used only wooden planes. It was a wood or metal container that held tightly wrapped felt that was saturated in linseed oil. Occasionally pulling the plane sole over the wick made the plane slippery, which made planing easier. This was an improvement on the grease box that required the craftsman to use his fingers to put the grease on the plane bottom to lubricate it.

When metal planes came into use, it was immediately recognized that they offered more planing resistance than the wooden ones so manufacturers tried to compensate by corrugating the bottoms to reduce resistance. The effect of the corrugations has been debated ever since. Today, woodworkers using metal planes – smooth-bottomed or corrugated – often wax the bottoms with paste wax or rub a candle stub on them to make them slide more easily. However, neither application lasts very long and it is a pain to stop planing and re-apply wax every five minutes.

Illuminating Thought

One day, while looking for my candle stub in a pile of shavings in my tool tray, I remembered the plane wick that used to sit handily on almost every benchtop. I combined the two ideas to come up with the bench accessory you see here. It sits on the benchtop – or if one is working on a very wide panel it can rest right on the panel. You don't have to stop planing to re-apply lubricant. Just pull your plane over the paraffin wax blocks a time or two on a return stroke. You never have to change your grip on the plane. As an added bonus, it provides a safe place to park a plane when it is on the bench, thus ending the sleep-depriving, teeth-gnashing dilemma of whether to rest the plane on its side or bottom when you put it down. The paraffin is not going to dull the blade (and world peace is now just around the corner). The hole you see in the paraffin is for lubricating screw threads. To use, put the screw threads in the hole, press against a side and pull it out. It allows you do this task one-handed during an assembly.

Basically, this plane wick is just a holder for two pieces of paraffin wax, the kind that is used for canning and can be found in any grocery store.

The wick is made from a single block of wood: $10\frac{1}{4}$" long by 3" wide and $1\frac{3}{4}$" high. The profile on the bottom is cut with a band saw. I added decorative details – chamfers and stopped chamfers – on the corners. The pocket that holds the blocks is $\frac{5}{16}$" deep, $9\frac{1}{2}$" long and $2\frac{1}{4}$" wide. I used Forstner bits and a chisel to remove the waste. To determine the size of the pocket I measured the wax blocks and, because they are not consistently sized, deducted $\frac{3}{16}$" from the smallest length and width measurement then mortised the pocket to this size. Then, using a jack plane on its side, I planed the paraffin to fit snugly – the easiest planing you will ever do! A hair oversized is preferred as the excess will be easily shaved off as you press the wax into place. After you have fitted the wax blocks, remove them. Then pass a propane torch flame over the bottom of each block until it starts to drip then quickly press it back in place. The melted wax will keep them secure. (It is best to do the wax fitting after any finish has been applied to the base so there is no chance of the wax coating the bare wood.)

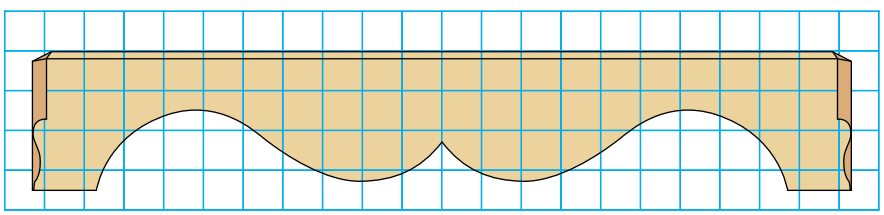
Everything in its Place

To keep the plane wick from sliding on the bench when pulling a plane back over it, I used another modern product – silicone caulk. Apply a bead of the silicone about $\frac{3}{8}$" wide on each end. Let this skin over – about 15 minutes – then place it on a smooth flat surface that has a piece of plastic or waxed paper on it. Press lightly and evenly to squeeze the silicone to about $\frac{1}{8}$" thickness. Let this dry overnight, pull the plastic off, and trim any excess with a razor knife. When dry, the surface of the silicone has a tacky quality that is non-skid, and as long as it remains clean it will not slide. If shavings or sawdust gets on the feet of the plane wick or on the surface it's resting on, simply wipe the feet on your apron and blow or wipe off the surface (I haven't had any problems with it sliding if kept clean). As an alternative one could also use four sharpened brads to keep it in place, or stick some sandpaper to the feet.

I've used this tool trouble-free for about eight years. At one time or another I have used every type of finish on my projects, and the paraffin wax has not caused any finishing problems. I've left planes sitting on it between projects and have never had a rust problem. I made this one in a traditional oilstone box shape, and have found that this size works equally well for block or jointer planes. It will also work just as well with wooden planes – without the mess of the linseed oil version of a plane wick.

The only caution that goes with this tool is that your planes will slide much more easily when using it – they just may get away from you. **PW**

John lives in Minneapolis, Minn., where he restores antique furniture. His restoration work led him to investigate the tools – and the history behind them – that were originally used in making that furniture.



1 Square = $\frac{1}{2}$"

PROFILE OF BASE

PHOTOS BY AL PARRISH; ILLUSTRATION BY MARY JANE FAVORITE

BY ROBERT W. LANG

College of the Redwoods

Krenov's woodworking school turns silver as the rest of us go gray.

One of the problems of getting older is the realization that events that seem recent actually happened decades ago. A conversation with a co-worker about movies or music comes to an abrupt halt as I realize they probably weren't listening to Buffalo Springfield or watching "Little Big Man" when they were three. The 25th anniversary of the Fine Woodworking Program at the College of the Redwoods fits neatly into this category for me.

Like many woodworkers who came of age in the 1970s, there are a handful of older craftsmen who influenced and inspired me. Sam Maloof, Art Carpenter and James Krenov were people doing what I wanted to do. They had been doing it well for quite a while by the time I became aware of their work. Hunger for information about this kind of craftsmanship led me to Krenov's books: "A Cabinetmaker's Notebook," "The Fine Art of Cabinetmaking" and "The Impractical Cabinetmaker" (all published by Linden).

These were the first woodworking books I read that went beyond the meat and potatoes of building furniture and discussed the philosophy and emotion involved. Where Ernest Joyce's "Encyclopedia of Furnituremaking" discussed the craft in dry detail, Krenov wrote about developing relationships with pieces of wood and tools in a philosophical, almost poetic way. He managed to tap into the unknown stuff deep inside that makes working with wood a basic need for many of us.

Krenov inspired enough interest that he was invited to give workshops for a woodworker's guild in Mendocino, Calif. This led to the founding of the nine-month program under the auspices of the College of the Redwoods, part of the California community college system. The program was successful from the start, attracting many applicants every year for each of the 20 or so bench spaces. It was, and still is, unique among woodworking schools. Some schools are based on traditions or styles, but the College of the Redwoods teaches the gospel according to Krenov.

Design in three dimensions. *The process of creating new designs follows that employed by James Krenov; full-size mockups like this one by Germán Plessi of Buenos Aires, Argentina, supplement drawings to better visualize details from all angles.*

I spent a day last January talking to faculty members, current students and former students who had come to town for a gallery show of the current students' work. The facility, curriculum, even the tools, habits and attitudes of students and graduates all bear the imprint of the founder. The wooden handplanes, cam clamps and small sawhorses were familiar from pictures in Krenov's books.

Small items like these and the work in progress was just a bit different from what you see in a typical American shop. In the

PHOTOS BY DAVID WELTER

same way that serving in the Marine Corps will change a person forever, someone attending this school will leave a different person. And, like the Marines, graduates share a fellowship and camaraderie that is long lasting and powerful.

A Step Back in Time

My first experience with graduates of the program came while I was doing art and craft shows in the mid-1980s. The scenario was always the same. A new woodworker would appear with a booth containing only a few objects. Exquisitely crafted and unbelievably priced, there would be small cabinets on delicate stands with doors that swung effortlessly and closed with a satisfying thunk. Closing one drawer with impossibly small and perfect dovetails would force air into a cabinet opening, causing an adjacent drawer to push open.

Beautifully grained surfaces had a distinctive texture from being handplaned and scraped, and carved handles and pulls fit in the hand just so. The question, "How's it going?" would be met with a conversation about design aesthetics or the personality of the wood in a piece. The pieces I saw on my recent visit, and the people I met had these same characteristics.

For Love, Not Money

Nearly everyone who sees work like this admires and appreciates it, but those willing to buy it are few. Any handcrafted furniture is difficult to sell, but Krenov-style pieces require so much time to render, that the odds of the maker earning a living wage are slim. But earning a living isn't really the point of this type of work, and the training at the College of the Redwoods isn't vocational training. It's more like a school of philosophy or a seminary than a trade school.

This isn't to say that there isn't a real and lasting value to the training. Students come to the school from all walks of life, and at different points in their lives. Some are young and seeking direction, and some are at the end of other careers and want to spend time digging into what they enjoy. All agree that experiencing a lengthy and intense period of time devoted to woodworking is an opportunity to take advantage of, regardless of the outcome.

Even though Krenov retired from teaching in June 2002, his influence is still felt and is profound. All of the current faculty members are graduates of the program, and that is unlikely to change in the foreseeable future. Graduates can no longer include the line "trained under James Krenov" in their résumés, but the faculty members and former students assured me that the program has changed little.

Students begin by learning to get tools' edges really, really sharp, make some wooden planes and create "the perfect board." Starting with a piece of wood about 1' wide and 1' long, edges and faces are planed until they can pass the closest scrutiny for being flat, straight and square.

Perhaps the biggest change since Krenov's departure is in the area of design freedom that students enjoy. A dominant and powerful personality, Krenov tended to view "good" and "bad" designs in terms of how they compared to his own work. Several people commented to me about non-Krenovian designs that were being made. "You wouldn't have seen that five or 10 years ago," was a common remark.

Design is as much a part of the course as building. Students learn to prepare sketches, drawings and full-size mockups as they learn basic hand-tool skills during their first semester. By the end of the term, they are completing work on a small project using the techniques learned. The second half of the course brings the building of more complicated and larger projects. A few students are invited to return for a second year of advanced work. Summer

Presence remains strong. *The master's influence continues in this claro walnut cabinet-on-stand by Plessi. Krenov's signature forms are often revisited by students.*

Details and hand-worked surfaces. *Greg Klassen of Lynden, Wash., designed and made this bench with a coopered madrone seat.*

Updated classic. *This cabinet by Kathleen Anderson of Portland, Ore., is reminiscent of a Roycroft design from the early 20th century, but it is lavished with details never attempted by the Roycrofters.*

classes and workshops are also offered, and many of the students I met used attendance at these shorter classes as a way to evaluate the school and their desire to participate in the longer program.

Many Call, But Few Are Chosen

Admission to the school is a combination of talent and luck. Applicants submit examples of their work, but many are accepted with minimal woodworking experience. They also must submit a letter stating their objectives, and this is given as much consideration as previous work or study. Ultimately, selections are made by a random drawing from a pool of qualified applicants.

Those accepted to the program will spend 8-10 hours a day, six days a week in the school's building on the edge of Fort Bragg, Calif., a small rural community on the Northern California coast, about a four-hour drive north of San Francisco.

The school's building is a fairly typical shop structure, with separate machine and bench rooms and an abundance of natural light. The machine room takes up about one-third of the space, and is well equipped with wide, industrial-strength jointers and planers, and the band saw is the preferred machine for ripping.

The students' benches are arranged on each of two long walls in the bench room. Benches are back to back, and while the space isn't cramped, there isn't a lot of extra room. Most projects are small in scale, and the back-to-back benches lead to bench mates being handy when help, advice or conversation is needed. The work is demanding and intense, but the pace (at least during my visit) is relaxed and friendly. The emphasis is on getting the work right, not getting it out the door.

In September and October, the Highlight Gallery in nearby Mendocino, Calif., will be hosting a special exhibition in commemoration of the woodworking program's 25th anniversary. All graduates of the program have been invited to display their work, and it will be a unique collection of work from this unique woodworking program. **PW**

Bob is the author of "The Complete Kitchen Cabinetmaker" (Cambium) in addition to other books. More information is available at his web site: craftsmanplans.com. Contact him at 513-531-2690 x1327 or robert.lang@fwpubs.com.

Bench room. *Roughly two-thirds of the building is dedicated to this quiet, well-lit space devoted to workbenches and handwork.*

Small in scale, but large in detail. *Mark Chidister, of Ames, Iowa, works on the joinery for this frame that is destined for the small cabinet waiting on the bench.*

Help is close at hand. *With benches placed back to back, students are there to help each other, either with discussion of design and technique or an extra pair of hands. Here, Ron Wiggins (right), of Atlanta, Ga., is helping Plessi to set clamps.*

BY JUDY DITMER

Making Multiples

Sometimes, unique is exactly what you want to avoid when turning.

Get a handle on multiples. *Turning multiples is not difficult and can be a satisfying accomplishment. You can learn to turn multiples as quickly (and very nearly as accurately) by hand as you could with mechanical duplicators. I once made 175 of these gavels for a client.*

If you turn, sooner or later you are going to find yourself facing some project that requires several (or many) duplicate turnings. You may feel a brief rush of mild panic, most likely followed by a powerful urge to check your catalog shelf (or browser bookmarks) in search of duplicating equipment that will fit your lathe.

Resist the urge. There may be situations that call for machine duplicators, but in more than 20 years of turning for a living, I have yet to encounter one. Chances are good you can do as well or better without such devices.

With the knowledge of a few basic techniques (and, of course, some practice), you can learn to turn multiple, matching items by hand more quickly than with mechanical duplicators. If you need only to make a few items, you'll save yourself the expense and trouble of buying and fiddling with the device (Rube Goldberg would have loved some of them); if you will be making many copies, your speed and effectiveness will quickly improve anyway.

Matching Needn't Mean Identical

There are usually two primary concerns in turning a batch of matching items. One is, of course, making them match. But be aware that in most cases, this doesn't mean they must be perfectly identical, as if turned by machine. They just have to look the same. If you were to check out some classic hand-built furniture in a museum (with a tape, caliper and profile gauge) you would probably be surprised to find that there is a fair amount of variation from one spindle to another. And when used in an assembled piece, turnings that are reasonably similar – but not necessarily identical – look fine, if not indistinguishable.

The second concern is speed. If you are turning for pleasure, this may not matter to you at all. However, if you have a fair number of items to produce, you will probably want to be efficient. After all, beyond getting these pieces done, you most likely have other things you want to get to in what may be limited time in the shop.

Beyond an ongoing cultivation of basic turning skills, the key is to set up the job in a way that makes repetition simple and minimizes unnecessary actions. Whether you are reproducing an existing item (chair rungs, stair spindles, etc.) or designing something from scratch, turn a few prototypes. Don't worry about matching them exactly, or how many more you'll make, or about how fast you are going. At this point, you just want to pay attention to developing a logical sequence of cuts, and to get the overall feel of making the object. Time spent here will more than pay off later. The better you understand the job, the easier it will be to increase the speed of making each item.

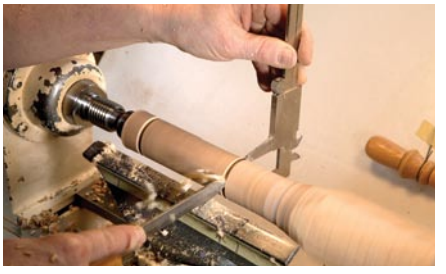
First, do it right. Then, do it faster. Soon you'll wonder why you ever thought you needed a mechanical helper. And you'll be a better turner, which, as always, will pay off handsomely on your next project.

Judy, author of two turning books and many articles, has been turning since 1985. She teaches and demonstrates her skills throughout the United States and Canada.

PHOTOS BY AL PARRISH

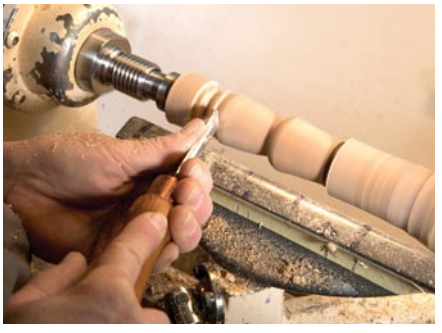
1 ***A good setup to turn multiples.*** *Set the calipers to the key diameters and hang them in the proper order. The prototype is easy to see against the backboard.*

2 ***Begin by rounding off the workpiece.*** *A large roughing (spindle) gouge is quick and effective. Cut on the low side of the gouge, and from larger to smaller diameter.*



3 ***Part about halfway into the center*** *on the left end. This will be the end of the finished piece. Then mark the diameter of the first key location (in this case, the diameter to the right of the first decorative cove and bead). If you aren't comfortable with the one-handed cut shown, just make the cut and stop the lathe frequently to check the diameter until it's correct.*

4 ***Begin shaping the details*** *as per your prototype. Here I am using my favorite long fingernail-grind detail gouge. The long edge will cut very nearly as clean as any skew, and the long tip will allow you to cut very tight detail.*



5 ***Round the end of the handle,*** *but don't cut too far in yet. You'll need the support on this end when you rough in the other half of the handle.*

6 ***Finish turning the details,*** *and begin working down the excess stock on the long taper. A wider (roughing) gouge works best here.*

7 ***Clean up the taper,*** *turning downhill (large to small diameter). Stop cutting just before you get to the waste remaining on the right; if you push the gouge uphill, it will catch badly.*

8 ***With the parting tool,*** *cut to the diameter of the bead on the long taper. The parting cut on the right end of the handle is where the end of the handle will be.*

9 ***Finish cleaning up the taper,*** *and turn the bead. As the narrowest part gets smaller, vibrations will increase. Take lighter cuts; push into the cut, not toward the workpiece.*

10 ***Continue the taper on toward the end.*** *To fit properly into the 1/2" mortise that will be drilled into the gavel head, the diameter should taper slightly from just over to just under 1/2" at about 1" from the finished end. Leave it a bit thick to allow for sanding.*

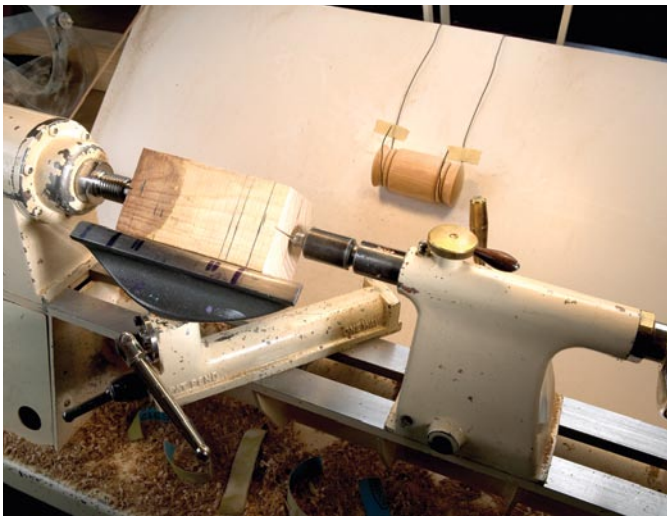
11 ***Sand the handle to your satisfaction,*** *with the toolrest moved out of the way. I have made decorative burn marks to set off the details (see #21 on page 79).*

12 ***Apply and buff the finish*** *(I used a hard wax). Don't finish the small end where it will be glued into the head; glue won't stick to wax.*

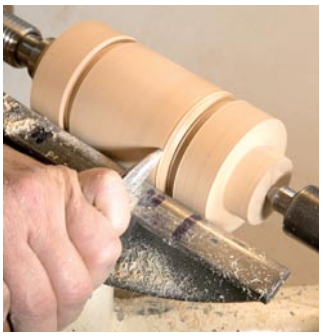
13 ***Cut in at the end of the handle,**** *but don't part off all the way – the piece will twist and fly off. Cutting off the excess at the band saw or with a small backsaw is safer.*

14 ***Here the piece has been remounted*** *in a chuck (no need to use padding if you make sure that only the part that will be inside the mortise in the gavel head is being gripped by the chuck jaws). At a slow speed, and with tailstock support, turn the round end down very close, but not quite all the way.*

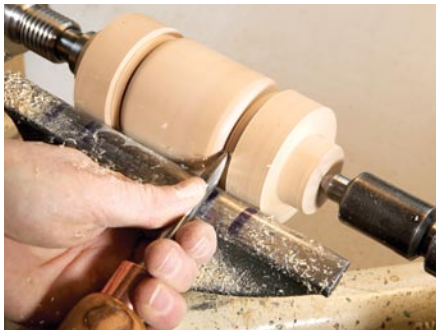
15 ***To sand and finish the end,*** *turn the lathe speed down very slow and support the turning with your left hand. This can be dangerous if you aren't very careful, as the centrifugal force can pull the handle loose and flip it out of your hand or even out of the chuck. You may want to do this final sanding with the piece off the lathe.*



16 ***Ready to turn the head.*** *I don't need calipers for this; after rounding the stock (which all starts out at about the same size), I'll just part in about 1/2" (gauged by watching how deep the parting tool is) at the locations of the beads. Then mark the ends, and just turn the rest by eye.*



17 ***After rounding the stock*** *and smoothing the cylinder, shape the round shoulders of the center section, next to the bead.*

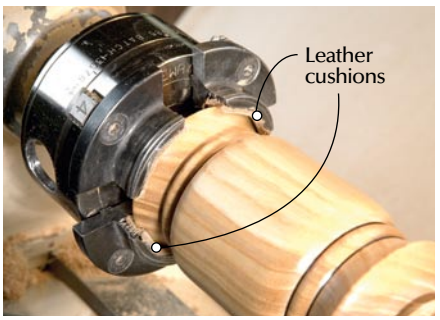


18 ***Turn the bead.*** *The long, narrow tip of the detail gouge is ideal for this kind of tight detail. It fits right down into the crease, and isn't very likely to kick back.*

19 ***Turn the cove down to the bead.*** *Don't try to take off all the excess at once; turn it off in stages so the last cut can be clean. Trying to take off too much of the wood at once will cause tear-out or even splitting.*

20 ***Finish up the detail on the bead*** *where it meets the cove. Reduce the diameter at the ends, but leave an even waste stub for mounting in a chuck to turn the ends.*

21 ***To make the burn marks,*** *attach steel wire to a couple short lengths of dowel. With the lathe on, hold the dowels (not the wire itself) to apply pressure until the friction burns the wood.*



22 ***I mount the piece in a chuck*** *to turn the faces. Note the leather pieces glued inside the jaws to cushion the piece. This remount allows me to get a clean cut and smooth curve on the end grain of the gavel faces. Doing the sanding and finishing on the lathe (albeit at slow speed) gives a better result than if done off the lathe and it's faster.*

23 ***You must use tailstock support*** *to remove the waste wood. Turn very nearly all the way in, as with the end of the handle, then sand and finish.*

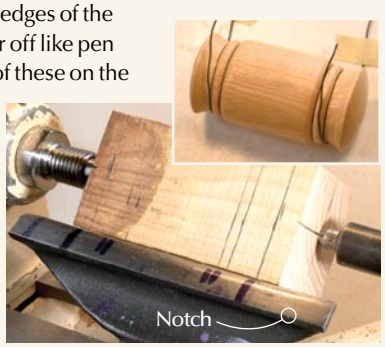
A Simple Layout Technique

Marking the toolrest is an efficient way to lay out a simple turning.

Once you set it up correctly, you need only cut a few key diameters after rounding the workpiece, and you can finish turning the piece without further measuring (after some practice, of course).

Develop a system that makes sense to you for these markings. My own convention is this: The ends are marked with a line all the way across the toolrest, small beads with short double lines, and other critical diameters with arrows or short lines (for the first toolrest position, these are on the forward half of the rest; for the second, on the back half). For the gavel head, where the toolrest doesn't have to be moved, I mark only the ends and the location of the beads.

In real life (for a large production run, not for just a handful of duplicates) I would actually file tiny notches into the edges of the rest for the key markings; they won't wear off like pen marks (you can see the remnants of one of these on the lower edge of the toolrest, near the right end). The toolrest is filed down to remove the notches after the job is done. This saves time overall; removing the marks later is far quicker than the total time it would take to continually hold up a measuring stick or template to a fresh workpiece every time I need to mark a location. — JD



24 ***For items that need to be very close*** *to identical, you may want to use a gauge of some kind to check the profile of the pieces as you turn them. I'm holding a profile gauge, often used to transfer moulding profiles. On the lathe bed is a simple template cut from a piece of thin plywood.* **PW**

BY BOB FLEXNER

Animal Hide Glue

Reversibility and quick tack make this traditional method worth the trouble – sometimes.

Dry hide glue. *Most hide glue is available as Grape-Nuts-sized granules (above), which soak up water and become ready to heat and use quickly. Some hide glue is available in slightly larger "pearl" form (below). This glue has a strong aroma, which indicates it is either "bone" glue or contains a lot of bacteria. In the old days, hide glue came in "brick" form (left). You had to break it into small pieces and soak them for a long time before heating. All three forms have an infinite shelf life in dry form.*

In my last story (April 2007, issue #161) I discussed regluing doweled chairs. The chair I used for illustration was made in the 1920s or early 30s. As with virtually all furniture made before white glue was introduced in the 1950s, this chair had been glued originally with hot animal hide glue.

Because hot hide glue is more difficult to use than modern adhesives, it's not likely you use it for your projects. I'm not advocating you switch to hide glue, at least for new woodworking. The glue takes getting used to, which means using it regularly for a while. Hot hide glue is very useful in restoration, however.

Even if you don't use hide glue, you may still be interested in it, just as you are probably interested in old methods of woodworking. Following is an introduction to hide glue.

What is Hide Glue?

Animal hide glue is made by decomposing the protein, or collagen, from animal hides. Almost any hide can be used, including horsehides ("take the horse to the glue factory"). In modern times, however, cowhides are universally used. In fact, hide glue factories are commonly located near tanneries.

The hides are washed and soaked in lime for up to a month to break down the collagen. After being neutralized with an acid, the hides are heated in water to extract the glue. The glue is then dried and ground into Grape-Nuts-sized granules, which is the form in which it is usually sold.

The heating process is done a number of times to extract all the glue. Each subsequent extraction produces a lower grade of glue. The grades are measured by how much weight, in grams, it takes to make a dent in a 12.5 percent solution of gelled glue a given amount.

Standard grades range from a high of 512 grams, called "512 gram-strength glue," to a low of 85 grams. The most common glue used in woodworking and furniture restoration is 192-gram strength. The most common used by musical instrument makers is 251-gram strength. Higher gram strengths gel too quickly to be useful in woodworking.

Animal bones, or at least the sinew in the joints, can also be used to make glue. But "bone" glue is greasy, more odorous, and has less tacking strength than hide glue, so it is not a good choice. Contrary to what you often read, horns and hoofs are never used because they don't contain collagen.

Bad Reputation

Hide glue has an unfortunate reputation of being weak and not water resistant.

As just explained, the strength of hide glue varies depending on the extraction, and also on what additives may be included (for example, in liquid hide glue, discussed on page 85). But all hide glues sold for woodworking create a bond stronger than the wood itself as long as the wood is clean and the parts fit snugly. No more strength than this is needed.

It's true that hide glue isn't very water resistant, but this is more an advantage than disadvantage because it allows repairs to be done more easily. Poor water resistance is rarely a problem with wooden objects intended for indoor use, anyway.

PHOTOS BY THE AUTHOR

Proof that less strength and water resistance compared to most modern adhesives aren't serious problems is the survival of so much furniture made before the 1950s.

(Actually, I think the bad reputation began in the 1950s when manufacturers claimed superior strength and water resistance for their white and yellow glues to get craftsmen to switch. These non-issue claims are still used today by suppliers of even stronger and more water-resistant adhesives.)

Disadvantages and Advantages

Nevertheless, hide glue still has a number of disadvantages compared to modern adhesives. Hot hide glue has to be prepared in advance and applied hot. It sets up too fast for relaxed assembly and has a relatively short pot life (several weeks at room temperature) before it begins rotting and losing strength. So there is usually a lot of waste. In addition, and not least important, hot animal hide glue has an aroma many find unpleasant.

But the glue has two unique advantages over all other adhesives: reversibility and quick tack. Both are far more useful for repairing old furniture glued originally with hide glue than for making new furniture.

I don't buy the argument that you should use hide glue on new furniture so it can be repaired more easily decades from now. It's rare that today's repairmen recognize the glue, so what are the chances tomorrow's will? So there's little likelihood they will take advantage of hide glue's easier repairability. The best argument for using hide glue is to stay true to the original when making reproductions.

Glue-block strength. *These glue blocks in the inside corner of a mid-19th-century Empire chest-of-drawers are still strong. Glue blocks were commonly used in corners to add strength.*

Keep it covered. *A commercial glue pot maintains the temperature of the glue at an ideal 150°. To retard evaporation and the glue thickening, I keep the pot covered with a plastic lid. The lid has a cut out for brushes and a stirring stick.*

Heating options. *You don't need to invest in a glue pot. Any situation you can arrange that will keep the glue at about 140° to 150° will work well – in this case a jar of glue in a pan of water on an electric hot plate. Keep an eye on the temperature.*

Reversibility

Reversibility is the quality that makes redissolving possible after the glue has dried. It allows you to reglue loose joints without first having to remove the old glue (to create clean wood). Simply remove any loose or powdered glue, apply fresh hot hide glue, and reassemble. The moist heat of the new glue dissolves the old glue and the two combine to create a strong bond.

Though it's fairly easy to remove white and yellow glues by soaking and scrubbing with hot water or vinegar, no freshly applied glue redissolves into these glues. Other adhesives, including polyurethane, epoxy, plastic-resin and cyanoacrylate, can't be broken down. They have to be scraped off which can't help but remove some of the wood, resulting in loose-fitting joints.

Reversibility also makes cleaning hands and removing glue seepage from newly assembled joints a relatively quick and easy task. Simply rinse or wipe with hot water. And it makes separation of sound glue joints possible by injecting hot water, steam, vinegar or denatured alcohol (which crystallizes old hide glue).

Initial Tack

Unlike other adhesives, hot animal hide glue bonds in two steps. An initial tacking occurs when the glue cools from its application temperature of 140-150° Fahrenheit to about 95°F. The bond becomes complete when the water evaporates out of the glue.

The initial tack allows you to glue two pieces of wood together without clamps. Simply apply the glue to both surfaces and rub the pieces together to work out the excess glue. As the glue cools, it gels and the pieces begin to stick. Position them correctly and let the glue dry to complete the bond.

As long as the pieces are not forced apart while the glue is still in the gel state, the tack is strong enough to create a good bond. On the other hand, if you don't like the positioning of the pieces, you can separate them for some time before the bond becomes too strong.

The glue blocks you see behind legs and on the inside corners of old case furniture were positioned with this rubbing technique, called a "rub joint." It's not uncommon to see glue blocks still sound after 200 years, especially if the grain of both parts runs parallel.

You can use a rub joint to replace broken pieces on carvings, small pieces of veneer, and other parts that would be difficult to clamp. You can also strengthen case furniture by regluing old glue blocks or by inserting new

Finger test. *Rub joints work well with hot hide glue because of the strong tack created when the glue cools to about 95°F. Use your fingers to check the strength of the glue as it ages and loses tack. The glue cleans off quickly in hot water.*

ones. Just be sure to remove chunks of old glue to create room for rubbing, and remember that the surfaces have to fit snugly for a good bond. You can't glue air spaces.

Yellow glue offers some degree of tack, so you can sometimes perform these tasks with this glue. But the tack is much weaker, so the slightest pressure during drying will move the parts and destroy the bond.

The technique of "hammer veneering," which is used to apply veneer using hot hide glue, is a form of rub joint. (For in-depth information on hammer veneering, see "Old School Veneering," issue #162.)

Preparing Hide Glue

Most hide glue is sold in granular form. To prepare the granules for use, soak the amount you need in water for about 10 minutes, or until they soak up the water and become mushy (like Grape-Nuts in a bowl of milk). Then heat the glue to about 140-150°F so it becomes liquid.

If you use hide glue often, an electric glue pot is worth buying. Otherwise, you can place a jar of the glue in water placed over a heat source (creating a double boiler situation), or heat the glue in a microwave. I know people who use a Crock-Pot.

The ratio of water to glue depends on the gram strength of the glue. For 192-gram strength, I find the ratio of $2\frac{2}{3}$ cups of water to one pound of glue works well. You want the glue to be about the viscosity of yellow glue. You can always add water or more saturated granules to adjust the viscosity of the glue.

For your first batch, I suggest you use $\frac{1}{4}$ lb. of glue and $\frac{2}{3}$ cup of water so you have less waste. Or reduce both amounts, keeping to the same ratio, if your needs are less for the job at hand.

If you leave the glue heating for a while, a lighter colored skin will form at the surface due to contact with cooler air. The first time you heat the glue, this skin may contain some dirt or other foreign matter. It's a good (but not absolutely necessary) practice to remove the majority of this skin from the glue pot, using a stirring stick or brush and throw it away.

From then on you can stir the skin back into the glue. Now and then, you'll have to add water to replace evaporation. To slow evaporation and the thickening of the glue, keep the container covered.

Hide glue is organic material, so it rots in time. The aroma becomes stronger and the strength, or tack, of the glue weakens. Eventually, mold will form on the surface of the glue. To retard this natural deterioration, store the glue in a cool place, such as a refrigerator. Be sure to cover the glue tightly so it doesn't dry out. — BF

Soak first. *To prepare hide glue for use, first soak the granules in water until they resemble Grape-Nuts in a bowl of milk. Then turn on the heat.*

De-skin. *The first time you heat hide glue with no lid on the top of the glue pot, a light-colored skin will form. It's good practice, but not essential, to remove most of this skin. From then on, you can stir the skin back into the glue with no loss of strength.*

Just add water. *For most projects the viscosity of hot hide glue should be about that of yellow glue. But you can easily change the viscosity by adding water or more saturated glue. You will have to add water now and then to make up for evaporation.*

Dealing With Rapid Tacking

Rapid tacking is an advantage when performing rub joints, but a problem when gluing up furniture with numerous joints—especially in a cold shop. The easy solution is to warm the wood beforehand to retard the gelling.

In the old days, cabinetmakers stacked furniture parts next to the shop stove to warm them. Factories made a "steam room" with temperatures as warm as 120°F for gluing up. With all parts together, the assembled pieces would be moved to a cooler room so the glue could harden.

Neither of these methods is feasible in most modern shops, but we have electric blow driers and heat lamps not available to our ancestors. I have used a combination of heating devices countless times when my shop was cold to create enough time to get all the parts together. Also helpful are laying the parts out logically and dividing complex objects, such as chairs and case furniture, into sections, assembling each separately before assembling the entire unit.

Keep in mind that gelling, which can cause a thick glue line on parts clamped edge to edge, is less of a problem in housed joints. As a tenon or dowel is slid into the mortise or hole, or as dovetails are assembled, the gelled "skin" on the surface of the glue is removed,

A better way. *Using small blocks of wood and the rub-joint technique with hot hide glue to install mirrors in frames is far safer than using a hammer to pound in nails or other metal fasteners. In this case, I'm reinstalling a mirror in an old frame after refinishing.*

exposing still-liquid glue underneath for some time.

Liquid Hide Glue

Franklin, the manufacturer of Titebond, makes a widely available product called "liquid hide glue." A similar product labeled "Old Brown Glue" is available at wpatrickedwards.com. Both are the same as hot hide glue, but with gel depressants added to keep them liquid at room temperature and preservatives added to retard deterioration for about a year. These glues redissolve just like hot hide glue, but they don't have an initial tack and don't dissolve well into old hide glue unless applied hot.

On the other hand, these glues are ready to use and have a long "open" time, even longer than white glue. They may be a good choice when there are many parts to be glued simultaneously, such as on Windsor chairs. **PW**

Bob is the author of "Understanding Wood Finishing" and a contributing editor to Popular Woodworking. *His video, "Repairing Furniture with Bob Flexner," showing extensive use of hide glue, is available from Taunton Press; 800-477-8727.*

Supplies

- **Merit Industries**
  800-856-4441 or
  meritindustries.com
- **Olde Mill Cabinet Shoppe**
  717-755-8884 or
  oldemill.com
- **Tools for Working Wood**
  800-426-4613 or
  toolsforworkingwood.com
- **Woodworker's Supply**
  800-645-9292 or
  woodworker.com
- **W. Patrick Edwards**
  619-298-0864 or
  wpatrickedwards.com

Animal hide glue is available wholesale in 50-pound quantities directly from the one remaining hide glue factory in the United States.

- **Milligan & Higgins**
  518-762-4638 or
  milligan1868.com

BY CHRISTOPHER SCHWARZ

Benjamin Seaton's Saws

One man's career choice in the 18th century drives a 21st-century woodworker into a saw obsession.

Englishman Benjamin Seaton is famous in woodworking circles today because he never took hammer in hand to follow his father into the cabinetmaking profession.

Because he never built furniture for a living, thousands of hand-tool enthusiasts have a clearer picture of how to do it themselves.

And because he never much used a handsaw or chisel, I now have a set of late 18th-century-style saws hanging above my workbench that I use all the time.

Seaton was born in 1775, the first son of Joesph Seaton, a cabinetmaker and Baptist minister. When Benjamin was 21, his father bought him a tremendous gift 10 days before Christmas: a set of about 200 woodworking tools. Benjamin built a nice chest for the tools, made a list of its contents and then for some unknown reason never put them to use.

During the rest of his life, Benjamin called himself a cabinetmaker, upholsterer, auctioneer and undertaker, but the historical record suggests he didn't do much woodworking. He died in 1834, perhaps of typhus, and his chest and tools survive to this day in the Guildhall Museum in Rochester, Kent. The chest and tools are a rare glimpse at what a period woodworker needed to build furniture.

Britain's Tool and Trades History Society published a fantastic book about the chest, "The Tool Chest of Benjamin Seaton," and when I first read that book about 10 years ago, I was inspired to build a version of his chest for myself. And some day I plan to build an even closer copy of the chest.

But the part of the book I became obsessed with was its section on his saws. The six handsaws and backsaws in Seaton's chest were made by John Kenyon of Sheffield and don't look like the saws I grew up with. The Kenyon saws were both elegant and strange to my eye. The tenon saw was 19" long – 7" longer than my tenon saw at the time. And there was a sash saw, a type of saw I'd never heard of.

Seaton in this century. *Until recently, saws like this haven't been available for almost 200 years. But now you can find out what it's like to use a period-style saw that's brand new.*

For years I tried to purchase saws just like Seaton's, but a writer's salary doesn't buy many mint 18th-century saws. So I tried to get custom toolmakers interested in making copies of the Kenyon saws for me. I wanted to know what these saws were like to work with. Were they different than modern saws?

After years of searching, I found Mike Wenzloff, a cabinetmaker-turned-sawmaker who was eager to make copies of the Kenyon saws for both me and Dean Jansa, another woodworker with a saw sickness.

First Wenzloff built the freakishly huge tenon saw. When it arrived, I was almost afraid to use it. Like the original, the sawplate seemed flimsy for such a big saw. But after cutting my first tenon with that saw, I was hooked. The saw's length makes fast and accurate cheek cuts, even in small workpieces.

Then he made the sash saw, which is a remarkable all-around saw, and the huge Kenyon crosscut handsaw, which just flies through the work when used properly.

Then history came full circle. Wenzloff now makes the complete line of six Kenyon saws, which are sold by The Best Things, in Herndon, Va. (thebestthings.com or 800-884-1373). They're priced a bit more than you'd pay for a typical premium handsaw, but they're worth it. The handles are exquisite, and the hand-filed teeth cut more smoothly than many of my Japanese saws.

Though I now own almost a complete set of these Kenyon saws, I found one way that Benjamin Seaton and I are different. Last week while cutting half-lap joints with the tenon saw, I laid the tool to rest on my now beat-up Seaton chest. When I stood up, the elegant handle hooked into my shop apron, plunging the saw to the concrete floor.

The fall splintered the horn at the top of the handle. That's a common place for old saws to get damaged, though the horn of Seaton's tenon saw is still pristine. I stared at my damaged tool for a moment, then I shrugged and hung the tool back above my bench. Bumps and dings are the sorts of things that happen when you actually use your tools. **PW**

Christopher Schwarz is the editor of Popular Woodworking *and has four DVDs on using traditional tools that are available through Lie-Nielsen Toolworks (lie-nielsen.com).*

PHOTO BY AL PARRISH