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JUNE 2005
ISSUE #148

POPULAR WOODWORKING

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ON THE COVER

Use similar construction techniques to build bookcases in four popular and good-looking furniture styles. We show you the tricks to make one bookcase (or 100) as easy as possible in a home shop.

Cover photo by Al Parrish

DEPARTMENTS

PROJECTS, TOOLS AND TECHNIQUES

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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. Safety First!

On the Cutting Edge Of Enlightenment

A while back I was cruising an Internet discussion forum and read through a thread that began with this question:

"I've just finished stage one of setting up my shop. I have a bench and some tools, but I don't have the money for a table saw. Can I start making projects without a table saw?"

Other woodworkers chimed in with advice: Get a miter saw for accurate cuts. Use a circular saw and a straightedge. Don't use a circular saw and straightedge. Buy an inexpensive benchtop table saw.

This got me thinking. How do people think furniture, buildings and bridges were built before power tools? It reminded me of something I once read: The typical suburban garage has more tools than were available in 1800 to clear the forests and build the cities between the Atlantic Ocean and the Mississippi River. What if those guys had waited for the table saw? We'd still be sending our taxes to London!

Why do so many woodworkers, the Normites, equate the craft with power tools? And why, for that matter, is there a growing number of hand-tool enthusiasts, the Neanders, who reject any tool with a cord attached?

The point here is not to take sides but to circle back to the original question about having a table saw. More fundamentally, how best to get started in woodworking and build skills leading to good craftsmanship.

The answer, I've concluded, is you really must learn both hand- and power-tool skills. Knowing both makes you a well-rounded woodworker, a "double threat" who can call on either skill set to deliver the best result.

I was not an early adopter of hand tools and I still have much to learn. For years my experience with planes and chisels resulted in frustrating, unsatisfactory results. The reason was a basic inability to produce a truly sharp edge. How was I to know what was sharp if I didn't know what sharp really was? Oh, I knew when my carbide saw blades or router bits were dull. And I knew exactly how to fix them – send them out to be sharpened!

I had a moment of enlightenment recently on a visit to Joel Moskowitz's Tools for Working Wood store in New York City. Joel loves hand tools, but he's even more passionate about the earliest woodworking "how-to" books, forerunners of today's woodworking magazines. Joel mentioned in passing the total absence of any early writing about sharpening. Then it hit me. Before the advent of power tools, sharpening skills were as common as driving skills are today. If you wanted to shave, cut down a tree, butcher a hog or even slay an enemy, you had to know how to produce a sharp edge. Your life depended on it, literally! To a woodworker, sharpening was second nature.

As power tools replaced hand tools during the Industrial Revolution, once-commonplace sharpening skills were lost, and much of the hand-tool know-how that built our country then slipped into obscurity.

If I could turn the clock back to the earliest days of my learning to work with wood, I'd learn to sharpen edge tools just like I learned many other skills. I would have been a better woodworker these past 25 years. And it would have given me something productive to do while saving up for a table saw. **PW**

Steve Shanesy
Editor & Publisher

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ADAM CHERUBINI

During the day, Adam Cherubini works with cutting-edge technology as an aerospace engineer. But at night, he builds baroque-style furniture with antique hand tools in an 18th century-style woodshop in his 1950s New Jersey home. This dichotomous lifestyle brings balance to his life, he says. Apart from raising three children, Cherubini has devoted much of his life to researching early woodworking techniques. He shares what he has learned with others by volunteering at Pennsbury Manor on Historic Trades Days (pennsburymanor.org) and by writing our new series, "Arts & Mysteries." His latest article, "Advanced Chisel Techniques," begins on page 82.

BOB DUNSTAN

Born in England and trained to make harpsichords, Bob Dunstan moved to Wyoming with his wife when he was 25. Discovering few demands for harpsichords, Dunstan spent the next 10 years building period furniture by commission out of a converted tractor shed on the banks of the Snake River, and raising two children. In 1987, he started Whitechapel Ltd., a catalog of fine furniture-grade European hardware. By 1990, Whitechapel kept Dunstan so busy that he had to quit his furniture business. Today, his catalog is managed for him, allowing him to return to furniture making and to create a new form of measurement – the "bob." (See "Farewell Fractions – Hello Bob" on page 96.)

Next Purchase: Power Jointer or Jack Plane?

Can a Jack Plane Do the Work of a Powered Jointer or Jointer Plane?

After reading the November 2004 issue, I have a question regarding hand planes. Christopher Schwarz wrote a very favorable review of the Veritas Low-angle Jack Plane (Tool Test, issue #144). Also in the issue was the "Insidious Mistakes" article, which indicated one of the mistakes that inexperienced woodworkers make is buying too many planes. I always try to do research before making any purchases, and just about all of the publications I have read say the same thing: Start a plane collection with a block plane, smoother, jointer and shoulder plane.

The Low-angle Jack was highly rated and appears to be reasonably priced. Can it function as a jointer? I have a Lie-Nielsen adjustable-mouth block plane, and have been looking at their smoother and jointer, however the expense associated with the jointer especially is significant. In fact, it exceeds the price of the Grizzly 6" power jointer.

So, what's a beginner to do? Can the Low-angle Jack function as a jointer? Is it better to invest in a high-quality hand plane jointer, such as the Lie-Nielsen, or would it be better to go with something like the Grizzly?

Marc Wsol
Grafton, Massachusetts

The Veritas Low-angle Jack plane is a versatile tool for any shop, but I don't think it's a good substitute for either a power jointer or a jointer plane, unless your work is primarily small in scale – jewelry boxes and the like.

The virtue of a power jointer is that it quickly trues both the faces and edges of rough stock. This operation can be done with hand planes, but it is labor-intensive.

The jointer plane does have great merit: Its virtue is the length of its sole, which allows it to knock down the high spots instead of following the hills and valleys of a board. I have found it ideal for flattening glued-up tabletops and panels, and squaring edges that are difficult for my powered jointer.

Shorter planes, such as the jack plane, can true a shorter board reliably, but they have great difficulty with cabinet-size components (22" and longer). If anything, the Veritas Low-angle Jack is a substitute for a smoothing plane in a shop that blends hand and power tools. Most stock we work with is pretty flat out of the planer, so the jack plane has a pretty easy time smoothing it, especially when set up with a curved blade. Plus, the ability to use a high-angle blade allows you to smooth tricky grain.

Bottom line: You probably will want both – someday. I'd start with the power jointer to take care of the grunt work and some day add the low-angle jack to your arsenal.

— Christopher Schwarz, executive editor

Do the Math With the WoodRat – It's Not as Expensive as You Think

In response to the statement that the WoodRat is expensive at $800 ("The WoodRat," issue #146), I would point out that to purchase two Leigh jigs (the FMT and D4) required to make some (but not all) of the joints I can make on my WoodRat would be about $1,400. The WoodRat is the most versatile accessory to a plunge router I've ever seen.

I was in the process of designing a two-axis manual control system using 80/20 extrusions

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WRITE TO US

Popular Woodworking welcomes letters from readers with comments about the magazine or woodworking in general. We try to respond to all correspondence. Published letters may be edited for length or style. All letters become the property of *Popular Woodworking*. How to send your letter:

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when I came across the WoodRat. It does everything I had envisioned and more. I've had mine for three years now, and if all my tools were stolen, or destroyed, it would be one of the first things I would replace.

Randall Thomas
Henderson, Nevada

Thoughts on High-speed Steel Chisels

The testing protocols devised by Christopher Schwarz for chisels ("High-speed Steel Chisels are Beyond Tough" February 2005) are objective and the results surprised me. In metalworking, high-speed steels, especially those alloyed with cobalt, often are brittle. I would have expected the edge to fracture in hard service as readily as a carbon-steel edge.

High-speed steels were originally devised to obtain "hot-hardness" (the ability to retain as-quenched hardness for hours) when working at temperatures that would draw the temper out of quenched carbon steels. There are different analyses of high-speed steel and, especially for industrial woodworking, certain analyses vary in their resistance to abrasion and even a type of dulling caused by steam and heartwood extractives at the cutting edge – more akin to accelerated corrosion than abrasion. High-speed steels really shine predominantly when hot-hardness is needed.

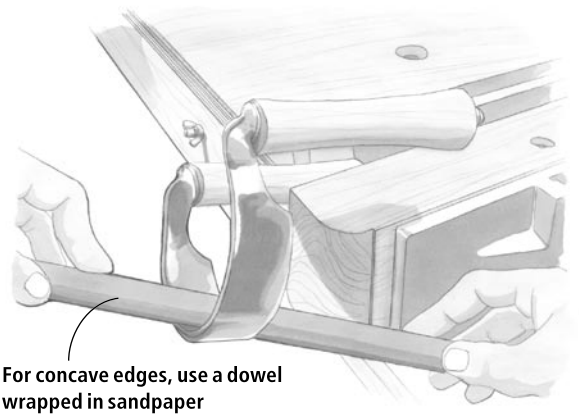
When a carbon steel chisel is sharpened on a grinder and the edge turns blue, the temper is drawn and that edge is ruined. Mr. Schwarz correctly points out that these high-speed steel chisels are designed for rough applications and I would like to point out that these chisels could be sharpened expeditiously on grinders and returned to service with the edge hardness unimpaired, even if discolored. I have done quite a bit of flooring and Victorian restoration, and these are two applications where I often had to do whatever it took, and unpleasant surprises go with the territory. These chisels could justify their premium price primarily where rapid return to serviceability after severe damage is necessary. **PW**

Cameron Brown
Salem, Oregon

CORRECTION

In the "One-weekend Router Table" article (April 2005), the Milwaukee router we used was model 5625-20, not 5625-29 as stated in the text.

How to Sharpen Odd Or Curved Blades



Illustrations by Hayes Shanesy

Sharpening Curved Edges on Flat Sharpening Stones is Tricky

A friend has asked me to sharpen a round knife he uses for leatherworking. This knife is different than anything I use in my wood carving and other woodworking. Before I begin putting metal to waterstone I wanted to seek advice on any techniques that might assist me in getting this knife back to a keen edge.

The handle behind the blade – which is the shape of a half-circle – makes it difficult to push the blade across the stone. And even the shape of the curved cutting edge adds another dimension of difficulty.

I know your magazine runs an occasional article on sharpening but it seems that chisels get most of the attention. Perhaps in the future you can do a piece on sharpening knives of various types: carving gouges, and jointer and planer knives. I'm surprised at the number of woodworkers that shudder at the thought of sharpening any blade. There seems to be a lack of information on the subject.

Jeff Acord
Belgrade, Montana

I've never sharpened a leatherworking tool so I'm not sure how sharp it has to be. That said, when I sharpen any odd-shaped tool for woodworking, I tend to avoid my sharpening stones. Instead, I'll secure the tool in a handscrew and clamp the handscrew in my bench vise. Then I work the edge with sanding fids – essentially curved scraps of wood with adhesive-back sandpaper stuck to them.

For a tool with a convex blade, such as a moulding plane, I'll make a cut using the tool in some softwood. Then I'll stick some sandpaper to the shape and work the edge. For curved knife-like tools, I'll trace a section of the curvature on a scrap, band saw out the shape, smooth it with a rasp and then stick the sandpaper to that. Move up in grits until you get to the level of sharpness you require – not everything needs to be as sharp as a plane iron.

For sharpening marking knives, for example, I'll start with #150 grit and progress up to about #300 grit. That's good enough to sever wood fibers cleanly.

For sharpening concave blades (such as an inshave), you can use a large dowel wrapped in sandpaper in a similar manner.

— Christopher Schwarz, executive editor

How Can I Make Small Patches For Repairing Veneer?

I recently purchased a coffee table that has some age on it. It has a veneered top and someone has made an attempt to replace a small area. It is a very bad attempt.

I have some walnut that's more than 100 years old that would match up well. The prob-

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lem I have is trying to figure out which way I should go about making thin enough pieces. The piece or pieces will not be more than 2" long. I would appreciate any suggestions.

Jim Teitloff
Nashville, Tennessee

The simple answer is to make your big pieces thin and then cut them to size. For larger thin pieces, use a carrier board on your planer. Essentially you use some double-sided tape to attach the walnut to a wide piece of MDF or other board, and run the piece through the planer until the veneer is the thickness you require.

For smaller pieces (2" long applies) surface one side of a thicker piece then set your table saw to trim off a thinner 1/16" piece, to the outside of the blade. The larger part of the wood guides against the fence. After it's thin, break out the utility knife and have some fun!

— David Thiel, senior editor

Where Can I Find the Materials for Your 'Authentic Arts & Crafts Finish'

I am writing to inquire about a substitute for Lilly Industries' "warm brown glaze." I read your recipe for staining Arts & Crafts furniture using J.E. Moser's Shearton red dye followed by boiled linseed oil and then Lilly Industries' "warm brown glaze."

You wrote that basically you live and die by this glaze in finishing Mission-style furniture. I have found the Moser's dye; but, as you no doubt know, Lilly Industries was acquired by Valspar some three years ago, and hence, the warm brown glaze is no longer available. Can you suggest a supplement or alternative glaze for my finish?

Dr. Michael Reid
Salt Lake City, Utah

Since we first published that finish recipe, that glaze has gone through a long and tortured history: Sold, resold and now discontinued.

But there is good news. Recently our editor and publisher, Steve Shanesy, spent about a month testing 30 or so different products to try to find one that replicates the look of one of Gustav Stickley's original finishes. After a lot of sample boards, we settled on using General Finishes' "Java" stain. It's a one-step coloring finish. Rag it on, let it flash and then wipe it off. Then topcoat it with lacquer, varnish, shellac or whatever you use normally.

I just finished a Stickley D-handled bookcase with it and it looks as good as the three-step finish. General Finishes are widely available at home centers and woodworking stores. We bought ours at Lowe's.

— Christopher Schwarz, executive editor

Should I Rip Down My Lumber to Narrow Widths to Make a Tabletop?

I am making a kitchen/dining table out of black walnut. When gluing up the boards to get the width for the top, do they need to be narrower than 6" wide for gluing?

I have some boards that are 8" and 10" wide. But I read a tip somewhere that you should use pieces that are smaller than 6".

Also, do you have any finishing recommendations for the table?

Timothy Souder
Higginsville, Missouri

The adage about gluing up a tabletop from narrower boards to reduce warping is – in my opinion – not the way to go. Modern kiln-dried lumber in our climate-controlled homes isn't going to cup and twist very much.

The top of a table is the most visible part of the project. It should look as good as possible, and wide boards generally look better than narrow ones. Match the boards without regard for their width (or even the direction of the boards' annular rings). Just make the top look its best.

As to finishing, a varnish or polyurethane varnish would be wise because of its exposure to heat and daily wear. I don't recommend shellac for dining tables, however; it offers poor resistance to heat and alcohol spills (wine, etc.) **PW**

— Christopher Schwarz, executive editor

WRITE TO US

Every day we get questions from readers on all subjects about their woodworking. Some are letters; many are e-mail messages. 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. In addition to the hundreds we answer privately every month, we want to share the best questions here with readers.

Send your questions via e-mail to popwood@fwpubs.com, or by mail to:

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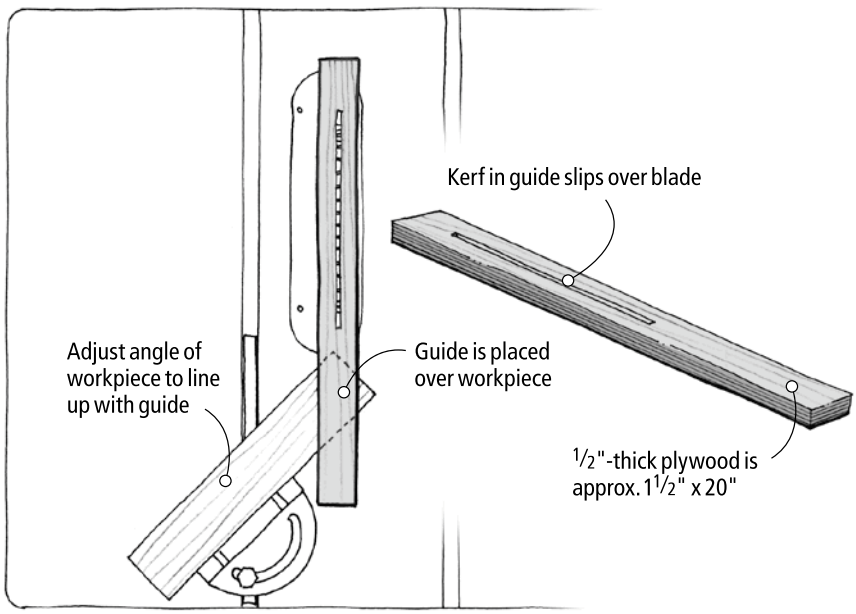
Compiled by Paul Anthony
Illustrations by Matt Bantly

Setting Miter Gauge Angles

THE WINNER:

When cutting an angle on the end of a board using the table saw, I never liked the aggravation of having to set up the cut using a bevel gauge. I wanted to find a quick, easy way to set my table saw's miter gauge to an angle drawn on my workpiece. I tried laying a straightedge against the side of the blade, then aligning it parallel to the cutline by holding the workpiece on my miter gauge and tilting the gauge. However, I found that this involved holding too many things in place at once.

I found that the solution was to first make an appropriate straightedge by fully raising the running blade up through a piece of 1/2"-thick plywood about 1 1/2" wide by 20" long to create a kerf in the center. For the straightedge, use a piece of plywood with parallel edges, and clamp the piece in place against the rip fence to make the cut. Now, to set up my miter gauge, I simply slip one end of the kerfed straightedge over the raised blade, with the other end laying over the workpiece next to the cutline. The straightedge will now stay in place while I adjust the angle of the workpiece and miter gauge to set the cutline parallel to the blade. All that's left is to shift the cutline in line with the blade and make the cut.



Roger DuBois
Dudley, Massachusetts

CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a great set of three perfectly matched Veritas hand planes from Lee Valley. These three high-quality planes (7" Medium Shoulder Plane, 15" Low-angle Jack Plane and a 5 1/2" Apron Plane) make a great three-piece set to tackle almost all of your woodworking needs with ease. This terrific prize package is valued at almost $400.

veritas® Tools Inc.

Runners-up each receive a check for $75. 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.

Keep a Brush Fresh While Waiting for the Next Coat

When applying solvent-based finishes with a brush, you don't have to fastidiously clean the brush after every use. If you're going to be using it to apply a subsequent coat of the same finish within the next day or so, just swish the brush around in some reasonably clean solvent, then slip it fully wet into a Ziploc sandwich bag. Zip the top closed as much as possible, then fold the bag around the enclosed brush to maintain its shape. Lay it down on a flat surface so the solvent remains dispersed throughout the bristles. Before using the brush again, simply squeeze out the excess solvent.

Carrie Burns
Denver, Colorado

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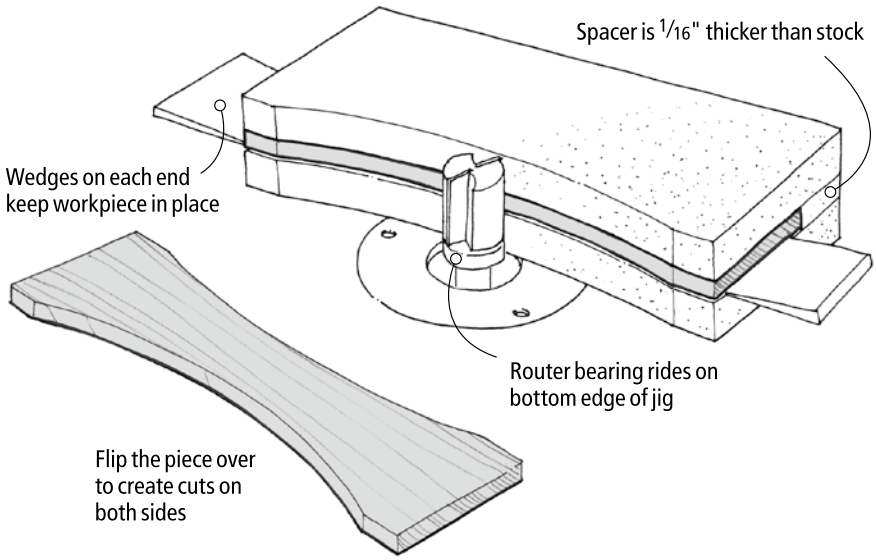
Double-sided Router Template Jig

Recently, I needed to make 24 cradle slats with slightly concave edges. Using a router template seemed the perfect solution for the task, except that half the cut would be made against the grain, inevitably resulting in tear-out during half of the cut. To avoid this, I considered using two bits: one with a top-mounted bearing and the other with a bottom-mounted bearing. This would allow me to flip the workpiece/template assembly over halfway through the cut to favor the grain, but it seemed too time-consuming.

Instead, I made a pair of identical templates by attaching two pieces of stock together with double-sided tape and cutting them to shape on the band saw. Next, I cleaned up the cut with a spokeshave and drum sander. After separating the two pieces, I glued them both to a piece of spacer stock that was about 1/16" thicker than my slat stock.

Now it was a simple matter of band sawing each workpiece slightly shy of the shape cutline, then securing the piece in the template jig using thin wedges tapped in from both ends. Using a 3/4"-diameter flush-trim bit with a top-mounted bearing in a table-mounted router, I routed halfway in from one end, then flipped the whole thing over to finish the cut from the other end. To rout the opposite edge, I just removed the wedges, flipped the slat, re-wedged it, and repeated the sequence. It was fast, easy and free of tear-out. The same process could be used for any number of shapes to be template-routed.



Colin Rogers
Tuolumne, California

Aluminum Winding Sticks

Winding sticks are time-honored tools for checking for twist, or "wind," in a board or cabinet case. Traditionally made of straight-grained wood, winding sticks are used in pairs, placed roughly parallel to each other at opposite ends of the surface to be checked. The sticks effectively extend the surface in question so that sighting across the tops of the sticks with both eyes open tells you immediately whether both ends of the surface are in the same plane or not.

My winding stick trick, which I actually learned from chairmaker Mike Dunbar, is to use aluminum angle instead of wood, which can warp out of true. Aluminum angle is straight, inexpensive, commonly available at home supply stores, and easy to cut to any length. The 3/4" angle is wide enough, but make sure to get the 1/8"-thick variety, as the thinner-walled stuff may bend. It's best to place the lengths standing on their legs on the surface, while sighting across the peaks. This also gives the sticks good footing on irregular surfaces that might tip narrow-edged sticks. Painting one of the lengths white will improve the contrast, helping you sight better.

Tod Herrli
Marion, Indiana

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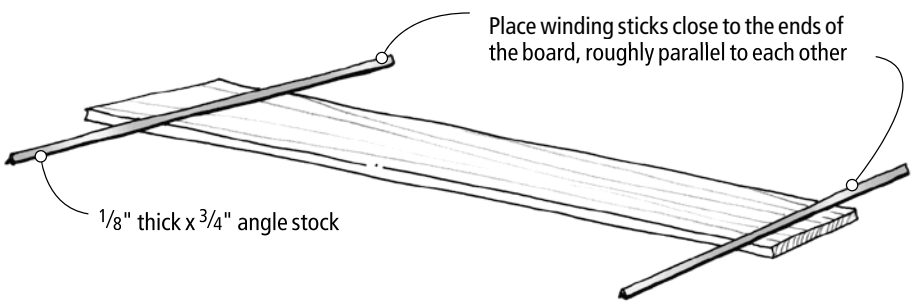

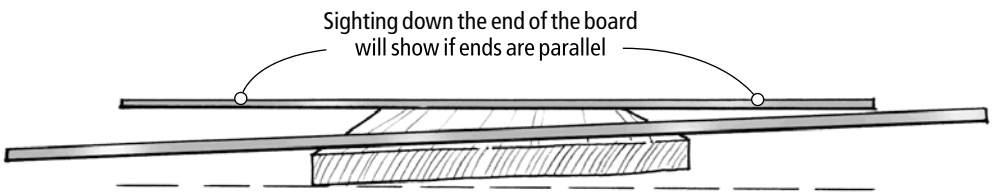

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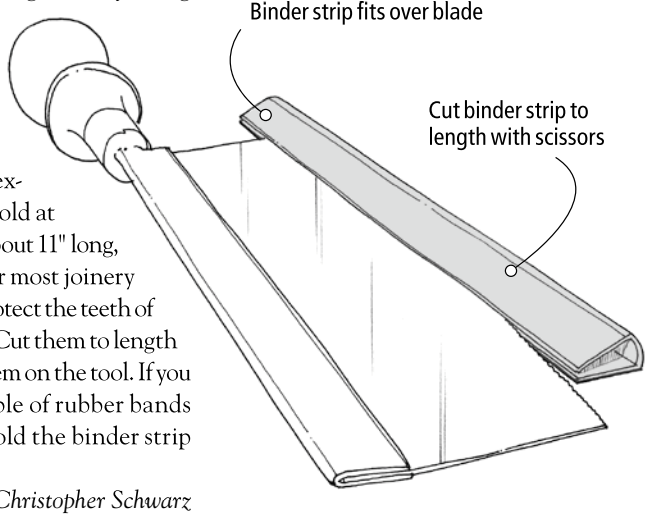
Protecting Saw Teeth

The teeth of your handsaws – whether they're Western or Japanese-style saws – are quite delicate. A bit of rough handling or even jostling in a toolbox can bend or break them. The simplest solution to protect the teeth of your saws is to use the long plastic clips that come with inexpensive report binders sold at office-supply stores. At about 11" long, one of them is perfect for most joinery saws. Two of them will protect the teeth of most full-size handsaws. Cut them to length with scissors and slide them on the tool. If you like, you can slip a couple of rubber bands over the saw blade to hold the binder strip in place.



Christopher Schwarz
Executive Editor

Lipstick Traces At the Door

Of all the woodworking tools and supplies I've swiped from my wife's makeup kit, lipstick is among the most useful. I keep a stick of it in my toolbox for marking lock mortise locations in door jambs. After installing a lockset in a door and nailing the door stop in place, I wipe the lipstick (I prefer "Midnight Passion") across the end of the bolt. I retract the bolt, close the door, and let the bolt kiss the door jamb to indicate the best placement for the bolt mortise and striker plate.

Paul Anthony
Riegelsville, Pennsylvania

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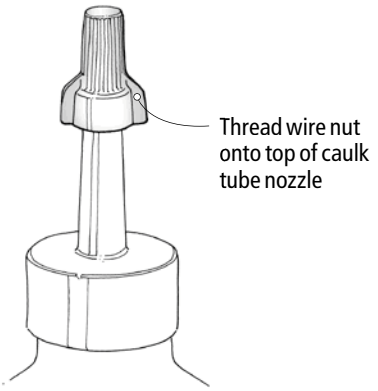
Refreshing a Sled to Restore Accuracy

I have become a firm believer in table saw crosscut sleds. A sled can carry a long, heavy board past the blade, and the saw kerf in the sled panel effectively serves as a zero-clearance throat plate, allowing me to line up a cut with one edge of the kerf.

Recently, however, I used a blade that inadvertently widened the kerf in the sled. When I remounted my favorite blade, I discovered that I had lost my cutline reference. To get it back, I "skinned" the sled panel by covering it with a piece of 1/4"-thick hardboard, such as Masonite, then made a cut with my original blade. I screwed the hardboard to the sled panel so I can continue to use it for a long time. Whenever the kerf widens unacceptably, I simply unscrew the material, slide both halves against each other at the center, screw them down again, and make a fresh cut. The adjustment takes only a few minutes, and is much cheaper than making a new sled.

Robin Frost
Clovis, California



Capping Caulk

When using tubes of caulk or adhesive, I've gotten annoyed at the amount of product eventually wasted in partially used tubes. Many tubes don't come with any sort of tight-fitting cap to prevent the contents from drying out. I tried sealing the tip with different things, including towels and duct tape, but nothing made a tight enough seal. But then I discovered what turned out to be an old trick: capping tubes with electrical wire nuts. These plastic caps have a metal coil interior that is designed to thread onto the ends of electrical wires to join them together.

Available in different sizes at hardware stores, wire nuts are inexpensive and will tightly seal the tube to prevent the contents from hardening. You'll want a variety of sizes because the interior metal coil needs to be the appropriate size to thread onto the plastic tube tip, whose diameter depends on how short it was cut.

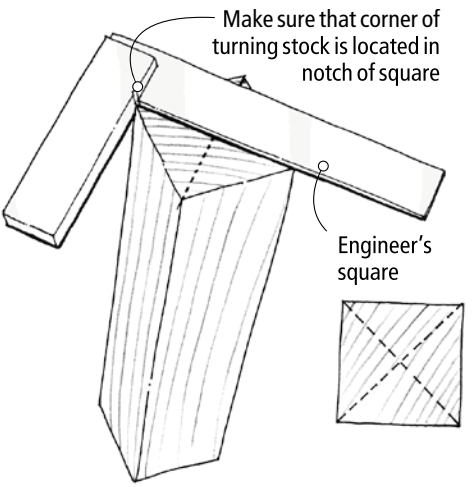
Arthur Shady
Oak Ridge, Tennessee

A Quick Swing to Center

When marking out centers on the ends of square turning stock, it's usual to lay out lines connecting opposing corners, with the center lying at the intersection of the lines. This can be done using a miter square or even a short straightedge. In both cases, however, you have to carefully align your guide with the corners of the stock. But there's a quicker way.

Engineer's squares – which are accurate, inexpensive and useful around the shop – have a notch at the intersection of the blade and body. Meant to accommodate the tip of a pencil, the notch can serve as a registration point for the corner of the stock. Simply tuck the workpiece's corner into the notch, swing the blade to the opposite corner, and draw your first line. Repeat the process on an adjacent corner to create your second line. Quick. Easy. Done. **PW**

Dave Whiting
Townsend, Massachusetts



Hitachi C12LCH Digital Readout Compound Miter Saw

Not having to decipher hash marks to determine where your miter saw is set to cut? Priceless. (Well, actually it's $370.) Hitachi now offers a 12" compound miter saw with digital readouts for both the miter and bevel settings, right up front, where you need them. But wait, there's more! The C12LCH also has a laser to guide your cut!

OK, enough marketing. We found the saw in good condition out of the box, but we needed to tweak the fences to align them with one another and with the blade. This wasn't a crisis because the fences are separate castings and are easily adjusted independently.

The digital display is easy to read and offers a backlight feature to allow for changes in ambient lighting. The scale reads out in half-degree increments, except when you need to cut crown moulding and need a 35.3°, 31.6° or 33.9° setting. Then the scale is able to read in tenths of a degree. Hmmm.

We also found some play (about one-quarter of a degree) between digital settings that could be a problem when you're tweaking a miter setting (as we all do) and you're relying on the digital scale.

The readout also has a feature you need to be aware of. It resets itself to zero each time the power is turned on. So if you put the saw away and bump the miter or bevel by 1°, you could end up with every cut off by a degree.

The laser is adjustable and operates without the blade running, which we like. We weren't as fond of the fact that the blade hides the laser line as it enters the cut.

We also found the saw loud (97 dB) and it could have benefitted from a soft-start feature – the tool exhibited a strong jerk at start.

As a cost-saving option, Hitachi offers the C12LC ($345, with just the digital readout) and C12FCH ($289, with just the laser).

Bottom line: It's a decent saw and we think the digital readout is a very good addition. Some of the features are almost what we want, but they fall short. And for a saw priced at the top of the category, we'd like a little more.

— David Thiel

For more information, circle #162 on Free Information Card.

SPECIFICATIONS

Hitachi C12LCH 12" Miter Saw
Street price: $370
Motor: 15 amp, 4,000 rpm
Miter range: 0° - 52°, left and right
Performance: ●●●○○
Price range: $$$$
Hitachi: 800-829-4752 or hitachi.com/hpt

AngleMag Sets the Amateur Sawyer Straight

Learning to handsaw to a line is a fundamental woodworking skill. And I routinely see many new woodworkers struggle mightily with making straight and square saw cuts.

The Australian-made AngleMag is an interesting jig that acts as a guiding hand for your saw's blade. Four magnets buried behind a plastic cover keep your saw cutting in a straight line at virtually any angle imaginable.

The AngleMag is clever and it allows you to quickly switch between one angle and its complement, a feature designed for cutting dovetails. The three screw clamps hold the jig rigidly on stock up to 2" thick. And the fit and finish, instructions and online tutorial at the distributor's web site are first-rate.

I have only three real complaints with the jig. First, it's expensive – $125. Second, you can use it effectively only with saws that are perfectly set and don't have a back on them. If the teeth of your saw are set even a little off, the cut is difficult: The saw will try to wander but the magnets will try to correct it. The result is a less-than-optimal cut. Luckily, most (but not all) Japanese saws are well-set by the factory.

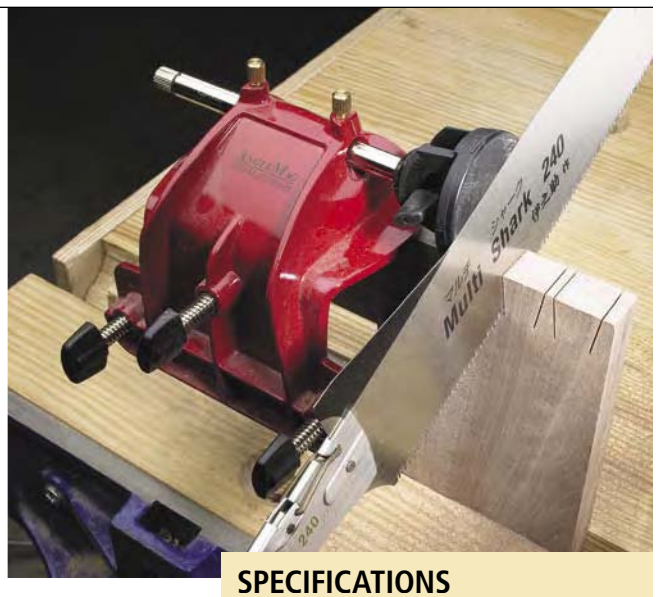
My third gripe is philosophical. I think sawing by hand and eye is one of the most worthwhile skills woodworkers should develop. It frees you from jigs and even your table saw. I fear this jig will slow the acquisition of this skill.

That said, the AngleMag really delivers the goods: Within minutes of opening the box you can be sawing straight and clean lines, even if you have little experience with a hand saw. Plus the joints you can cut with ease with the jig are pretty amazing.

So if it's this jig that opens your mind to the wonders of handsawing, then in the end, it's a thing worth owning.

— Christopher Schwarz

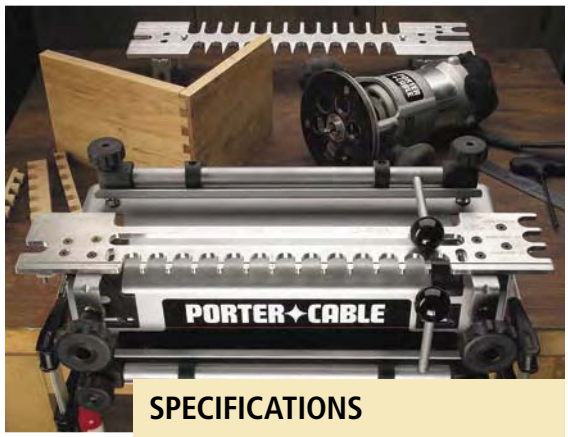
For more information, circle #163 on Free Information Card.



SPECIFICATIONS

AngleMag
Street price: $125
Cutting angles: -1° to +46° in four planes: 0°, 90°, 180° and 270°
Stock capacity: 2"
Performance: ●●●●○
Price range: $$$$$
Tools for Working Wood: 800-426-4613 or toolsforworkingwood.com

New Porter-Cable Dovetail Jigs are Simpler to Use



I've yet to find a dovetail jig that I find simple. That includes the Porter-Cable Omnijig, which has been a mainstay among dovetail jigs for decades. But the Omnijig's new little brother makes things easier than many.

The new jig (we call it the "LittleOmni") is smaller, handling a maximum 12"-wide board, but is capable of handling stock 1/4" to 1 1/8" thick. There are actually two model numbers for this jig (4210 and 4212) with the only difference being the number of templates included. The 4210 comes with a half-blind dovetail and dado template, while the 4212 also includes a through-dovetail/box-joint template.

The jig actually works much like the Omnijig. But they've added alignment lines on the templates and jig, and a router bit depth stop that takes the math and set-up out of the equation. The clamps have also been simplified and sandpaper has been added to the locking bars to improve the gripping power.

The jigs are also capable (templates permitting) of cutting rabbeted half-blind dovetails, and sliding dovetails. Additional templates are also available to create miniature dovetails.

This *is* a better dovetail jig. It's well made, competitively priced and easier to operate with good results. But I'm still looking for a jig that makes dovetails simple. *— DT*

For more information, circle #164 on Free Information Card.

SPECIFICATIONS

Porter-Cable 12" Dovetail Jigs
Street price: #4212: $150, #4210: $110
Materials: Stamped steel and aluminum
Performance: ●●●●○
Price range: $$$$
Porter-Cable: 800-321-9443 or porter-cable.com

Glen-Drake Hammer for Dovetailing and Carving

Cutting dovetails by hand involves a lot of personal choices – from the saw to the chisel to even which part of the joint you cut first. So it was with great trepidation that I tried the Tite-Hammer from Glen-Drake Toolworks.

However, after a couple sets of dovetails, I was sold. The Tite-Hammer offers a level of control and sensitivity that traditional wooden mallets don't give me. The small size of the hammer allows you to wrap your index finger over the head of the tool with the handle nestled in your palm.

In fact, the tool feels like a smooth river stone in your hand and directs your force exactly where you want it.

The hammer has two faces (one for striking wooden-handled chisels; the other for plastic) and it is available in four weights. I'm an aggressive chopper and cut lots of case dovetails, so I chose the heaviest hammer, the No. 4, at 14 ounces. If your wooden mallet is a bit of a wild card, the Tite-Hammer will put you back in charge. **PW** *— CS*

For more information, circle #165 on Free Information Card.

SPECIFICATIONS

Tite-Hammer
Street price: $40 to $50
Head weights: 6, 9, 11 and 14 ounces
Total length: 4 1/2"
Handle: Tanoak
Performance: ●●●●○
Price range: $$$$
Glen-Drake: 800-961-1569 or glen-drake.com

LITHIUM ION CORDLESS

A few years ago 24-volt tools were introduced and we were wondering just how far cordless technology could go. Now Milwaukee (milwaukeetool.com) has announced a 28-volt cordless tool line that uses lithium ion battery technology.

With this new technology, Milwaukee is promising twice the run time, more power and less weight than that found with a standard 18-volt NiCad battery. Some other advantages of lithium ion, according to the company, include higher performance in a wider temperature range, fade-free power throughout the entire discharge cycle, and because the batteries use no cadmium, they're more eco-friendly.

The new tools also include a smart battery with an on-board fuel gauge to show you how much charge is remaining.

Lithium ion batteries have been used for years in cell phones and digital cameras, but the technology was never a good fit for high-current draw applications such as power tools.

Milwaukee partnered with E-One Moli Energy of Canada to develop a battery cell utilizing lithium manganese to overcome the high-draw hurdle.

The new line will initially include a portable band saw, drill/driver, circular saw, reciprocating saw and standard drill/driver. More tools are already in the development stage. *— DT*

ABOUT OUR TOOL RATINGS

Performance is rated on a one-to-five scale. You won't see a low rating ("one or two") because we don't publicize inferior tools. "Five" indicates the leader in the category. Five dollar signs indicates highest price in the category. Three indicates an average price. If you have tool questions, call me at 513-531-2690 ext. 1255, or e-mail me at david.thiel@fwpubs.com. Or visit our web site at popwood.com to sign up for our free e-mail newsletter.

— David Thiel, senior editor

Box Joints

Cut this stout joint using a simple jig, and your table saw or router.

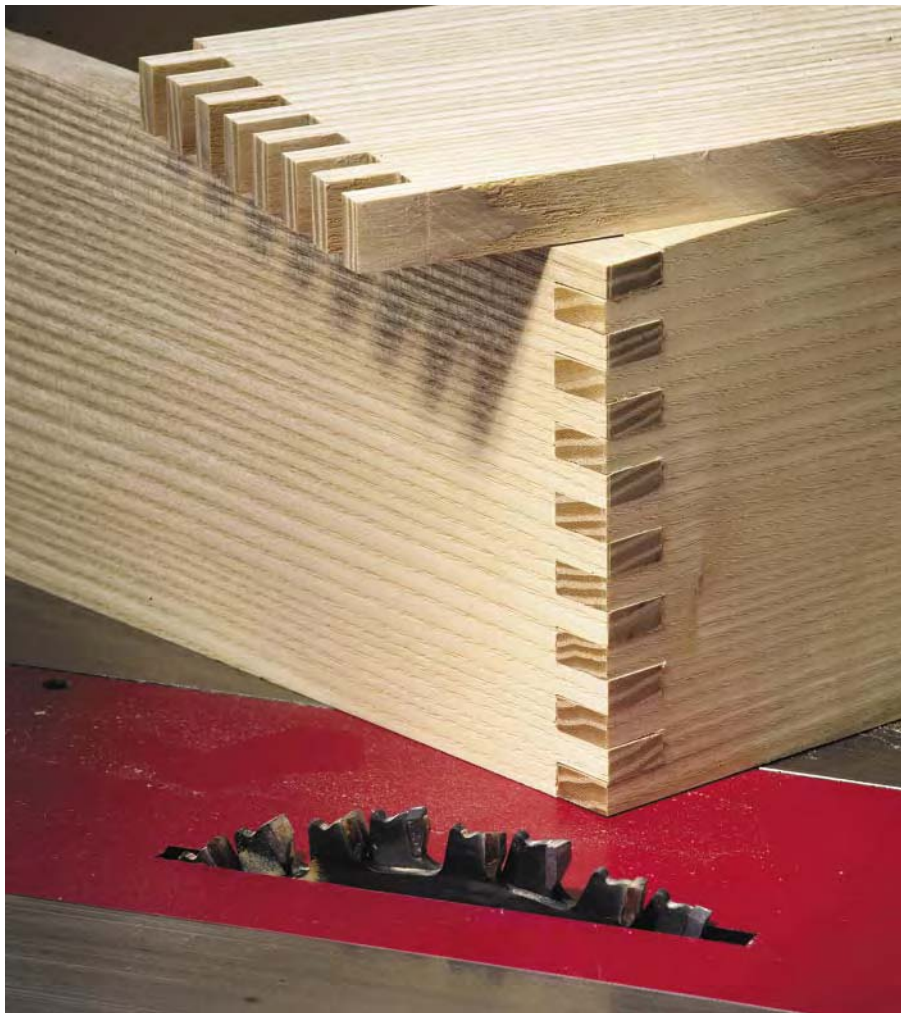


Photo by Al Parrish

Visit most any antiques store or flea market, and you're sure to see stacks of old wooden boxes marked with the logos of bygone businesses. Small boxes for cigars, big ones for fruit and lots of in-between sizes. All are assembled at the corners with interlocking square pins or fingers – the box joint.

The box joint is a sort of square-cut through dovetail. It's used in the same situations as the dovetail – assembling boxes, drawers and casework. It has pretty fair mechanical strength, but what it does is create a tremendous amount of gluing surface to create a stout joint.

You may know this joint as a finger joint. I use that name for an interlocking edge-to-edge joint that's cut with a special bit.

Look at the box-jointed object above. The end of the piece on top is comb-like, with uniform pins and slots. The pins on this board fit into the slots on its mate and vice versa. So making the joint is all about cutting a series of slots to form a series of pins.

You can cut the slots in several ways. The most obvious is on the table saw with a dado cutter. Make a little jig to attach to the miter gauge – or an independent one that rides in both miter slots – and go to town. But the table-mounted router does a clean job, too, and in the same amount of time.

The Box-joint Jig

Whether you do the work on the table saw or the router table, the process is the same, and so is the jig. What the jig does is position the work so the cuts are separated by pins that are the same size as the cuts. The critical element is a little wooden "key." The key is custom-made, so it fits the cut exactly. It's attached to the jig in a way that permits lateral adjustment so you can control the spacing of the cuts.

The box-joint jigs I've made are miter-gauge-like, with a separate facing into which the key is glued. The jig itself can be any scrappy old thing, so long as it's accurate, with the back perpendicular to the saw or router table. You can change the facing as dictated by wear and use.

While you probably can get acceptable results cutting 1/2"-deep slots on a jig set up for a 3/4" depth-of-cut, splintering or "blow-out" is likely to occur as the bit exits a cut. The backing is 1/4" above where the tip of the blade or bit cuts through the workpiece, which is as good as no backing at all.

While it's possible to reuse a facing, it may be better to use a fresh pair of slots – not necessarily a fresh facing – for each new job. (By sliding the facing fully right for one job, then fully left for another, and then rotating it 180° and repeating, you should be able to use a single facing for at least four jobs. Then you can trim it down and drill new mounting holes and use it for a couple more.)

I made an independent box-joint jig for the table saw (shown at right) that rides in both miter slots and has the capacity for blanket-chest-size parts. Candidly, I haven't used it on anything bigger than roughly 2'-square, 8"-high drawers. The particulars are shown in the illustration at right.

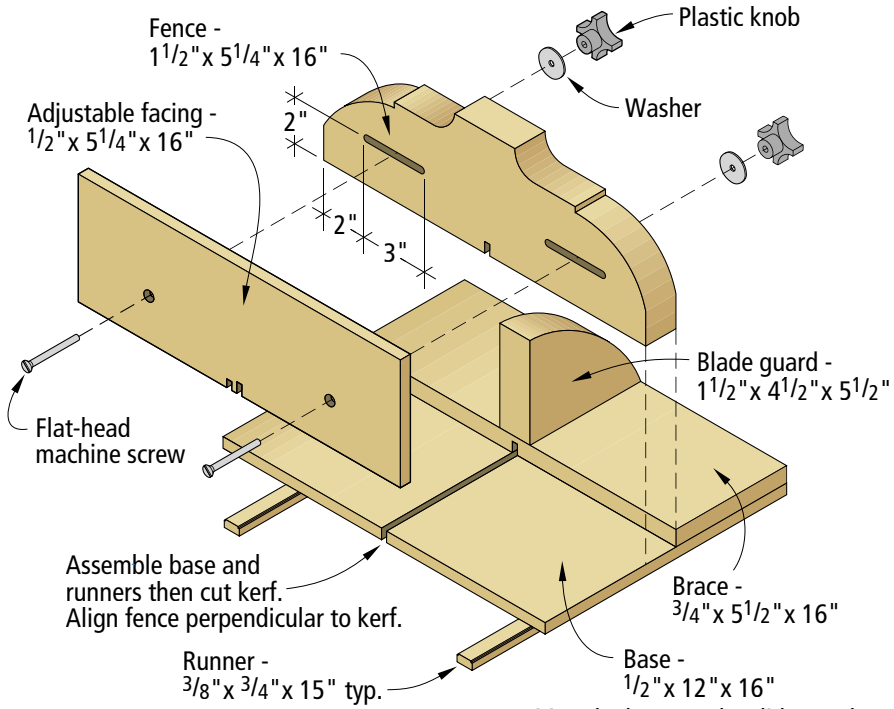
To make the jig, select suitable materials from your scrap pile. I used sheet goods (plywood and MDF, primarily) for most parts because they're stable, and because I always seem to have odd scraps around. The "key" is the one part of the jig that should always be a hard wood. It's subjected to a lot of wear, and

by Bill Hylton

Bill is the author of several books about furniture construction and router operations. When he isn't writing about woodworking, he's doing it in his home shop in Kempton, Pennsylvania.

if it's too soft, it will deform and throw off the accuracy of your cuts. The pins won't mesh, in other words. Except for the replaceable facing, glue and screw the parts together.

My router tables are devoid of miter-gauge slots. So for router-table use, I have a small box-joint sled, shown below right. To guide it, I clamp hardboard or plywood strips to the tabletop – the sled is then trapped between them. These fences allow the workpieces to extend beyond the jig's edge. You can cut joints on wide stock as easily as on narrow boards.



Box-joint jig

Using the Jig

The initial step is to reconcile the slot width and the width of the workpieces. You really want to begin and end each array of pins with a full pin or a full slot. To accomplish this, the width of the boards should be evenly divisible by the slot width. If this isn't the case, then it's best to change either the slot width or the joint width.

A corollary is that a joint layout that begins with a full pin and ends with a full slot mates two identical pieces. Therefore you can cut both at the same time. All four parts of a box can even be cut simultaneously.

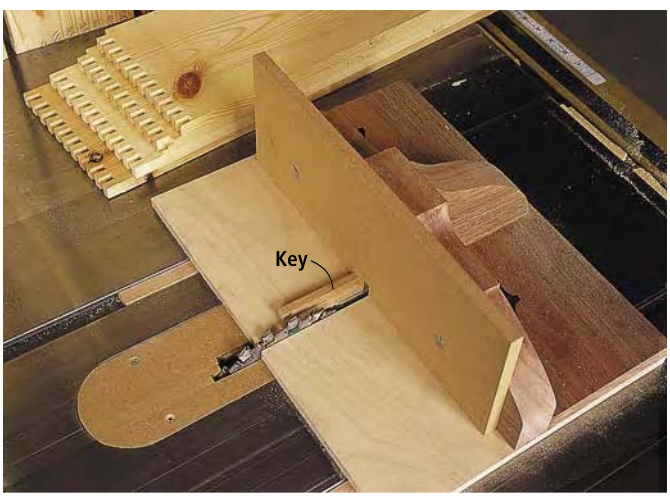
If the layout begins and ends with a full pin, you must cut the sides and ends in sequence. I'll explain this in just a few more paragraphs.

It's worth pointing out that the stock thickness has no bearing on the pin thickness. You can use 1/4" pins on 3/4" stock, for example, or 1/2" pins on 3/8" stock. But it does impact the pin length. The blade or bit elevation must equal the stock thickness (plus the jig base thickness, of course).

Set up the cutter and jig. Install the dado cutter in the table saw, combining the blades and chippers needed for the desired cut width. In a table-mounted router, use the correct diameter of straight bit. Adjust the height. The easiest way to set this is to lay a scrap of the working stock on the jig base, park it by the cutter and raise the cutter to that height.

The first cut creates a slot in the facing for the key. What I do is offset the facing to the left to begin. Lock the facing and cut a slot, as shown on the next page.

The next step is to make a key that just fits the slot. The key must be the exact width of the slot, but no taller. So your key is on the order of 1/2" wide and 3/8" thick, maybe smaller, maybe larger. I rip a stick close, then hand plane it (it's occasionally unavoidable)



The jig I use on the table saw rides in both miter-gauge slots. The adjustable facing, into which the key is glued, is cut from a scrap of 1/2" MDF.

On the router table, I use a small version of the jig. My tables don't have miter-gauge slots, so I align the jig with the selected bit in the slot in the jig base. Then I set a thin plywood strip against either edge of the jig and clamp them to the tabletop.

Step photos by the author

to fit. When it fits, I clip it in two and glue one piece into the slot.

To adjust the jig for the joinery cuts, set the second piece of the key against the cutter and slide the facing toward it until its key touches the loose one. The gap between the cutter and the key now equals the bit's diameter, as shown in the photo below.

Cut a test joint. Stand a stacked pair of samples in the jig, edges snug against the key. Cut a slot. Move the stack, fitting the slot over the key. Cut another slot. Repeat the process until all the pins are formed.

Fit the joint together (offset them if need be to align pins with slots). If the pins won't go into the slots, the key is too far from the cutter. If the pins are loose in the slots, the key is too close to the cutter.

Rather than slide the facing left or right a "hair," a "tad" or a "skoshe," use your dial calipers. Measure a pin and a slot. The amount you move the facing is half the difference between the pin width and the slot width. You can use a feeler gauge to make what is most likely a minute adjustment.

- If the pin is bigger than the slot, move the key closer to the cutter. Set a block against the key and clamp it. Loosen the facing, slip the feeler gauge between the block and the key, and relock the facing. Remove the block.
- If the slot is bigger than the pin, move the key away from the cutter. Clamp the block to the jig with the feeler gauge between it and the key. Loosen the facing, remove the gauge, and reset the facing with the key tight against the block. Then remove the block.

A second set of cuts will confirm the accuracy of your adjustment.

One note about fitting the joints: If your joint is long, with a dozen or more pins, you must be wary of cumulative error. A discrepancy of $^1/_{128}$" doesn't have a significant impact when the joint has six pins. But double or triple that number and you may have a joint that won't close. So the bigger the joint, the more exacting your setup must be.

Cutting the Joints

There's no reason to cut the parts one at a time. It's tedious work, so you'll appreciate anything you can do to expedite it.

As I already mentioned, if your joint layout begins with a pin and ends with a slot, you can cut sides and ends simultaneously, four parts in a stack.

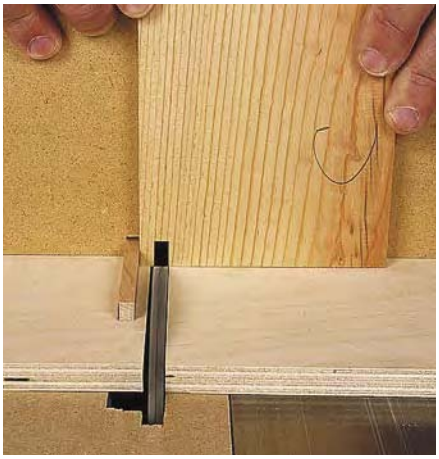
As with the test cut, you align the parts in the stack, stand them on the jig base, upright against the back. Butt the edges against the key. Cut. Step the stack over the key and cut. Step again and cut again. Repeat and repeat until the last slot is cut.

If one piece begins and ends with pins, the mate will begin and end with slots, as shown on page 31. They must be cut in sequence. You can, of course, pair up parts of a box, but you can't cut all four parts at once.

Start with the piece that begins and ends with pins. Cut the slots in it. After the last slot has been cut, step that slot over the key. Stand the mating piece beside it, edge to edge,

Kerfing the adjustable fence for the key is the first step in setting up your box-joint jig. Note the two kerfs from a previous job to the right of the blade. It's best, I think, to set up fresh for each new job.

Make a key strip, hand-planing it to achieve a tight press-fit in the kerf. Cut the strip into two pieces: one is the key, the second is a setup gauge.



Stand the work on end, tight against the key. Push the jig across the cutter and make the first slot.

After each cut, step the work to the right, fitting the freshly cut slot over the key. Each cut matches the width of the key, and leaves a pin of the same thickness between slots. Step-and-repeat until you've cut pins across the full width of the work.

Cutting the full layout across both pieces isn't necessary to test the fit. If the setup is significantly off, fitting three or four pins will expose it. If those pins mesh nicely, cut more of them and refit the joint.

as shown below. Cut. Remove the first piece and slide its mate to the right, the slot over the key. Cut again. Step and cut until all the slots are completed. **PW**

In production mode, you can cut more than one board at a time. Stack the sides and cut the pins across an end. Then hold the ends against the sides to continue the cutting sequence across them.

If the joint layout begins with a pin and ends with a slot, then all four parts are identical, and all can be cut at the same time.

If the layout on a board begins and ends with a pin, the mating piece must begin and end with a slot. To align the work for the beginning slot, butt the piece against its mate.

Build Better Bookcases

We show you how to make a great bookcase in any style, with one basic box design and one sheet of plywood.

Everyone needs a bookcase, and if you're a beginning woodworker, it's a great project to develop skills without breaking the bank. Our staff got together to design the ideal bookcase. We wanted it to fit in the average home, look good and be made to last. We also wanted to show that the same basic construction could be dressed up in different ways to suit anyone's sense of style. Our goal was to produce a plan that would make good use of materials, and be relatively quick and easy to put together and finish. We held meetings, passed memos, e-mails and sketches around the office and, in the end, made the new guy (me) do all the work.

Basic Bookcase Construction

The basic cabinet is built from one 4' by 8' sheet of ¾"-thick hardwood plywood plus a few board feet of solid wood. This keeps the cost reasonable, but introduces some constraints on the size of the finished bookcase. Our final design is 5' high and a little less than 2½'-wide. It's not quite as deep as many bookcases, but it is a useful size for all but the largest books. It does its job without taking over the room, will hold a lot of books and the shelves won't sag. You can make the basic design any size you want, but if you make it larger you won't be able to get all of the parts from one sheet of plywood. If you make it wider, keep the shelves less than 36". If the shelves are longer than that, they will likely sag when loaded with books.

Using ¾" plywood for the back as well as the other cabinet parts produces a box that is very strong. The edges of the plywood are all covered with solid wood. In three of the four designs this is a face frame applied to the front of the box. The other design uses ¼"-thick hardwood as an edge band.

I used biscuit joints to hold the case together and pocket screws to join the face frames. The assembled face frame is glued to the front of the cabinet. There is enough surface area for a good joint, without nail holes showing in the completed cabinet.

Using plywood solves many problems you would have if you made the bookcase from solid wood; the grain and color of all the parts will be similar, you won't have to glue any parts together for width and seasonal wood movement won't be an issue.

by Robert W. Lang

Comments or questions? Contact Bob at 513-531-2690 ext. 1327 or robert.lang@fwpubs.com. Visit his web site at craftsmanplans.com.

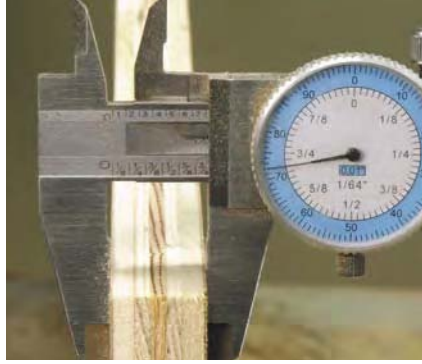
Photo by Al Parrish

SHAKER: Made from cherry plywood with a solid cherry face frame. The profiles for the mouldings were taken from typical details used in original Shaker pieces.

CONTEMPORARY: Made without a face frame from maple plywood with 1/4"-thick solid maple glued and nailed to the raw edges of the plywood.

ARTS & CRAFTS: Quartersawn white oak plywood and solid wood were used to construct the Arts & Crafts bookcase. The beveled mouldings were typical on built-in bookcases and other cabinets of the early 20th century.

FORMAL: The most complex bookcase is made from African mahogany plywood, with genuine mahogany face frame and mouldings. Additional mouldings are applied to the side to form panels.



One of the most important facts about plywood is that it is almost always thinner than the stated dimension. This (one of four types) 3/4" plywood was 1/32" undersized.

The Trouble with Plywood

Plywood however, does introduce some problems that you need to be aware of. The veneer face is very thin. You need to handle it carefully to avoid scratching it, and when you sand you need to be careful that you don't sand through the veneer. Despite what some people might tell you, the factory edges are not straight, and you should never assume that the corners of the sheet are square.

The other problem with plywood is its thickness. It will be between 1/32" and 1/16" less than 3/4", and the thickness can vary throughout the sheet. If you cut the horizontal parts to the dimensions in the cutting list, your cabinet will finish slightly smaller in width. If you then cut the top and make the face frame to the listed size, they won't quite fit. The first thing you need to do is determine the actual thickness. Then develop a strategy for working around this discrepancy.

I began by crosscutting the plywood at 60", as shown in the cutting diagram. This large piece will yield the two long sides of the bookcase and the back. The smaller piece will provide the top and bottom of the cabinet, as well as the fixed and adjustable shelves. There is a little extra room to allow for squaring the ends of the finished parts and cutting clean long edges. You can make this crosscut on the table saw, but it's easier to cut the full sheet with a circular saw and a straightedge. You could also make this first cut with a jigsaw, and then clean up the edge with a router. If you go this route, clamp a straightedge to the sheet, make sure it's square and run a flush trimming bit against it to clean up the cut.

Make the first rip cut on the table saw 1/4" wider than the finished part. Then move the fence in to trim the opposite edge. Keep the best side up, and the freshly cut edges against the fence so that you have two clean edges on each part. After ripping, I crosscut the parts on a sliding compound miter saw, using a stop to make sure that pairs of parts were the exact same length, which is important.

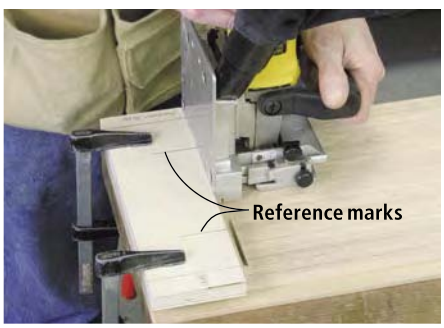
The plywood I was using was 1/32" thinner than 3/4", so I made the parts that go between the sides 1/16" longer than the listed length. This allows the cabinet to finish at the correct width.

Develop a Strategy

Look at the exploded drawing at right to understand how the parts of the basic carcase go together. The back sits in a 3/4"-wide by 1/2"-deep rabbet cut in the back edges of the sides, the bottom and the top. In the three versions with face

The rabbet at the back edge of the cabinet sides, bottom and top is made with a stack dado set on the table saw. The featherboard holds the plywood down flat to the surface of the saw.

The story stick, made from a scrap of plywood shows all of the cabinet parts at full size. Make one and put away your tape measure. Use it to lay out all of the parts quickly and accurately.



A second story stick acts as a jig to locate the biscuit slots in the cabinet sides. Reference marks for the slots line up with the centerline on the bottom of the machine.

With the cabinet on its side, I can easily reach both the front and back edges to keep them flush. Speed squares clamped to the side and shelves keep the cabinet square during this glue-up.

I let the glue dry overnight before attaching the cabinet top. Because the top is placed above the cabinet sides I had to use clamps in pairs to hold the top down as shown here.

frames, the bottom and fixed shelf go between the cabinet sides, and the top sits on the upper edge of the sides. In the contemporary bookcase, one difference is that the top goes between the sides.

The fixed middle shelf is 3/4" narrower than the cabinet bottom so its back edge is even with the rabbet in the other parts. The top is 3/4" wider than the bottom, as the front edge covers the top of the face frame.

Cut the parts from the sheet of plywood in stages. I cut only the two sides, the bottom and the fixed shelf to final size before assembling the box. I then cut the top to the right width, and cut its rabbet in the back with the other parts, but I left it long until after the basic box was assembled.

If something went wrong with one of these parts, I could make them into adjustable shelves, and replace them with the parts from the remaining plywood. This is less efficient than cutting all the parts at once, but it's insurance against mistakes.

I cut the rabbet with a stack dado set in the table saw, using a featherboard to hold the stock down (as shown at left). Plywood is often bowed, and if it raises up while it is going across the dado stack, the rabbet won't be a consistent depth. Making the rabbet 1/2" deep gives room to attach the back with #6 x 1 5/8" screws.

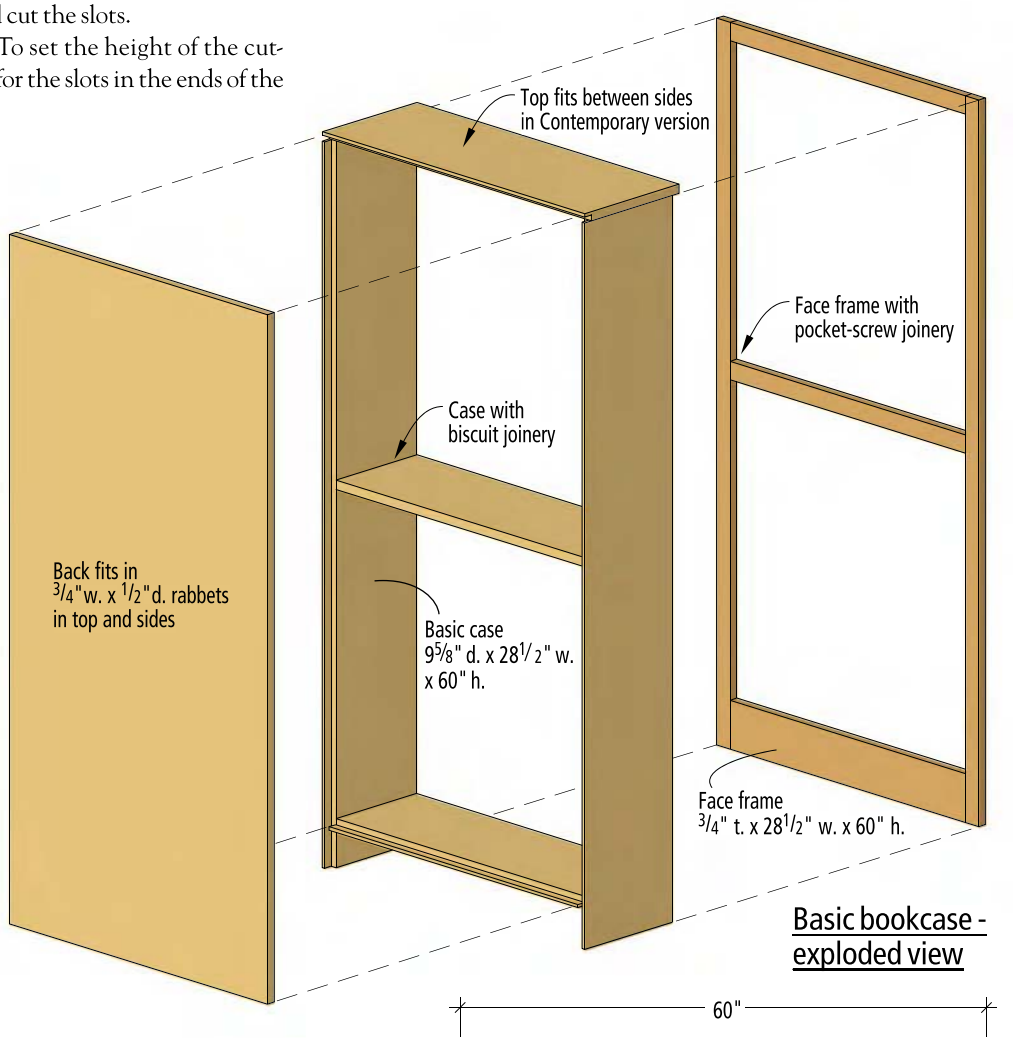
Making Layout Simple

With the carcase parts cut and rabbeted, I took a 60"-long piece of scrap plywood and made a story stick, showing at full scale the positions of the plywood parts, as well as the parts for the face frame. The most likely place to make a mistake is in measuring, and the story stick transfers the locations to the finished parts without measuring (as shown at left).

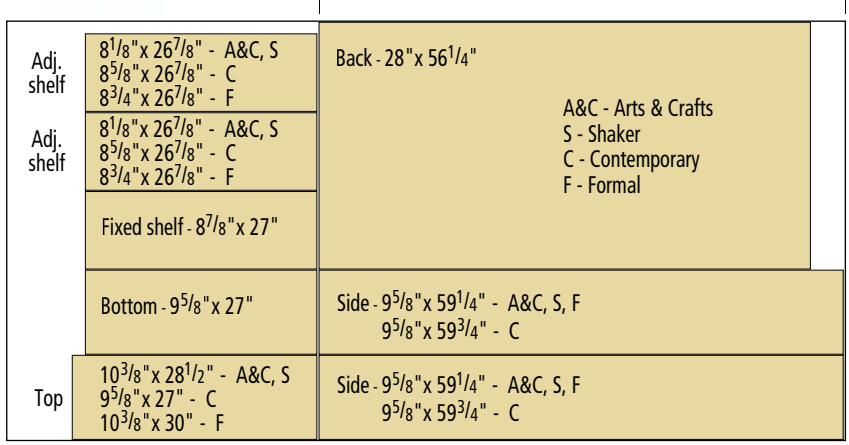
I also made a second story stick, 3 1/4" wide by 10 3/8". This was used to locate the slots for the biscuits in the cabinet sides, and in the edges of the bottom piece and the fixed shelf. I clamped this to the bottom edge of the cabinet sides, placed the bottom of the biscuit joiner against the marks and cut the slots.

To set the height of the cutter for the slots in the ends of the shelves, I placed a shelf flat on the bench, set the biscuit joiner next to it, and lowered the fence until it was flush with the top surface of the shelf. This indexes the machine so the slots cut using the guide block line up with the slots cut using the machine's fence.

With all the joints ready, it's tempting to go ahead and glue the cabinet together. It is faster, and you get a better finish if at this point you finish sand all of the inside surfaces, then assemble.



Basic bookcase - exploded view



Cutting diagram

Arts & Crafts Style

The Arts & Crafts bookcase and the Shaker bookcase are constructed the same way. I assembled the cabinet with one side across two sawhorses. This let me position clamps across both sides of each joint. I clamped a speed square on each of two opposite corners to keep the box square while the glue dried.

Before attaching the top, I still needed to cut it to its exact length. Instead of relying on the cutting list, I checked the outside dimension of the assembled box to be certain to get a good fit without the undersized plywood throwing me off. I held the top in place against the ends of the sides and made a couple of marks for the biscuits. To clamp the top in position, I had to hook two clamps together as shown on page 34.

I put together the basic box with the bottom and fixed shelf between the sides, and the top of the cabinet above the sides. Before working on the face frame, I made sure that all the edges on the cabinet were flush by sanding them with a sanding block (shown below). It's simply a piece of plywood 3" wide with a piece of a sanding belt glued to it. By holding it flat on two adjacent surfaces, any variations can be quickly removed so that the face frame will sit flat.

The face frame is assembled and glued to the front edge of the plywood box. The outside edges of the face frame are flush with the outside faces of the plywood when the cabinet is complete, but you want to make the face frame so that it extends slightly beyond the veneer. If you try to make it dead flush you are likely to end up with the veneer proud of the solid wood frame at some point. If this happens it's almost impossible to correct without sanding through the thin veneer.

Put Your Tape Away

Instead of measuring the parts for the face frame, I put the assembled cabinet on its back, and clamped the stiles to the front edges of the plywood, letting the long edges

Before attaching the face frame, sand the front edges flush with a flat sanding block. I used a cloth-backed sanding belt glued to plywood.

With the stiles clamped to the assembled box, I mark both the length and the exact location of the rails directly. This eliminates errors due to measuring or using undersized plywood.

The face frame is put together with pocket screws before being glued in place on the assembled cabinet box. Two clamps hold the stile on edge so that I can see and reach both sides of the joint.

It might take every clamp you own, plus a few borrowed from a neighbor, to attach the face frame. It's worth the effort to get it lined up perfectly without leaving nail holes to be filled.

It's safer to trim the solid wood parts down to the plywood parts. The block plane works quickly against an edge or against the veneer.

A card scraper brings the solid wood even with the plywood without raising a cloud of dust, or risking the damage that a belt sander or random-orbit sander could cause.

hang over the plywood about 1/32". Then I marked the length and the location of the rails directly from the plywood parts. Once the rails are the correct length, I used a pocket-hole jig to drill holes in the ends of each rail.

After assembling the face frame, it is glued down to the plywood. It takes a lot of clamps to get a nice tight glue line. The face frame can be nailed down, but that means filling all the holes.

Where Solid Meets Ply

After letting the glue on the face-frame-to-cabinet joint dry overnight, it was time to clean up where the plywood and solid wood meet. Because the solid wood was proud of the veneer, I could use a block plane and scraper to bring the surfaces flush.

In the past I've used a random-orbit sander or belt sander for this task, but I have found that using the plane and card scraper is faster, does a better job and there is a lot less risk of going through the plywood's thin face veneer.

The trim around the front and sides of the plywood cabinet top is mitered at the corners, and glued to the edges. If these trim pieces are bowed, I use a few biscuits to help keep the solid wood flush with the plywood.

I glued the solid-wood edges to the two adjustable shelves, and then bored the holes for the adjustable shelf pins using a jig I made, shown on page 38. You may need to trim the shelves to fit behind the face frame. I then sanded everything inside and out to #240 grit to prepare it for finishing.

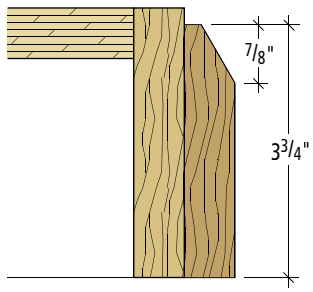
The crown and base mouldings for the Arts & Crafts cabinet are made with 30° bevel cuts. I made the cuts on the table saw and then removed the saw marks with my block plane.

ARTS & CRAFTS-STYLE BOOKCASE

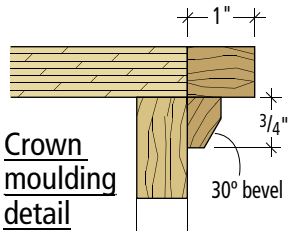
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Sides	3/4"	9 5/8"	59 1/4"	Plywood	QSWO*
❑	1	Bottom	3/4"	9 5/8"	27"	Plywood	QSWO
❑	1	Fixed shelf	3/4"	8 7/8"	27"	Plywood	QSWO
❑	1	Top	3/4"	10 3/8"	28 1/2"	Plywood	QSWO
❑	1	Back	3/4"	28"	56 1/4"	Plywood	QSWO
❑	2	Adj. shelves	3/4"	8 1/8"	26 7/8"	Plywood	QSWO
❑	2	Stiles	3/4"	1 1/2"	59 1/4"	Solid	QSWO
❑	2	Rails	3/4"	1 1/2"	25 1/2"	Solid	QSWO
❑	1	Bottom rail	3/4"	4"	25 1/2"	Solid	QSWO
❑	2	Shelf edges	3/4"	1 1/2"	26 7/8"	Solid	QSWO
❑	1	Top trim	3/4"	1"	60"	Solid	QSWO
❑	1	Top trim	1/2"	3/4"	60"	Solid	QSWO
❑	1	Base trim	3/4"	3 3/4"	60"	Solid	QSWO

*Quartersawn white oak

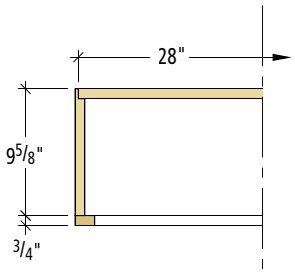
The Arts & Crafts finish consists of General Finishes' Java gel stain, followed by amber shellac. After a coat of wax, I put the back in place, attaching it with #6 x 1 5/8" screws.



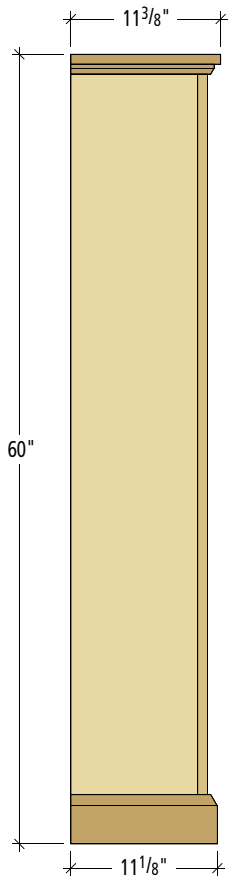
Base moulding detail



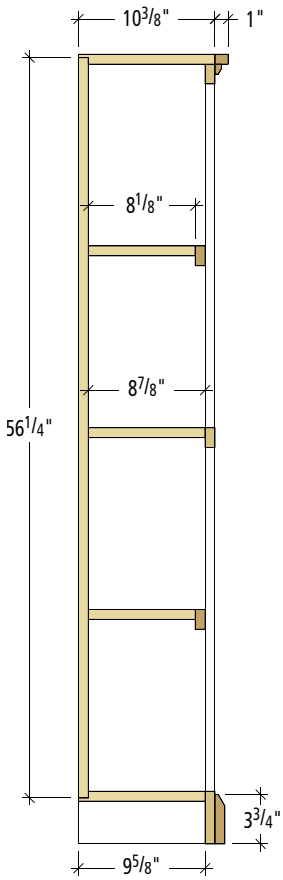
Crown moulding detail



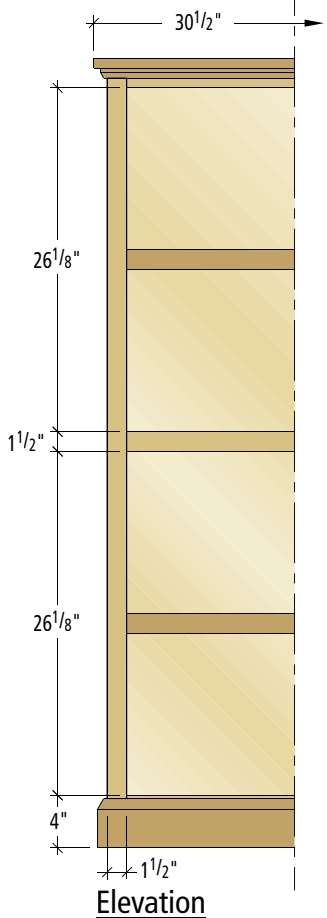
Plan section



Profile



Profile section



Elevation

Shaker Style

The Shaker bookcase is assembled and trimmed in the same way as the Arts & Crafts case. The only difference between the two is the profile of the mouldings, the species of wood and the finish.

All of these mouldings were made on the router table. The bullnose trim around the top of the cabinet can be made with two passes over a 3/8"-radius quarter-round bit, or one pass over a bullnose cutter. Either way, leave a slight flat spot at the center of the radius. If you machine off the entire curve, the wood will move toward the router bit at the end of the cut and leave a snipe in the last few inches of the moulding.

The cove moulding starts as a 3/4" x 3/4" piece of square stock. The 5/8" radius was milled on the router table. The base moulding is a 1/2"-radius bead with the cutter set to be flush with the face of the moulding at one end, leaving a 1/4" x 1/8" step at the top edge. Use a pair of featherboards to hold the stock down to the router table and tight to the fence while making the mouldings. Make one pass to remove most of the waste, and then reset the router to make a final, light finishing pass.

Apply the Trim

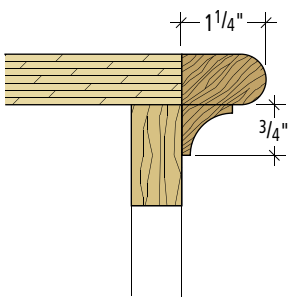
Putting the trim around the edges of the top is the most exacting part of this project. I added an auxiliary fence and table to my miter saw, as shown on page 40 and I then made a 45° cut in each direction so that I would have a reference to exactly where the cut would be made. I marked the cuts directly from the assembled cabinet and lined up the marks to the kerf in the auxiliary fence and table.

After I made the mouldings on the router table, I cut the pieces of trim a few inches longer than needed. I then made a 45° cut on one end of each of the three pieces. This let me check the angle at the corners. I held one end of the front piece against one of the short legs, and then marked the other end by running my pencil across the back of it, where it met the side of the cabinet. I usually make the cut just a little long, check the angle with the mating piece and then make the final cut.

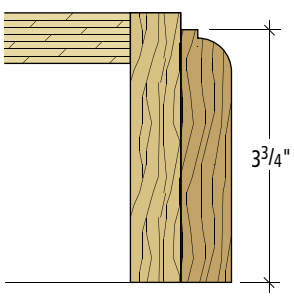
The trim is glued to the cabinet, no nails are necessary. I trimmed the top first, and then scraped the top edge flush with the veneer.

The Shaker cabinet is finished with Watco Danish oil. I wanted to add a bit of color to the wood so I mixed half medium walnut and half natural together, and applied two coats of oil followed by one coat of paste wax.

I used a shop-made jig to drill the holes for the pegs for the adjustable shelves. 1/4"-20 T-nuts act as bushings to guide a brad-point drill bit. After drilling the holes for the T-nuts on 1" centers top-to-bottom, I used a twist drill bit to bore out the soft threads in the T-nuts, leaving a 1/4" diameter.



Crown moulding detail



Base moulding detail

SHAKER-STYLE BOOKCASE

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Sides	3/4"	9 5/8"	59 1/4"	Plywood	Cherry
❑	1	Bottom	3/4"	9 5/8"	27"	Plywood	Cherry
❑	1	Fixed shelf	3/4"	8 7/8"	27"	Plywood	Cherry
❑	1	Top	3/4"	10 3/8"	28 1/2"	Plywood	Cherry
❑	1	Back	3/4"	28"	56 1/4"	Plywood	Cherry
❑	2	Adj. shelves	3/4"	8 1/8"	26 7/8"	Plywood	Cherry
❑	2	Stiles	3/4"	1 1/2"	59 1/4"	Solid	Cherry
❑	2	Rails	3/4"	1 1/2"	25 1/2"	Solid	Cherry
❑	1	Bottom rail	3/4"	4"	25 1/2"	Solid	Cherry
❑	2	Shelf edges	3/4"	1 1/2"	26 7/8"	Solid	Cherry
❑	1	Top trim	3/4"	1 1/4"	60"	Solid	Cherry
❑	1	Top trim	3/4"	3/4"	60"	Solid	Cherry
❑	1	Base trim	3/4"	3 3/4"	60"	Solid	Cherry

Contemporary Style

This bookcase is made without a face frame. It is lighter and simpler in appearance, and takes less time to build and finish. Instead of a face frame, the visible front edges of the plywood are covered with 1/4"-thick strips of solid wood.

The plywood sides of this cabinet are cut to a finished length of 59 3/4" and a piece of edge trim is put on the ends before the front trim is applied. The top piece in this version is the same size as the bottom, and fits in between the sides. Because of this, the basic cabinet carcase should be assembled in one step.

I clamped each part vertically on the bench to attach the edges with glue and 23-gauge pins. The edges are wider than the plywood is thick.

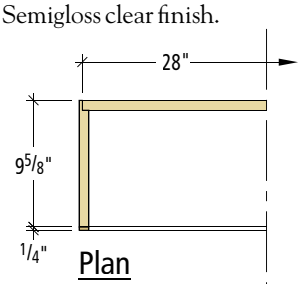
Before assembling the cabinet, trim the solid wood edges flush to the plywood using a block plane followed by a card scraper. I sanded all the parts before assembly.

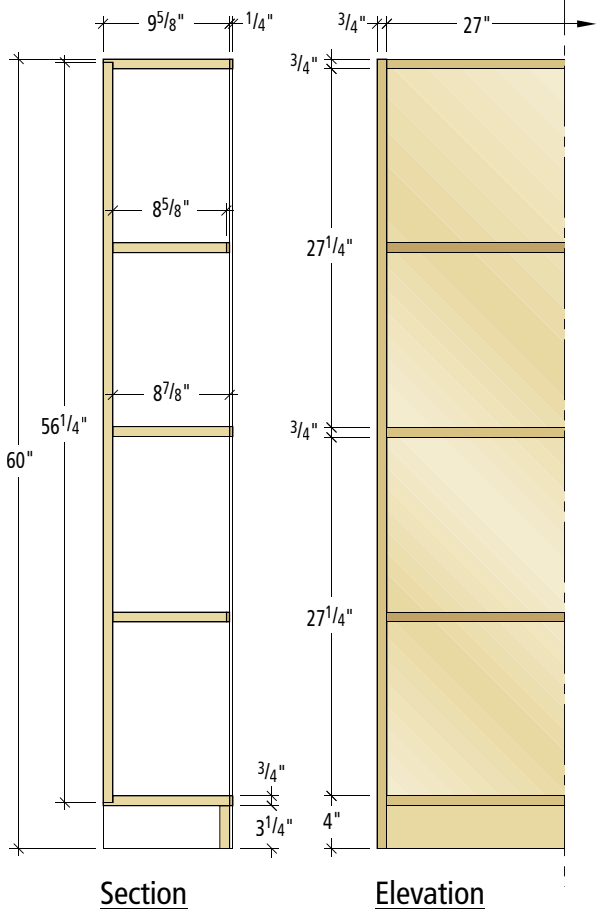
Trim Now, Assemble Later

The solid edges are applied and trimmed before the cabinet box is put together. I ripped the strips to 3/8" and then took them down to 1/4" thick by making two passes through the planer. The solid maple I used had been planed to 1/32" over 3/4", so the strips were about 1/16" wider than the plywood was thick. This extra width makes it easy to attach the strips without worrying about lining up the edge of the solid wood perfectly.

I trimmed the solid wood down to the level of the plywood with a block plane followed by a card scraper. You could use a router with a flush-trimming bit, but it's awkward to try to balance the base of the router on the edge of the piece. If the router tilts at all, the bit will dig in and ruin the edge. The router bit will also likely tear out a piece of the solid wood if the grain direction isn't consistent.

Assemble the box after applying the edges. Below the bottom shelf is a 3 1/4"- high, 27"-wide (grain runs vertically) piece of plywood to support the bottom shelf. The face of this kick board piece is set in 1/4" from the edge of the cabinet sides. I finished the bookcase with Minwax Polycrylic Semigloss clear finish.





CONTEMPORARY-STYLE BOOKCASE

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Sides	3/4"	9 5/8"	59 3/4"	Plywood	Maple
❑	2	Top & bottom	3/4"	9 5/8"	27"	Plywood	Maple
❑	1	Fixed shelf	3/4"	8 7/8"	27"	Plywood	Maple
❑	2	Adj. shelves	3/4"	8 1/8"	26 7/8"	Plywood	Maple
❑	1	Back	3/4"	28"	56 1/4"	Plywood	Maple
❑	1	Kick board	3/4"	27"	3 1/4"	Plywood	Maple
❑	1	Edge trim	1/4"	25/32"	30LF*	Solid	Maple

*Linear feet

Formal Style

The plywood case of the formal cabinet is assembled the same way as the other two face-frame cabinets, but the top and the face frame are both larger to accommodate the paneled trim on the outside of the bookcase. The shelves are also deeper. Instead of tucking behind the face frame, they sit 1/8" back from the front of the face frame.

The edge of the face frame is flush with the inside edge of the cabinet side instead of the outside. This allows for the addition of pieces of solid wood on the outside of the cabinet to look like paneling. The top also overhangs the side of the cabinet 3/4" so that it is above the paneling. The joint between the two is covered by the crown moulding.

Make the face-frame stiles 1 9/16" wide so that the edges of the face frame are proud of the veneer on both the inside of the cabinet, and the panel stiles on the outside. If you need to trim or sand after everything is put together, it's better to trim and sand these narrow edges.

Applied Paneling

With the cabinet box assembled, and the face frame in place, I marked the locations of the applied stiles and rails on the face of the plywood (shown below, left). The front stile fits behind the edge of the face frame and is only 1 1/4" wide. The stile at the back edge is 2" wide, equal to the width of the front stile added to the thickness of the face frame.

The 2"-wide middle rail is centered vertically on the side of the cabinet. The top and bottom rails are made to leave 2" exposed from the edge of the crown and base mouldings. This makes the top rail 3 1/4" wide. I made the bottom rail the same width, and added a piece of 1 1/2"-wide material to the bottom edge of the cabinet side for

After laying out the locations of the stiles and rails, I glued and clamped the solid-wood parts to the plywood cabinet sides. An extra piece of wood is added at the bottom edge of the cabinet to support the short leg of the base moulding.

By holding the gun upside down, and pulling the trigger with my little finger, I can nail the bead moulding from the side. The next layer of moulding will cover the holes.

Attaching a sacrificial base and fence to the miter saw lets me see precisely where the cut will be made by lining up my pencil marks with the saw kerfs.

The solid wood stiles and rails, combined with the bead, cove and crown mouldings are a simple way to produce a rich paneled look to the finished bookcase.

attaching the base moulding.

I used glue only to hold these in place, clamping them down and letting the glue dry for an hour. Then I began applying the trim to the inside edges. I marked the lengths of the mitered pieces directly from the corners of the stiles and rails.

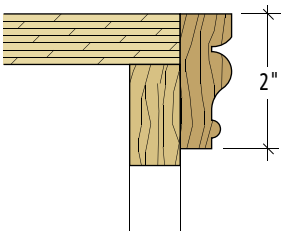
Two-step Moulding

The bead moulding can be nailed from the side, because the cove moulding will cover the nail holes. I fit and placed all the bead moulding before beginning to fit the cove. I did nail the cove moulding with 23-gauge pins. These leave very tiny holes that I filled with a bit of sanding dust mixed with clear lacquer.

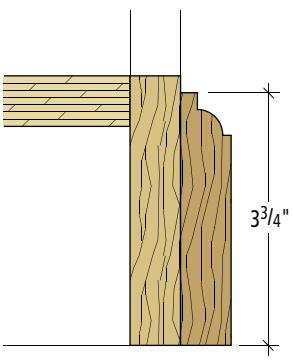
After all the panel moulding was on, I cut and fit the crown, and after a final sanding stained the wood with Behlen's "American Walnut" NGR stain, followed by two coats of shellac. **PW**

FORMAL-STYLE BOOKCASE

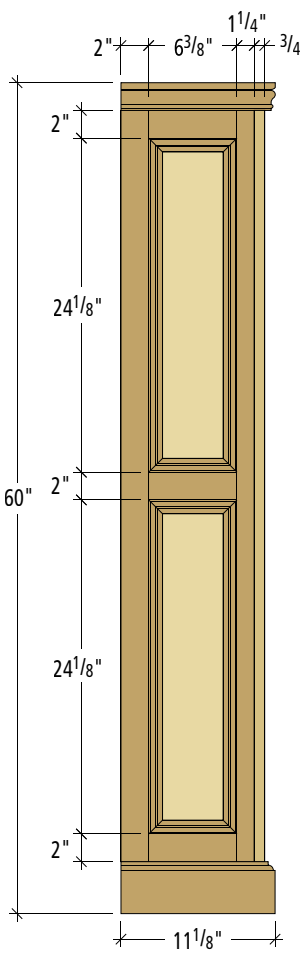
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Sides	3/4"	9 5/8"	59 1/4"	Plywood	Mahogany
❑	1	Bottom	3/4"	9 5/8"	27"	Plywood	Mahogany
❑	1	Fixed shelf	3/4"	8 7/8"	27"	Plywood	Mahogany
❑	1	Top	3/4"	10 3/8"	30"	Plywood	Mahogany
❑	1	Back	3/4"	28"	56 1/4"	Plywood	Mahogany
❑	2	Adj. shelves	3/4"	8 3/4"	26 7/8"	Plywood	Mahogany
❑	2	FF stiles	3/4"	1 9/16"	59 1/4"	Solid	Mahogany
❑	2	FF rails	3/4"	1 1/2"	27"	Solid	Mahogany
❑	1	FF bottom rail	3/4"	4"	27"	Solid	Mahogany
❑	2	Shelf edges	3/4"	1 1/2"	26 7/8"	Solid	Mahogany
❑	2	Front cab stile	3/4"	1 1/4"	59 1/4"	Solid	Mahogany
❑	2	Back cab stile	3/4"	2"	59 1/4"	Solid	Mahogany
❑	2	Cab top rail	3/4"	3 1/4"	6 3/8"	Solid	Mahogany
❑	2	Cab middle rail	3/4"	2"	6 3/8"	Solid	Mahogany
❑	2	Cab bottom rail	3/4"	3 1/4"	6 3/8"	Solid	Mahogany
❑	1	Cab bead moulding	1/2"	11/16"	28LF	Solid	Mahogany
❑	1	Cab cove moulding	1/2"	1/2"	28LF	Solid	Mahogany
❑	1	Crown moulding	3/4"	2"	60"	Solid	Mahogany
❑	1	Base moulding	3/4"	3 3/4"	60"	Solid	Mahogany



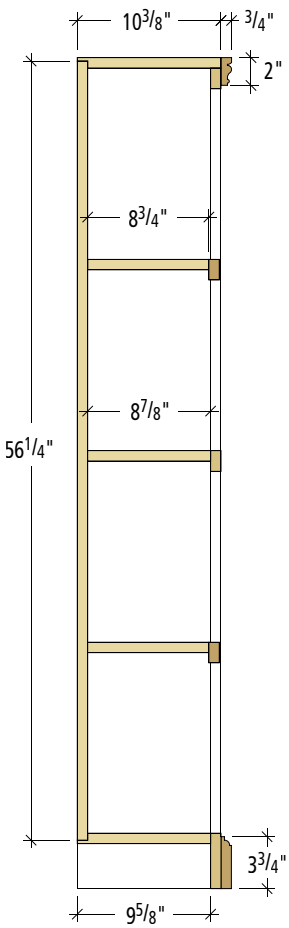
Crown moulding detail



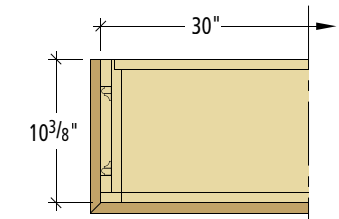
Base moulding detail



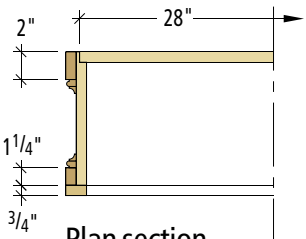
Profile



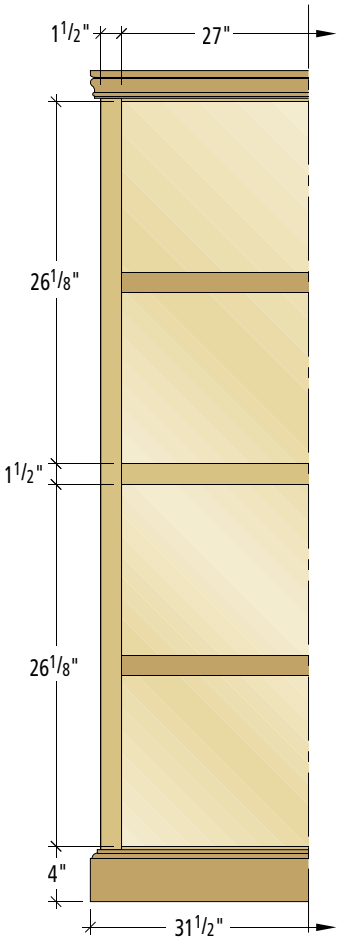
Profile section



Plan



Plan section



Elevation

SAWBENCH &

Photo by Al Parrish

SHOP STOOL

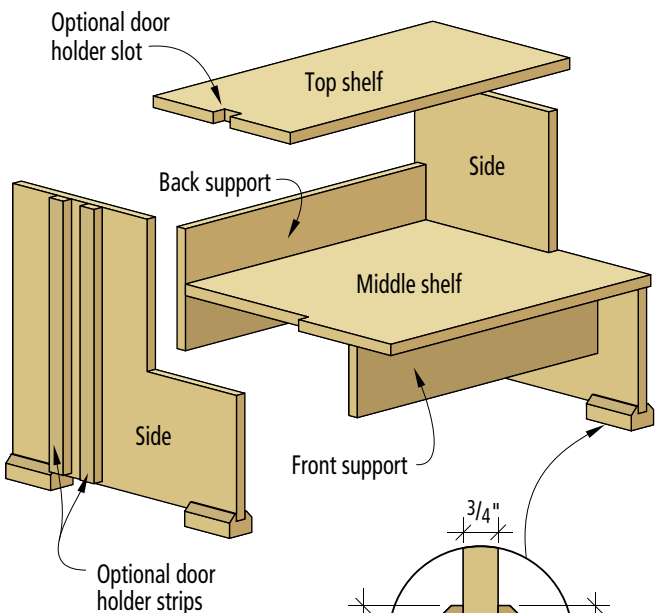
This simple afternoon project is perfect for handsawing, holding doors for planing, organizing tools and giving you a leg up. It will quickly become indispensable.

My simple plywood two-step in the old tool shed had reached the end of the road. Looking at it you could see a pile of old wood ready for the burn pile. I saw in it a project that recalled 45 years of working life. It was more than just memories that came to mind. If it was time to recycle the old stool then it was important to document what had been a most useful object, and perhaps make a successor to it before its last rites.

My time in home building and remodeling went back to four summers during college. I learned the trade of carpentering before the modern era of specialization, the days when a small carpenter crew did everything from the first framing to a completed house ready for painters. It was a good education. The shop stool represented a sort of rite of passage into the world of construction.

by John Wilson

John Wilson currently writes and operates The Home Shop in Charlotte, Michigan, where he teaches classes and sells Shaker box supplies.



Exploded view

Foot detail

Construction Steps:

1. After cutting all the plywood pieces, round over all the exposed edges in the stool using a 1/8"-diameter roundover router bit.

2. Assemble pieces using tapered drill and countersink to pre-drill for 1 5/8" deck screws. Start with the front and back supports on the middle shelf.

3. Cut 4'-long hardwood blocks for the feet with a groove to fit 3/4" plywood. Adjust the thickness of the blocks to make the stool level and glue them in place.

4. Finish with a sealer coat of polyurethane and thinner mixed 50/50.

That first summer I was too busy learning the ropes as the new kid to understand the significance of a shop stool. I borrowed someone else's when a task was at ceiling height. The second summer I was more confident of what was required on the job. After all, they had hired me back.

One day the boss suggested I stop by his shop to make a shop stool. It sounded helpful to me, but looking back on it from the perspective of years later I can see its significance. It marked my acceptance as a man who could use an on-site bench to do his work. From now on along with my growing box of tools, the back of my car held my very own work stool, something some newer member of the crew would ask to borrow. That pile of old plywood ready for the burn pile was to me a badge of rank, hard won during months of work on the job.

So what was so special about the shop stool on the job? The place at which you work is an important extension of the tools you use. This is as true of home building and remodeling as it is in the workshop. In fact this shop stool is an asset in either your shop or on the building site.

- It serves as a stable two-step work platform.
- It's a mobile work surface for cutting and assembly.
- It holds doors on edge for planing tasks.
- Two stools will replace the need for sawhorses.
- It keeps tools in one place where they are easier to find and transport to a new work site.

All of this is from a half sheet of $\frac{3}{4}$" plywood and some deck screws. Recalling all the ways the shop stool gives good service made me realize how important it was to record its dimensions. I inherited mine from men of experience on the job. There is no better school of design than experience. So here it is for you, too.

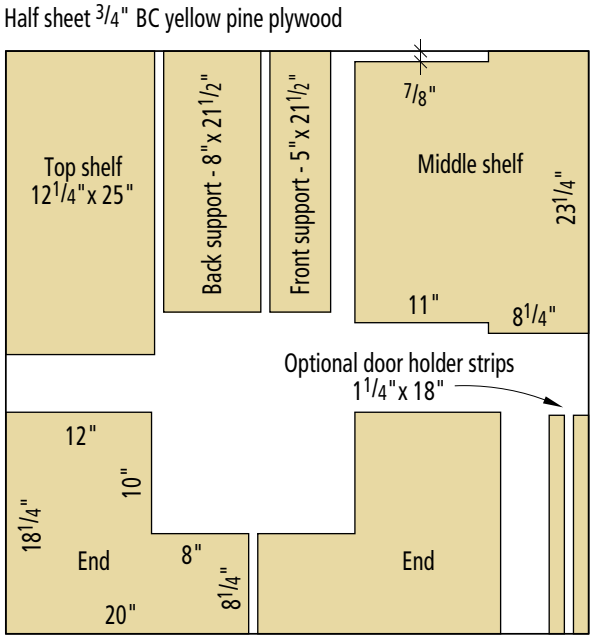
Construction Tips

While plywood is a stock construction item, I found that its quality varied considerably and that taking time to shop for a sheet with reasonable finish, free from major voids, and not warped, paid off. Some of the best plywood these days comes from yellow pine and is the BC grade with one good face. Pick the best you can.

The illustrations and cutting plan give you direction. Start by screwing the 8" back support to the middle shelf, and then screw the 5" front support under the middle shelf leaving it centered with $\frac{7}{8}$" exposed at each end. With these in place, the sides will screw to the middle shelf more easily. The top step goes on and you are done. It's that simple.

The door holder slot, if desired, is added to one side. And there is one more addition that will add years of life to your shop stool. I found that the plywood feet abraded away with use, as you can see in the picture below. As that happens, the stool loses stability as well. So I made some simple hardwood blocks. The blocks are made from a piece of $1\frac{1}{2}$" x 2" with a groove $\frac{3}{4}$" wide by $\frac{1}{2}$" deep routed into the wider face. Cut these into four pieces 4" long and glue them onto the sides.

One further use of the stool comes at noon—all the guys sitting around the work site with their lunch pails open! **PW**



Cutting plan

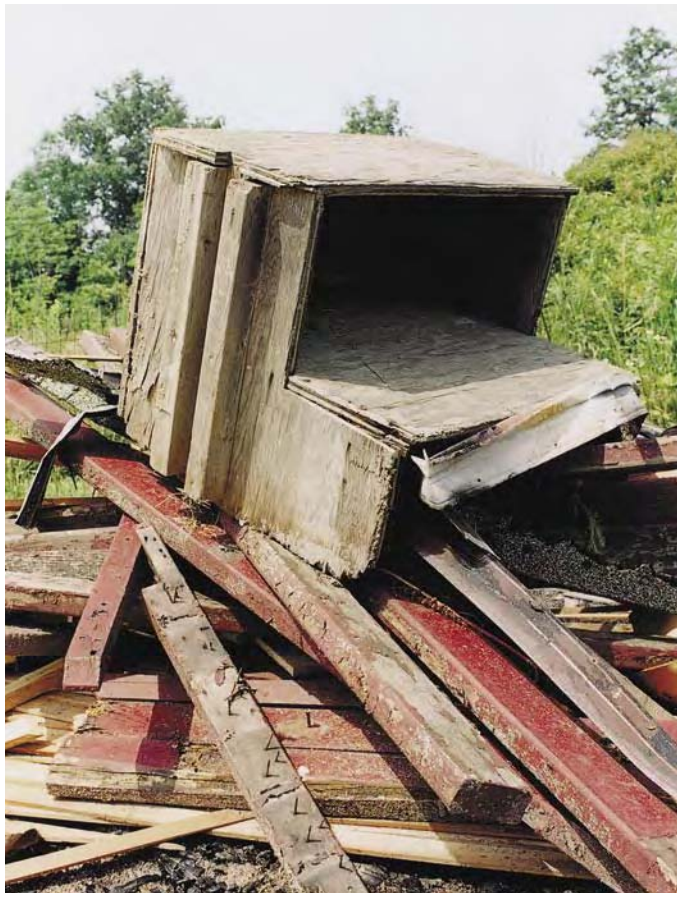


Photo by the author

Here is the old stool after a life of usefulness, now on the burn pile to be returned to basic elements of the universe and to be recombined into a new generation of materials. Note the badly worn corners where the plywood feet gave out. The attachment of the hardwood "shoes" as I describe in the article will extend the life of your stool.

WOODWORKING ESSENTIALS

BY NICK ENGLER

CHAPTER 6

Special Techniques

Although the table saw was invented to cut large boards into smaller ones, that's not all it will do. With the proper accessories, you can use it to cut a variety of woodworking joints, and an astonishing number of simple or complicated decorative shapes and profiles for your projects.

One such accessory is a moulding head or moulder. A moulder mounts on the saw's arbor similarly to a dado set and also makes broad cuts. But unlike a dado cutter, the kerf left by a moulder is rarely square. There are a variety of knives that fit in the moulding head and each cuts a different shape. With a good selection of moulding knives you can make decorative cuts or complex joints.

In this chapter we also discuss how to cut raised panels for doors and cabinetry. Plus, we show you step by step how to cut delicate tapers for table legs.

Using a Moulder

A moulder is used very much like a dado cutter, with one important difference. While there are only two basic dado cuts (dados and grooves), there are as many different cuts as there are moulding knives. The shape of each moulding cut is determined by the shape of the knives used to make it. Furthermore, you can create hundreds of additional shapes by passing a board over the moulder two or more times, using different knives for each pass.

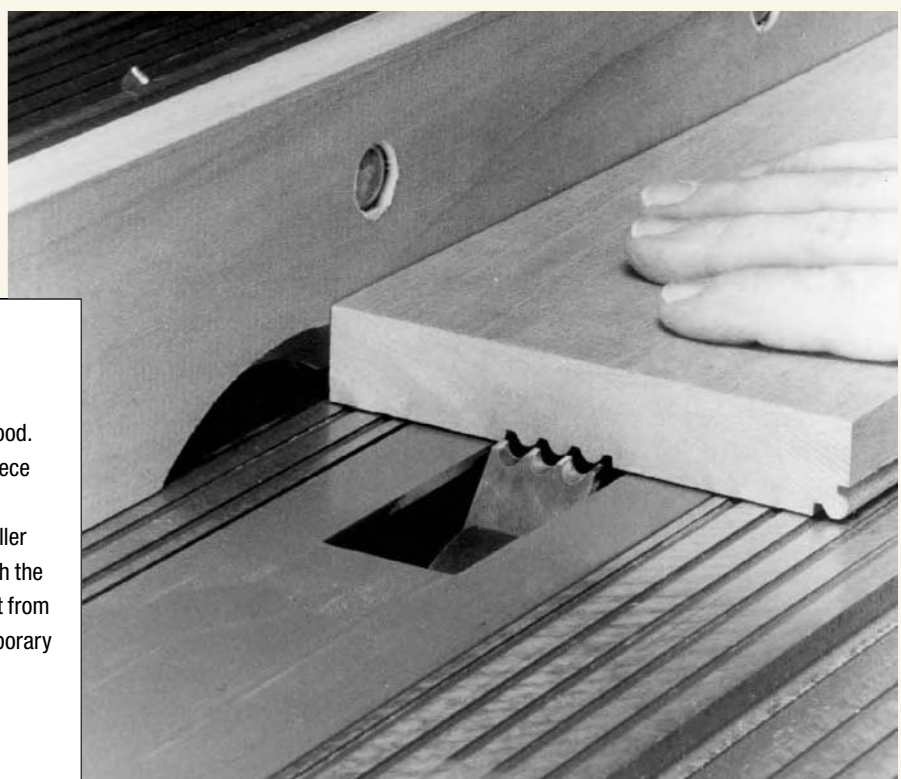
Although there are many different moulding profiles, they can all be grouped into three categories:

- **Single-purpose Knives**

These knives are designed to cut just one shape, such as a cove, a bead or an ogee. And they do that very well.

- **Multi-purpose Knives**

These knives cut two or more shapes. Usually one side of the knife is ground to cut one shape and the other side is ground to cut another. This saves setup time required to change knives.



Photos by the author

SAFETY TIP:

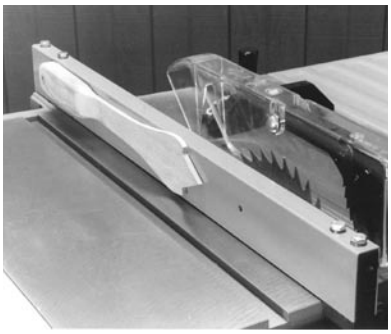
Work Large, Then Small

Many mouldings are created on smaller strips of wood. Don't attempt to mould narrow stock or any workpiece that's too small to safely control on the table saw. Instead, mould a larger board and then cut the smaller piece from it. Another option is to temporarily attach the small piece to a large scrap, mould it, and remove it from the scrap. To attach, use double-sided tape or temporary spray-mount adhesive.

TIPS & TRICKS

SAFETY TIP:

Right at Hand



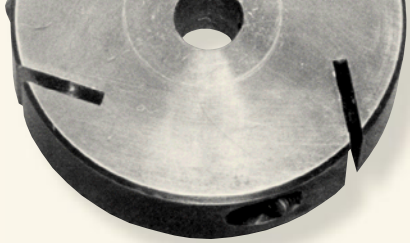
With all of the special saw techniques in this chapter, safety is even more important. With the blade extended further than normal and when using larger cutting knives, the possibility for accidents is increased. Keep your safety gear nearby. In fact, keeping a push stick attached to your saw fence is a great idea. If you have a metal saw fence, inset a couple of magnets in the handle of your push stick to keep it always handy. If your fence isn't metal, hook-and-loop fabric will work just as well.

PRO TIP:

Historic Profiles

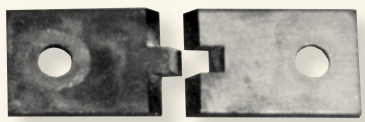
One of the great advantages of using a moulding head is the ability to create your own profiles. This is especially useful in reproducing existing moulding such as baseboard and crown mouldings found in older homes. These mouldings can't be purchased any longer and the only option is to grind your own knives. If possible, mixing and matching existing moulding knives may accurately reproduce these complicated profiles. If not, you still have the option of creating your own knife profiles.

By using a blank set of knives (flat topped with no cutting edge) you can copy the pattern onto the knives and then carefully grind the required shape with a special grinding wheel or rotary tool. The knives must be nearly identical and equally balanced. The finish may not be as perfect as a manufactured profile, but it's much cheaper than having custom knives made.



Ogee knife

Ogee-and-bead knife



Tongue-and-groove coping knives

The ogee knife (left) is a single-purpose knife because it cuts only the ogee shape. The ogee-and-bead knife (middle) is a multi-purpose knife that will cut two different shapes, depending on how you set up for the moulding cut. The tongue-and-groove coping knives (right) are precisely matched – one cuts a groove and the other cuts the tongue to fit it.

Coping Knives

These cut interlocking joints. They come in matched sets – one part of the set cuts one half of the joint, while the other part cuts the other half.

Setup and Use

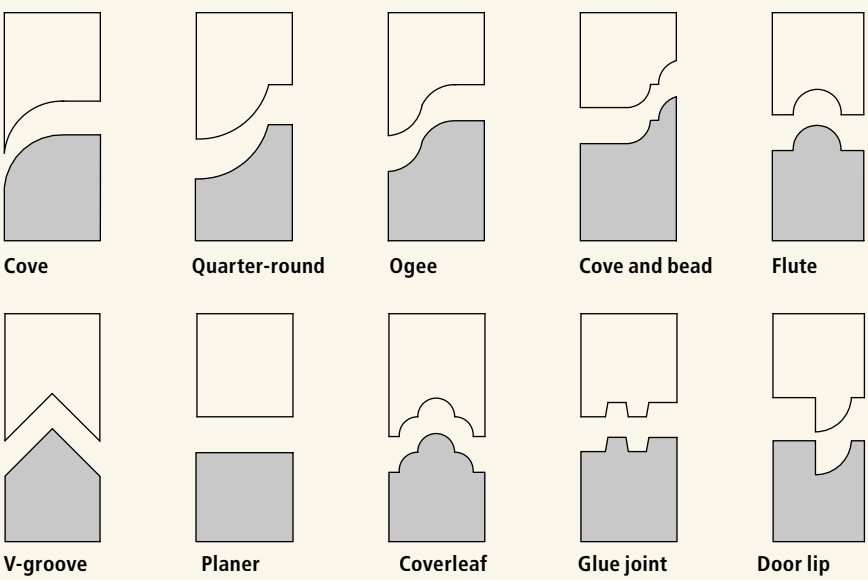
Moulding knives normally come in sets of three. This is a good idea because it helps balance out the moulding head. Using only two knives can cause excessive vibration during the cut. Three knives also improves the quality of the cut, creating more cuts per inch.

Each knife in a set is ground identically to the others. (Coping knives come in six-knife sets containing two matching sets of three.) To mount the knives in the moulding head, slip them into the slots in the cutterhead. Make sure the flat surfaces all face in the direction of rotation. Tighten the screws that hold the knives in the head, then check each screw again. With a standard table saw operating at 3,500 rpm, you don't want one of these knives coming loose.

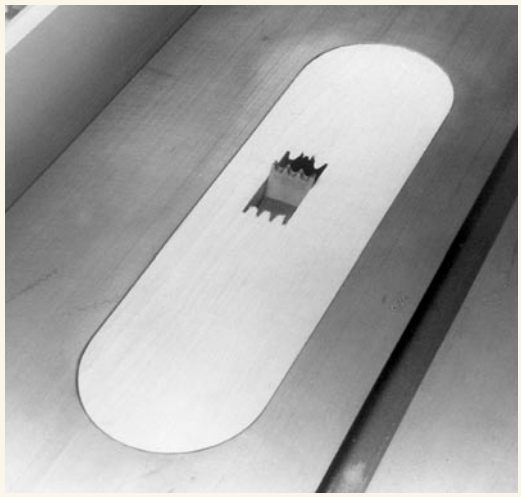
Set the position of the rip fence and the depth of cut as you would for a dado cutter and cut test pieces to check your setup. If you plan to cut two or more shapes in the same piece (for example, if you want to cut an ogee and a cove in the same board to form a crown moulding) cut several test pieces after you fine-tune the first setup. Use these pieces as samples to test successive setups.

As you're making your cut, feed the wood slowly over the cutter – slower than you would when making a saw cut or a dado cut. If you feed the wood too fast,

Common Moulding Knives



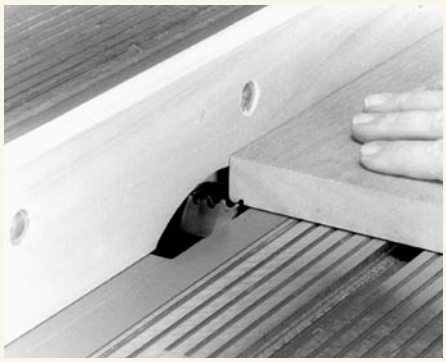
If there are no available throat plate inserts for the moulder you wish to use, you can easily make your own. First make an insert blank by using the existing insert to match the perimeter shape. Then lower the moulder height below the table. Bring the fence over until it covers the insert plate, but make sure it isn't covering the location where the moulding knife will come through. If you're unsure where the knife will come through, you can clamp a scrap board across the insert instead of using your saw fence. Start the saw and slowly raise the cutter up through the insert only as high as needed.



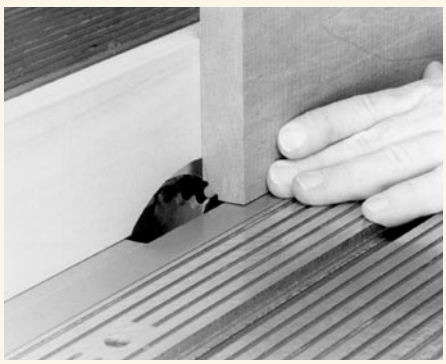
the shaped surface will show ridges or mill marks. By using a slower feed, you allow the moulder to make more cuts per inch so the moulded shape appears perfectly smooth. However, be careful not to feed the wood too slowly, especially when moulding hardwoods. If the moulder dwells too long in any one spot, it will heat up and burn the wood.

The advantage of a moulder over a router or shaper is that it will cut all three surfaces – the face of a board as well as the edges and ends, and it will do it in one pass. Shapers can also cut in one pass, but cut only edges and ends, while the decorative face cuts you can make with a router are limited. To mould the ends or edges, position the rip fence next to or partially covering the moulder (see photos at right). To cut the face, move the fence away or use the miter gauge to guide the work.

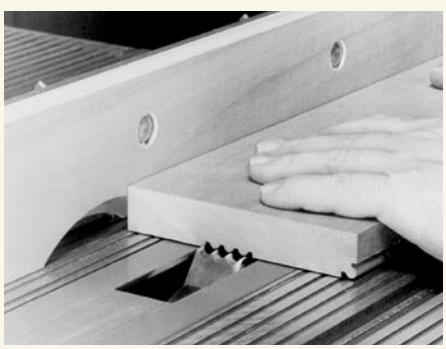
When cutting moulded shapes with the board on edge, you must not reduce the width of the board. If your moulding profile shapes the entire edge you need to carefully set the depth of the cut so the moulder does not plane the board. If the moulder removes too much wood, the board will rock forward toward the end of the cut, making the moulded edge crooked. This is especially important when cutting coped edge joints, such as rule joints, and tongues and grooves.



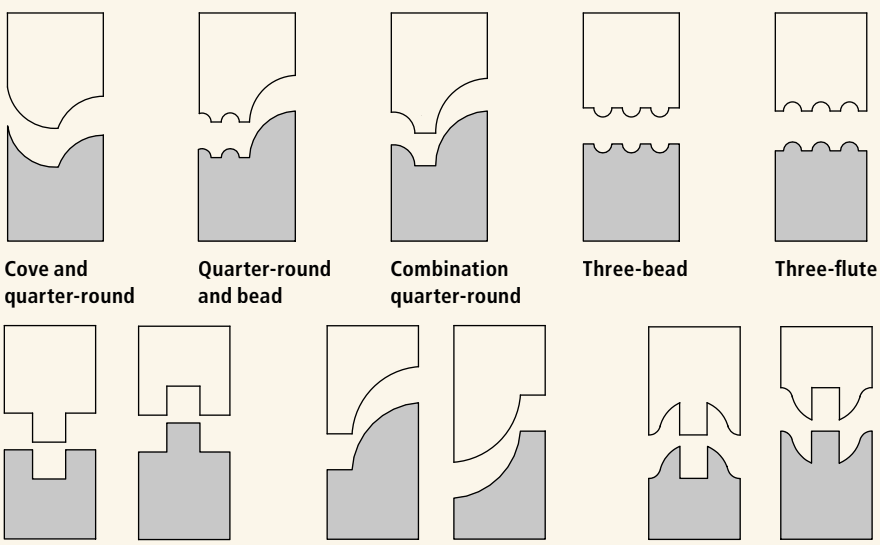
To cut a moulded shape in the edge or end of a board, position the rip fence next to or partially covering the knives. Place the face of the board on the table and slowly feed the stock over the cutter. Here, a moulder forms part of a corner bead in the bottom edge of a table apron.



You also can mould an edge with the face of the board against the rip fence and the edge on the saw table. Here, the same apron board has been turned to cut the second part of the corner bead. Note: If the board is significantly wider than the rip fence is tall, use a tall fence extension to support it.



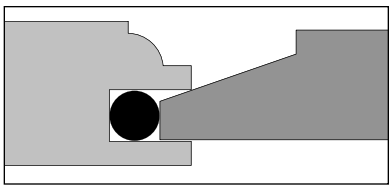
When moulding the face of a board, use a miter gauge to guide the board if cutting across the grain and a rip fence if cutting with the grain. Here, a moulder cuts three beads down the center of a table apron using the same knives that made the corner bead shown in the previous photos.



TIPS & TRICKS

PRO TIP:

Even, Quiet Spacing



Spacing and the proper bevel on a raised panel will make a perfect fit in the door frame. That is, until the panel shrinks because of humidity changes. Then the door will rattle and shift in the frame. A new concept (and product) to counteract this (and to make the initial panel-fitting simpler) is called Space Balls.

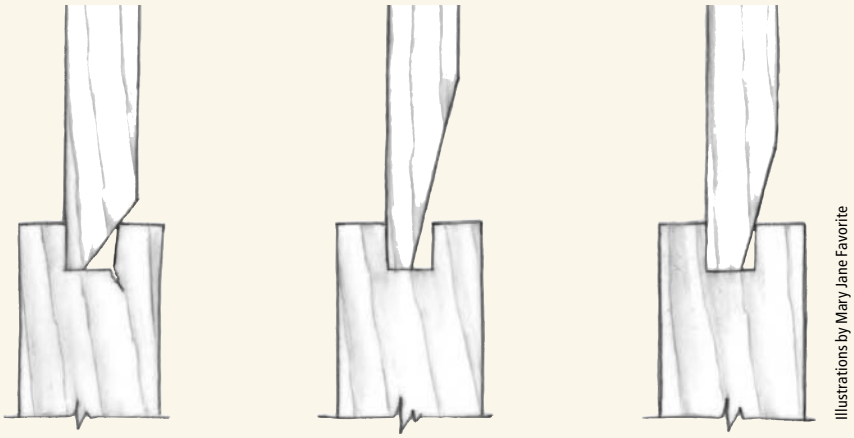
The concept is to place small rubber balls (.26" in diameter) into the groove in the frame. As the panel is placed in the groove the balls compress, perfectly spacing the panel in the frame. At a later time when the panel shrinks, the balls will decompress, maintaining the panel spacing and keeping it from shifting.

Space Balls are fairly inexpensive (about $5 for 100) and are available at a variety of woodworking supply houses, including Rockler (800-279-4441 or rockler.com). If you're feeling really thrifty, foam strip insulation will also work well for this purpose.

PRO TIP:

Finish First

Raised-panel doors can create a finishing problem that can be easily avoided. Because the panels are designed to float or move in the frame, unfinished wood can be exposed if the door is stained and finished after assembly. To avoid this, once your door has been successfully test-fit, remove the panels, and sand and stain them to their finished color. A thin coat of clear finish (if you're using one) is also a good idea at this time. It will keep the final staining of the frame from clouding or smearing the stain on the panel.



Bevel too steep
Panel splits frame

Bevel too shallow
Panel loose in frame

Bevel correct
Panel snug in frame

Illustrations by Mary Jane Favorite

When making a raised panel, the bevel angle is critical. If it's too steep (left) the panel could split the frame that it's mounted in. If it's too shallow (middle) the panel will be too loose and will rattle every time the door is moved. The bevel should be angled so it barely touches the groove's side when the edge of the panel rests in the groove's bottom, as shown above (right). In situations where wood may shrink or expand because of humidity changes, you may choose to leave the panel slightly loose to avoid damaging the frame.

Making Raised Panels

Raised panels are a staple in much traditional and contemporary woodworking. They form an attractive solid-wood panel for doors and cabinet sides, and even can be used for most of the pieces (sides, bottoms and tops) required for a variety of boxes – both decorative and functional. They allow solid wood to be used in large physical applications without concerns for wood movement caused by seasonal changes in humidity.

When not in a door frame, raised panels are also used as bottoms in most traditional drawers, allowing a thin groove to support the bottom, while still offering full-width support for larger drawers.

When using the table saw for specialty work, such as raising panels, it's important to remember that pushing a table saw to perform tasks that it wasn't originally designed to do can create a safety problem. If you overextend the table saw, you can easily lose control of

To determine the proper bevel angel of a raised panel, draw a full-size cross-section of the groove and the panel on edge as shown. Decide how thick the panel should be at the perimeter. (Most woodworkers prefer not to cut it thinner than 1/4"; if the beveled area becomes too thin, the panel will be weak.) Measure that thickness along the bottom of the groove from the bottom left corner of the groove and make a mark. From this mark, draw a line that just touches the top right corner of the groove. With a protractor, measure the angle between the side of the groove and the last line you drew – that's the bevel angle you want to cut. Tilt the saw blade to that angle.

the workpiece. This, in turn, makes the operation dangerous, inaccurate or both. When trying new techniques, you must maintain safety, accuracy and control.

Often, the easiest way to do this is to build a simple, sturdy jig to hold or guide the workpiece. A well-made jig is a tool in its own right, with its own capabilities and limits. For raised panels I highly recommend using a tall fence extension. The standard fence on a table saw is just too short to fully support a door panel being run on edge. Along with the tall extension, a featherboard to hold the piece tightly against the fence will make things safer, and also will ensure a quality cut with fewer saw marks.

A raised panel is a board with edges and ends that have been beveled or tapered so the stock is thicker in the center than it is at the perimeter. This panel is usually mounted in a frame that allows it to expand and contract without stressing or distorting the project. You can raise a panel on a table saw by beveling the ends and edges.

Before you can do so, you must decide what angle to cut the bevels. Most raised panels are designed to fit into grooves in their frames. If you make the bevel too steep, it will act as a wedge in the groove – when the panel expands, the bevel will split the sides of the groove. If you make the bevel too shallow, the panel will be loose in the groove. The bevel must be angled to just touch the groove's side when the edge of the panel rests in the groove's bottom. When you've determined the proper bevel, tilt the saw blade to that angle.

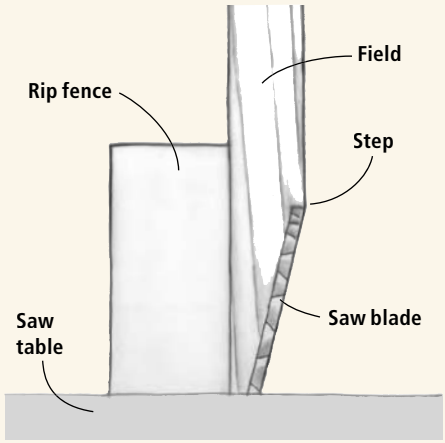
Next, decide whether the raised panel will have a step between the field (raised area) and the bevels, and how large that step will be. Most woodworkers prefer to make a 1/16"- to 1/8"-deep step (about the same width as the saw teeth). This helps delineate the field from the bevels and makes the visual effect more dramatic.

If you decide to make a step on the panel, place the rip fence so that just the outside corners of the teeth break through the wood as you cut. Make several test cuts to get the fence positioned just right, then cut the bevels in the ends and edges of the panel.

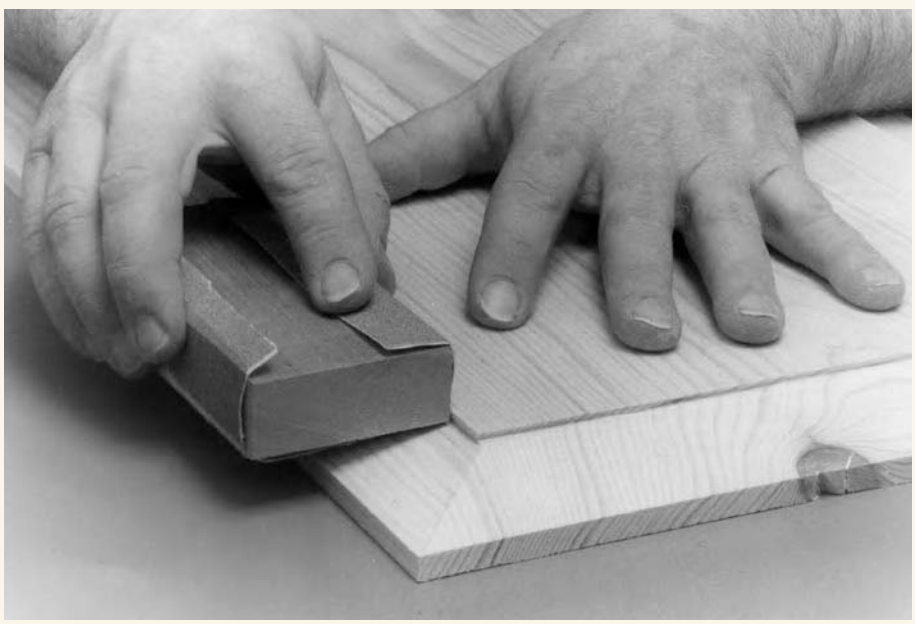
Because the blade was tilted when you cut the bevels, the step won't be square to the field. Depending on the grind of the saw teeth, it may not even be flat. Some woodworkers prefer to correct this by trimming it with a second series of saw cuts. But the step is so small that all it really needs is a little special attention with a file, scraper or sandpaper.

When you make your cuts, start with the ends of the panel first, then the long edges. If there's any tear-out while you're cutting across the wood grain, it will be removed when you cut the two bevels that are parallel to the grain.

One other note: On many table saws the blade tilts to the right. This means the fence must be placed to the left of the blade (away from the tilt) when raising panels.



Raised panels often have a step between the field and the bevels that emphasizes the design. If you decide to make a step, you must carefully position the rip fence so just the outside corners of the saw teeth break through the surface of the wood. The tops of the teeth will create the step. To make a shallower step, move the rip fence away from the blade – the teeth will protrude farther from the panel. To make it deeper, move the fence closer, but not too close or the teeth won't cut completely through the wood.



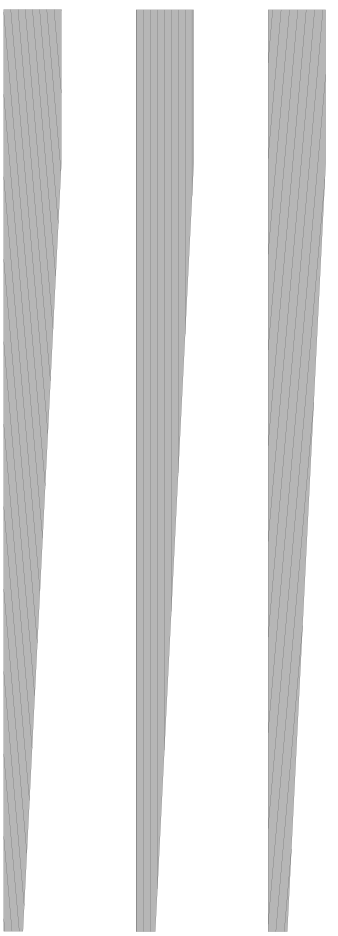
After it's cut, the step will not be square to the field. Some woodworkers prefer to correct this by trimming it with a second series of saw cuts. However, the step is so small that all it really needs is a little special attention with a file, scraper or sandpaper. If you use sandpaper to correct the angle of the step, wrap the paper around a hard, square block to make the step as flat as possible.

PRO TIP:

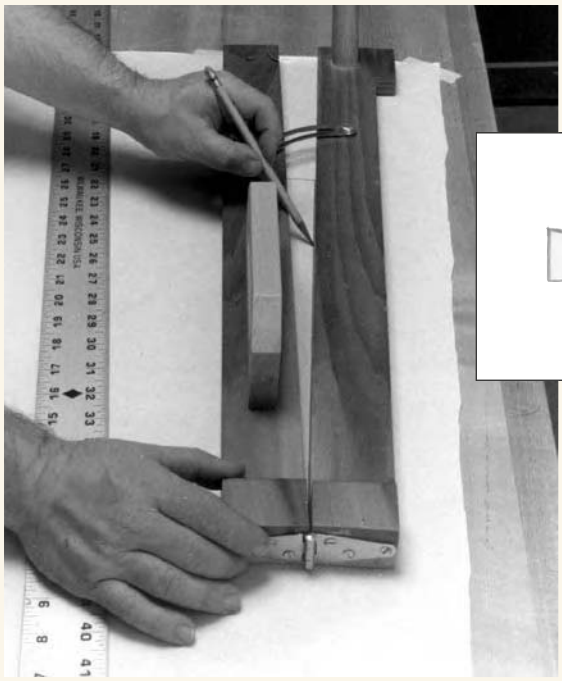
Optical Illusion

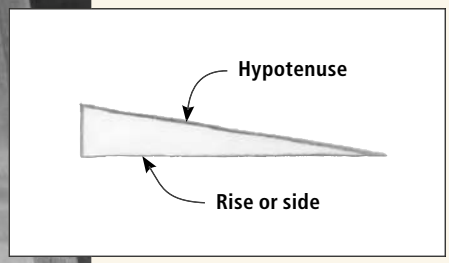
When making legs, whether for chairs or tables, choosing your wood carefully can make the difference between beautiful and bizarre. The grain direction in your lumber can make or break the look of a piece. This goes double for tapered legs. If your grain direction is running in contrast or in harmony with the taper on your legs, it changes the look.

The illustrations below help explain this. Angled grain (in either direction) gives your leg a barber pole appearance. Your best wood selection is a straight grain (rift cut) pattern with as little cathedral as possible. This is not only better for aesthetics, it also makes for a stronger leg.



Angled **Straight** **Angled**





On a sheet of scrap paper, draw a large right triangle with the same slope as the taper you want. Use this as a gauge to set the tapering jig to the proper angle: Align one arm with the base of the triangle and the other with the hypotenuse.

Making Taper Cuts

To taper a board, you must reduce its width gradually from one end of the board to the other. That requires holding the board with its length at a slight angle to the blade as you rip it.

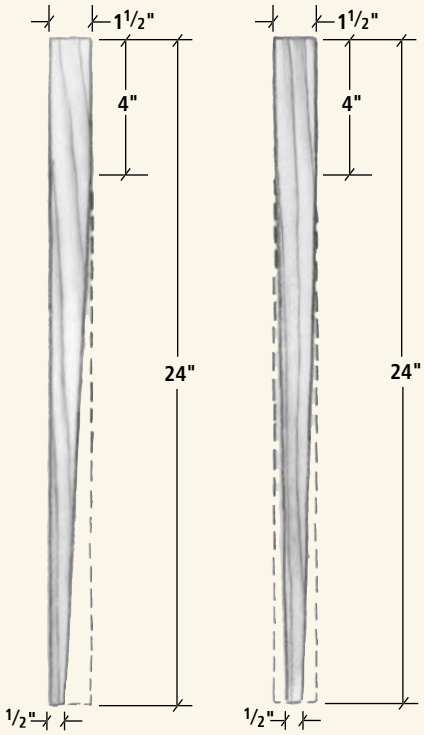
A tapering jig is the right tool for this job. This jig (detailed in Chapter 2 of this series) consists of two long arms, hinged together at one end. A ledge is glued to one arm near the end opposite the hinge. A metal brace lets you adjust and lock the angle between the two arms. The arm without the ledge guides the jig along the rip fence, while the other holds the stock at an angle to the saw blade.

To set up for a taper cut, you must know the slope of the taper. You also should know whether you will cut a single taper (on a single side or two adjacent sides) or a double taper (with tapers on two or more opposing sides).

Shown at right are two tapered table legs, each 24" long. The one on the left has a single taper; the one on the right, a double taper. The foot of both legs is the same width. The rise is equal on both. On both legs, the taper begins 4" from the top and continues to the bottom, making the rise 20" (24" – 4" = 20"). The run is not equal. Although both legs are 1½" wide at the top and then narrow to ½" at the bottom, the single-taper run is 1" (1½" – ½" = 1"), and the double-taper run is ½" ([1½" – ½"] ÷ 2" = ½").

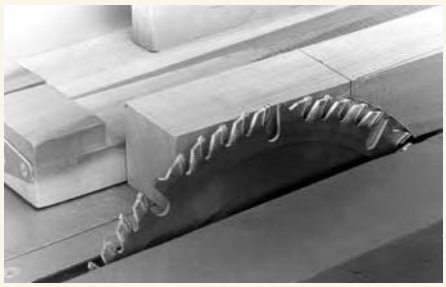
The slope is determined by the length and width of the taper (sometimes called the rise and run). To find the rise of a taper, measure from the starting point to the end. To determine the run of a single taper, calculate the amount by which the width of the board is reduced. For a double taper, divide that amount in half.

To set the tapering jig to the proper



Single taper
Rise=20", Run=1"

Double taper
Rise=20", Run=½"



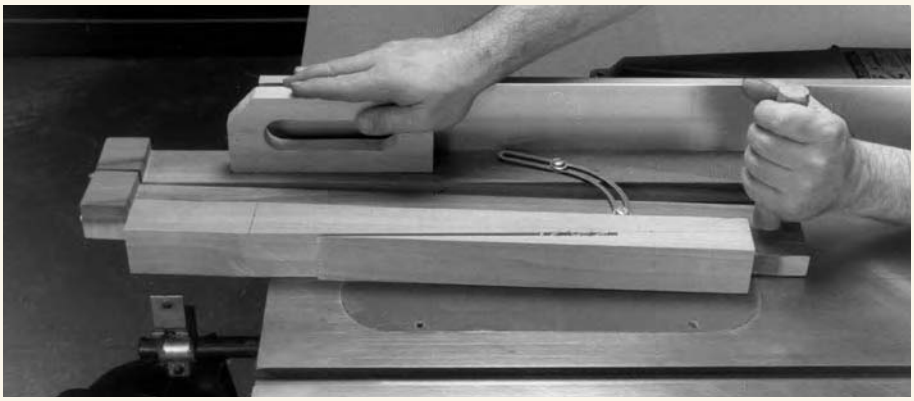
Using scrap stock, cut several test pieces to the same dimensions as the workpieces you will taper. Lay out the tapers on each of these pieces. Place the jig on the table saw with the guiding arm against the fence and place a test piece against the ledge on the other arm of the jig. Position the fence so the inside edges of the teeth brush the layout line that marks the start of the taper.

angle, draw a right triangle on a large sheet of paper. The base on the triangle must be the same length as the rise, and the side of the triangle must be equal to the run. Place the jig over the triangle, then adjust it so one arm is parallel to the base and the other is parallel to the hypotenuse (see photo top left). If the slope of a taper is given in degrees, you don't have to calculate the rise. Simply draw the triangle so the angle between the base and the hypotenuse matches that given for the slope.

Next, transfer your taper to a test piece of wood. Place the jig on the table saw with the guiding arm against the fence. Position the fence so the taper will begin at the proper point and make a test cut in a piece of scrap. If the test results are acceptable, cut the good stock.

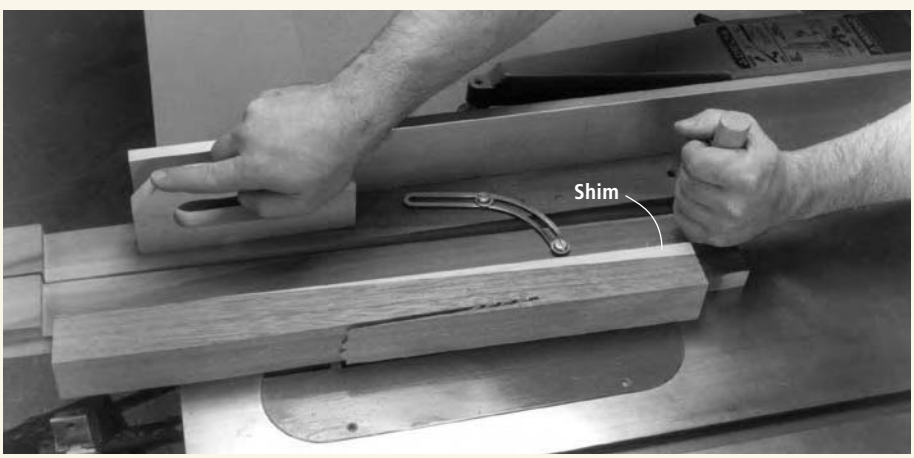
To cut a double taper, make the first pass as if you were making a single taper. Then flip the board so the cut edge faces the jig. Place a wedge-shaped shim between the workpiece and the jig to hold the stock at the proper angle and make the second pass.

Because the most common use for tapering is table legs, there is one other thing that should be kept in mind during this process. If you will be using mortise-and-tenon joinery to build your table, it's easier to cut the mortises in the legs prior to tapering them. It's much harder to form an accurate mortise on a shape that doesn't have flat sides. **PW**



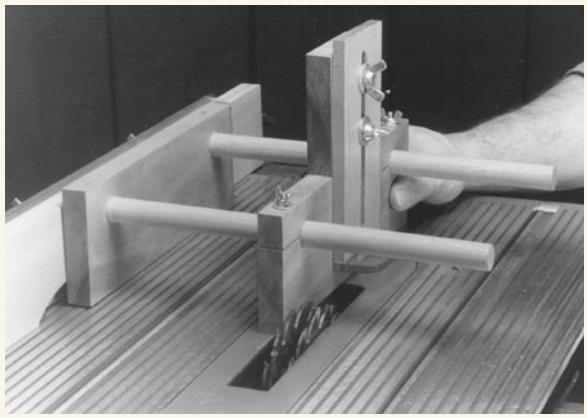
Turn on the saw and slowly push the jig forward, feeding the stock into the blade. As you do so, monitor the cut to make sure the blade follows the layout line. If it does, the setup is correct. If not, readjust the angle of the jig or the position of the rip fence.

Make the first pass of the double taper as if you were cutting a single taper. Turn the board so the cut side faces the jig and place the shim between the piece and the jig. The wide end of the shim must be flush with the narrow end of the stock. This will hold the workpiece at the same angle to the blade as it was for the first pass. Make the second pass, holding the workpiece and the shim against the ledge on the jig.



To cut a double taper, you must make two passes. Use a wedge-shaped shim (shown above) to position the stock on the second pass. The dimensions and slope of this shim are the same as the triangle you drew to set the angle of the jig. Lay out the shim on scrap stock, place the scrap in the tapering jig and cut the shim. Saw to the inside of the layout line.

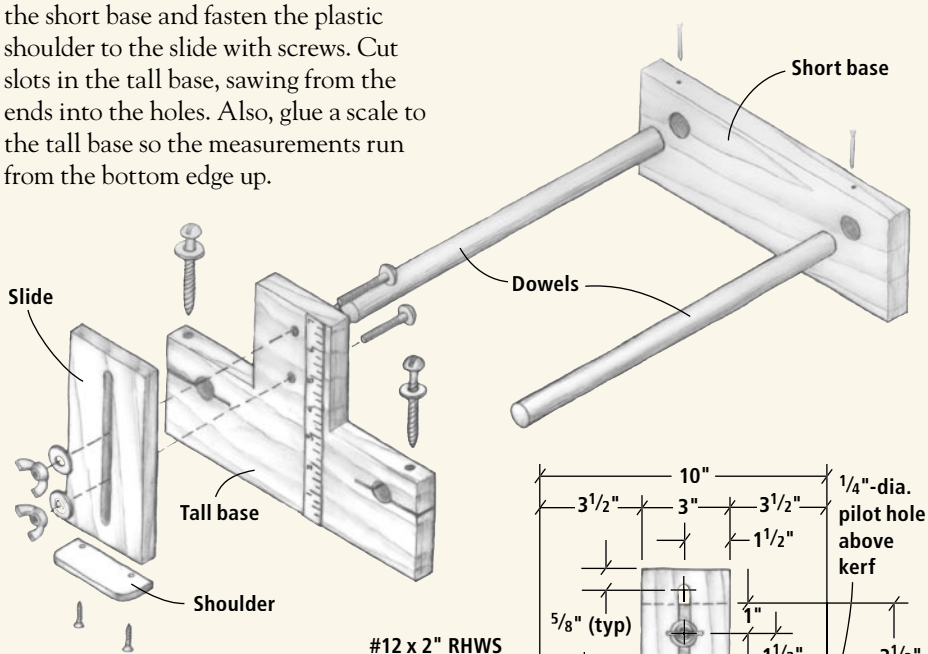
Height Gauge



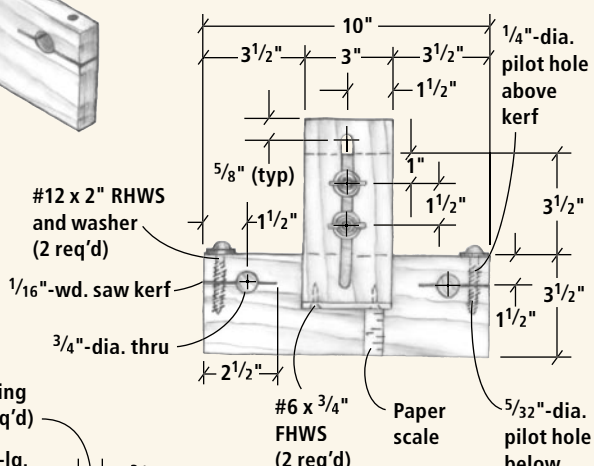
This simple gauge has a wide stance so it can stand on its own, leaving both hands free to make adjustments. The large shoulder makes it easy to position the gauge over the blade or cutter and you can adjust the width of the base to fit the distance between fence and cutter.

To make the gauge, cut the parts to the sizes and shapes needed. Drill the bases for bolts and dowels, and rout a groove in the slide. Glue the dowels to the short base and fasten the plastic shoulder to the slide with screws. Cut slots in the tall base, sawing from the ends into the holes. Also, glue a scale to the tall base so the measurements run from the bottom edge up.

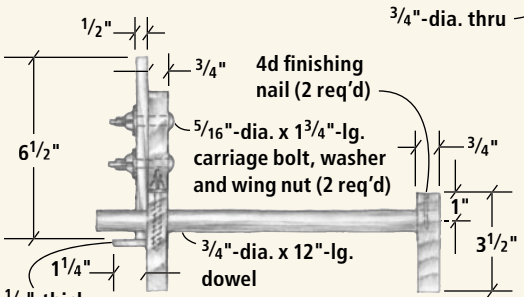
Fasten the shoulder/slide assembly to the tall base with carriage bolts and screws. Insert the dowels through the holes in the tall base. To clamp the tall base to the dowels, drive screws through the slots from the top edge.



Exploded view



Elevation



Profile

Photos by Al Parrish

A PRACTICAL Shop Cabinet

Easily organize, store and transport all your small woodworking accessories with this clever cabinet and inexpensive plastic tackle boxes – instead of drawers.

by Troy Sexton

Troy designs and builds custom furniture in Sunbury, Ohio, for his company, Sexton Classic American Furniture. He is a contributing editor to Popular Woodworking.

One of my favorite things to do when I have free time is to tinker around my shop, organizing my small stuff. I actually enjoy sorting through nails, bits and staples; and a pile of differently sized screws all thrown together drives me crazy. For this reason, I have become fond of Plano's plastic utility boxes. I have about 100 of them.

This might seem excessive, but I also use the boxes to organize and store fishing lures. In fact, these boxes often are advertised as miniature tackle boxes.

Any woodworker or angler knows that the amount of screws, nails, bits and lures one owns tends to grow exponentially, resulting in a lot of little stuff. (After sorting through

Cutting the dados is simple work with a dado set installed in your table saw. Cut four dados (one on each side piece and two on the divider), move the fence, then cut four more and so on.

Some heavy-duty screws will ensure this cabinet will stay put, even when fully stocked.

Two screw strips, one on the top and one on the bottom, allow you to screw your cabinet to your shop wall. Notice the notch cut into the divider to allow the screw strip to fit.

my fishing lures recently I realized I own almost 1,000.) Plano's boxes have dividers to keep everything organized and they're easy to carry around the shop, to a job site or on a boat. However, 100 loose boxes is a bit like a pile of differently sized screws. I needed a box to organize my boxes. The cabinet you see here is the result.

This project is simple and quick to build – as a shop project should be. The plastic boxes merely slide in and out on pieces of Masonite that are slipped into dados cut on the inside of each side piece and both sides of the cabinet's center divider. The cope-and-stick doors are entirely optional.

While any miniature tackle box will work, this cabinet fits Plano's 3700-series utility boxes. For more information, see "About Plano Utility Boxes" below.

ABOUT PLANO UTILITY BOXES

I built this cabinet to hold any of the plastic utility boxes in Plano's 3700 series. I've been using Plano utility boxes for years and they work great. The 3750 has a good, solid latch and the 3770 is perfect for storing a combination of woodworking and fishing accessories. Most cost less than $5 each and can be found at any large sporting-goods store. For more information about the boxes, call 800-226-9868 or visit planomolding.com. *– TS*

Rows of Dados

Cut the poplar top, bottom, sides, divider, plywood back and Masonite shelves to size, as stated in the cutting list. Now it's time to cut the dados. Install your dado stack in your table saw. The dados are 1/4" wide by 1/4" deep so you need only the outside cutters. There's no need to mess with chippers or shims.

I spaced my dados 2 1/4" apart. You need to cut each dado on the inside of each side piece and on both sides of the center divider. Cut the first dado in the four places required, adjust your fence and then cut the next one. You're cutting 11 dados on each piece, which amounts to 44 dados. This method ensures you move your fence as little as possible.

With the dados complete, cut a 1/4" x 1/4" rabbet on the rear edge of the side pieces that will hold the 1/4"-thick plywood back.

Assembling the Cabinet

Once the dados are cut, round over the edges of the top and bottom pieces using your router and a 1/2"-radius roundover bit. Sand all the case pieces to #180 grit.

Lay out where the sides and divider will go on the top and bottom, as shown in the illustration at right. Use these layout lines to drill your clearance holes, then screw the sides, top and bottom (but not the divider) together with #8 x 2" screws.

You need two screw strips to hang the cabinet on the wall – one on the top and one on the bottom, as shown in the drawing. While the screw strips fit between each side piece, you must first notch the center divider to make it work. Using your band saw, cut a 3/4" - wide by 1 1/2"-long notch at the top and bottom of the back side of the divider. Screw the divider in place and then nail the screw strips in place as well, as shown above.

If you did everything correctly, the 1/4"-thick plywood back should fit snugly between each side piece and flat against each screw strip. Basically, it fits into a 1/4"-deep rabbet you created when assembling the cabinet. Cut your back to size, sand it smooth and, using your brad nailer, nail it in place.

Cope-and-stick Doors

The doors are optional. In a shop, they'll keep the boxes from getting dusty. Plus, they show off your craftsmanship. If and how you make them is up to you.

I made my two doors using stile-and-rail cutters on my router table. I used my table saw to raise the panel. First, cut all your door parts to size. Then, using your rail bit (sometimes called the cope-cutting bit), cut the tenon on the four rails. Then cut the beaded moulding profile and groove on your four stiles with the stile bit from your stile-and-rail bit set.

It's always a good idea to do test cuts when using stile-and-rail bits. If you want additional instruction on using stile-and-rail bits, check out my "Frame & Panel Dresser" story in the February 2005 issue.

To raise the panel, head to your table saw and bevel the blade to 7°. Adjust the rip fence to leave a shoulder on the panel at the top of the blade and a thin-enough edge to fit into the grooves you just cut in your stiles and rails. Again, cutting a test piece first is a good idea to ensure a snug fit.

SUPPLIES

Plano
800-226-9868 or
planomolding.com

- plastic utility boxes 3700 series, price varies

Rockler
800-279-4441 or
rockler.com

4 • partial wrap-around hinges #31495, $6.39/pair

2 • narrow magnetic catches #26559, $1.49/each

2 • classic wooden knobs #15257, $3.39/pair

Prices correct at time of publication.

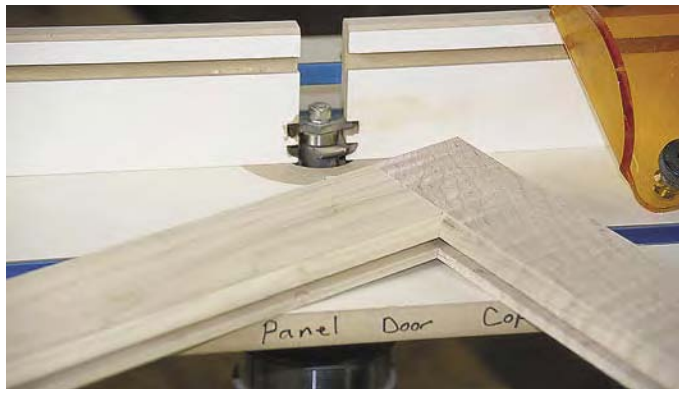
Sand the panels to #180 grit before gluing them up in the frame-and-panel assemblies. Don't sand the inside edges of the rail-and-stile pieces at the point where they mate to form the joints. You could easily create an ugly gap.

Glue up the door assemblies. It's a loose-panel assembly, so don't glue the frames' grooves. As the seasons change, you want your panel to expand and contract.

I used four Amerock partial wrap-around hinges to attach the doors to the cabinet and two magnetic catches to keep them shut. Don't forget the wooden knobs.

Initially I painted my cabinet yellow, which is the color shown here. But I decided I didn't like the yellow, so later I painted it black and then distressed the finish. There's no need to finish the Masonite shelves. Simply cut them to finished size and slide them into place.

This cabinet is the perfect solution for my woodworking and fishing storage needs. Whenever people visit my shop they comment on its ingenuity. It's so simple! There's only one problem: I didn't build this cabinet big enough. I'm currently working on a chimney cabinet design to resolve this issue. **PW**

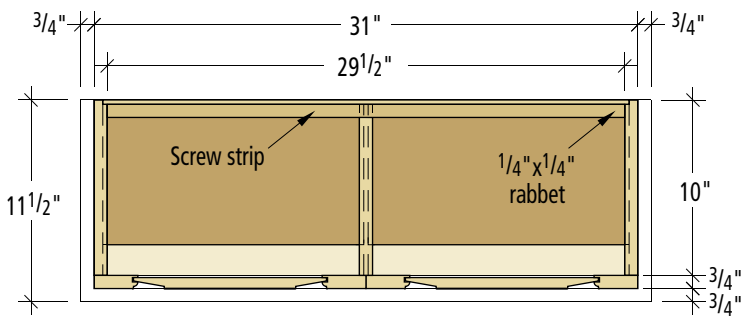


I built my cope-and-stick doors using a stile-and-rail bit set in my router. The doors are optional and can be made however you wish.

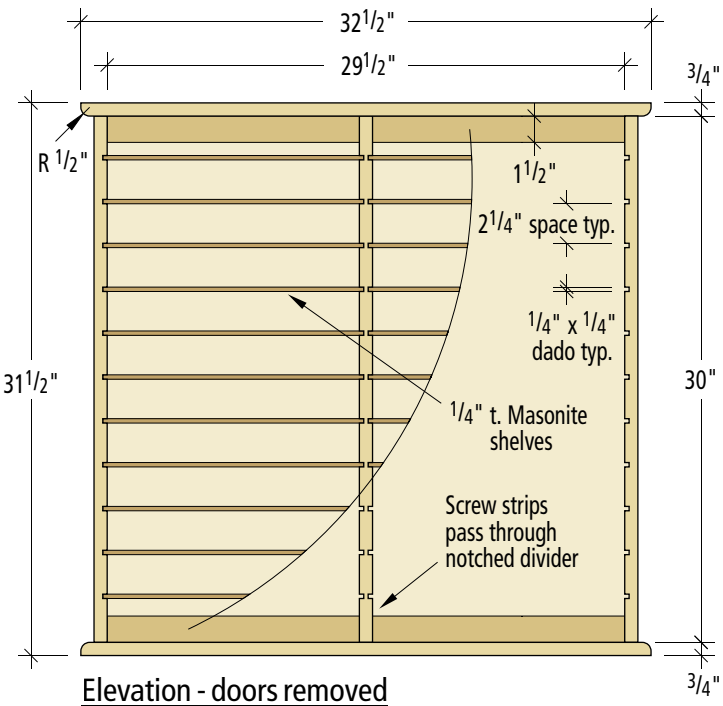
A PRACTICAL SHOP CABINET

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Top	3/4	11 1/2	32 1/2	Poplar
❑	1	Bottom	3/4	11 1/2	32 1/2	Poplar
❑	2	Sides	3/4	10	30	Poplar
❑	1	Divider	3/4	9 3/4	30	Poplar
❑	1	Back	1/4	30	30	Plywood
❑	22	Shelves	1/4	8	14 13/16	Masonite
❑	2	Screw strips	3/4	1 1/2	29 1/2	Poplar
❑	4	Door stiles	3/4	2 1/2	30	Poplar
❑	4	Door rails	3/4	2 1/2	11 1/4*	Poplar
❑	2	Door panels	3/4	11 1/8*	25 11/16*	Poplar

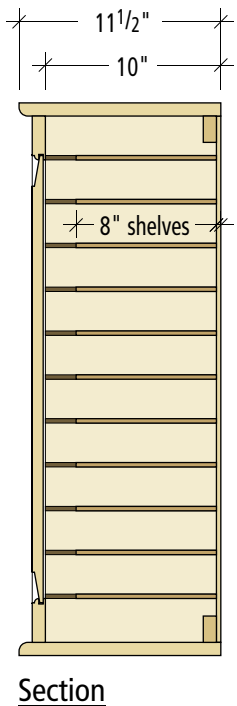
*Finished size will vary depending on your set of rail-and-stile bits.



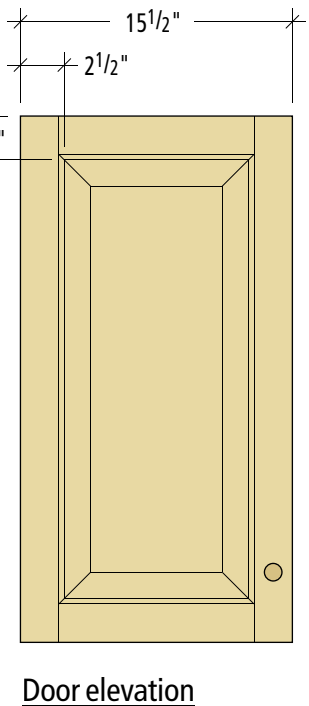
Plan - top removed



Elevation - doors removed



Section



Door elevation

Two Plane Makers

Lie-Nielsen Toolworks and Lee Valley Tools have changed woodworking with their premium hand planes. Meet the men behind the brands and learn the real differences between the tools.

by Christopher Schwarz

Comments or questions? Contact Chris at 513-531-2690 ext. 1407 or chris.schwarz@fwpubs.com.

Thomas Lie-Nielsen reaches into a cardboard box to fetch a tool his company plans to manufacture in the coming year. He pulls out a wooden pattern of a router plane, a well-shaped and handmade version of the tool as it will look when it's later cast in ductile iron.

Like many of the tools from Lie-Nielsen Toolworks in Warren, Maine, the plane is recognizable as an adaptation of a classic tool – in this case the Stanley No. 71. Though as you examine the wooden pattern, you do notice

LIE-NIELSEN NO. 4

subtle refinements, including an improved adjuster.

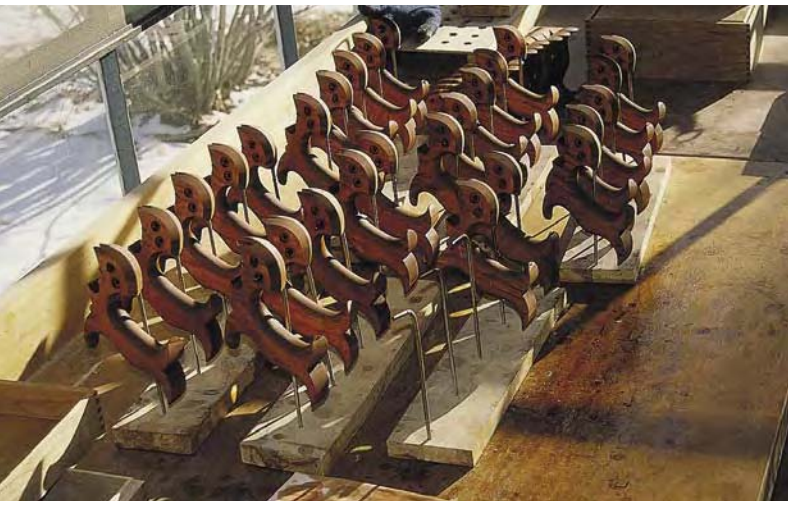
"A tool that looks like it was drawn in CAD is a failure to me," Lie-Nielsen says about the tool's almost-Victorian curves. "It might be fine, but it doesn't satisfy me."

More than 400 miles away in Ottawa, Canada, Robin Lee offers a similar preview of tools that will be produced under the Veritas name by Lee Valley Tools. During this tour, Veritas is gearing up to build a bullnose plane. There's a beautifully made wooden pattern to show, and a plastic one, too.

Thomas Lie-Nielsen in his factory in Warren, Maine. "How a tool looks is important, but I don't do things for strictly decorative purposes."

Robin Lee in the company's flagship retail store in Ottawa, Canada. "When we develop a tool we look at what will make it more usable for the average person. An inexperienced user should be able to get as much out of a tool as an experienced user."

VERITAS NO. 4



Here you can see saw handles being prepared for finishing at Lie-Nielsen's satellite factory. Though produced by modern methods, the handles are decidedly inspired by 19th century designs.

And the plane exists in a virtual environment on the company's servers as well.

Lee and a tool designer show off the plane's features and demonstrate how they tweak a tool's design in the computer to improve its balance and look. The Veritas bullnose plane looks like what you'd expect when you hold a bullnose plane, to be sure. But its DNA is impossible to trace to one historical example. The tool looks modern, and it has features never before seen on a bullnose – such as set screws that tweak the blade left and right. And it feels different in the hand thanks to holes and finger depressions in the body.

"Function is first," Lee says. "We're trying not to design from plane numbers, No. 1 and No. 2 and so on. Plus, people have changed. We're a lot bigger. There have been changes in nutrition and lifestyle. Muscle development has changed. We do less physical work. Our grips have changed. We have fewer callouses."

During the last two decades, these two toolmakers – Lie-Nielsen and Lee Valley – have transformed the way that thousands of woodworkers flatten and shape wood. Both companies have devoted enormous energy to do something almost unheard of: Produce high-quality hand tools in North America. While the planes cost more than many hand-held power tools, both brands have thousands of users who enthusiastically spread the word that well-made hand tools are worth the expense.

Both companies have succeeded while corporations, such as Stanley and Record, have abandoned efforts to make quality hand tools in the United States and England. In fact, demand is so strong that both Lee Valley Tools and Lie-Nielsen Toolworks struggle at times to keep up with their customer's orders.

And while these two toolmaking companies share many similar goals, the way they design their tools is different. For those woodworkers looking to purchase a premium plane, many agonize about which brand to get. They debate the differences in nauseating detail on the Internet. They call woodworking magazine editors for opinions. And ultimately, some end up buying hand planes from both companies.

The brands are indeed different – not only to look at but in use as well. And the differences can be traced to the passionate personalities behind each company.

The Self-taught Plane Maker

Thomas Lie-Nielsen doesn't have a traditional office. In a back room of his factory there's a large open space with worktables, a workbench that the company is developing for sale and sweeping views of the Maine landscape. The shelves on the back wall are filled with tools his company made, plus antiques that are being studied.

Lie-Nielsen shares this room with other long-time employees, and he sets up his laptop computer on a worktable to answer e-mail, phone calls and questions from employees. Today Lie-Nielsen examines a bit for a metal milling machine that's bored with tiny holes to carry lubricant to the cutting edge. Lie-Nielsen and Joe Butler, vice president of the company, debate the merits of the tooling and Lie-Nielsen asks how much the bits cost. Butler tells him.

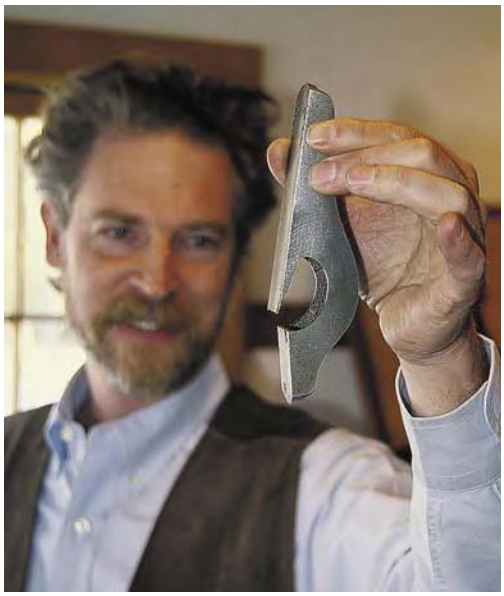
"And you think my tools are expensive?" Lie-Nielsen says with a laugh.

Surprisingly, Lie-Nielsen isn't a formally trained machinist or engineer, but he probably would be welcomed into any factory. Since establishing Lie-Nielsen Toolworks in 1987 in a decrepit woodshed, Lie-Nielsen has become personally accomplished at casting bronze, heat-treating steel and machining tools.

He was born in 1954 as the son of a Maine boatbuilder and grew up surrounded by craftsmen who built wooden boats with hand tools. His father's business, Lee's Boatshop, also had a machine shop and would cast the lead keels for its boats on the beach.

> "I don't do CAD. What works for me is to see things in real life. I can't sit at a computer, draw something up and be happy with it." — *Thomas Lie-Nielsen*

Veritas No. 6 fore planes after the frogs have been machined. Unlike a traditional No. 6, the Veritas has its mouth located further back than the Stanley versions.



Both Lie-Nielsen and Lee Valley use ductile iron for their plane bodies. This material is nearly unbreakable and stable. Here Lie-Nielsen shows off one of the castings that has been brutalized to show how it won't crack.

Lie-Nielsen enjoyed making things and considered becoming a boat builder; he recalls a visit to a yacht designer during high school as a pivotal career moment. When Lie-Nielsen asked the designer for advice about boat building, the designer handed over a set of old plans for a boat.

"He said: 'Here, take these. Everything you need to learn is right there. You don't need to go to school,'" Lie-Nielsen says.

Lie-Nielsen went to Hamilton College and studied English and history. After school he ended up in New York City while his wife attended graduate school there. An ad for the Garrett Wade woodworking catalog in *Wooden Boat* magazine caught his eye, and he landed a job with the Manhattan mail-order company run by Garry Chinn. There he had a front-row seat as Stanley and Record discontinued their specialty planes and allowed the quality to slip on their bench and block planes. He heard customers complain.

There were some cottage toolmakers making a few of these desirable tools, but they were a drop in the bucket. One of these toolmakers, Ken Wisner, made a version of the Stanley No. 95 edge-trimming plane and sold them through Garrett Wade. Lie-Nielsen heard that Wisner was looking to get out of the business. At the same time, Lie-Nielsen was looking to return to Maine. He worked out a deal with Wisner, bought a run-down farm in Maine and began making tools in the woodshed when he wasn't growing food, or tending the sheep and milk cows.

He developed the patterns for the skew block plane he now sells, and built a new shed on his property. A friend who ran an art foundry would cast the bronze, and Lie-Nielsen started investing in machines and tooling.

Customers and the woodworking press began to take notice. When David Sloan from *Fine Woodworking* magazine called Lie-Nielsen for the first time, he was picking blueberries on his land. Since then, it has been a story of almost-constant expansion.

Lie-Nielsen got divorced, sold the farm and moved the business into the building he now occupies – which was once an icehouse and later a factory that built one-man submarines. He struggled to find foundries that would handle his small volume and demands for quality. Until he found the right foundry, he cast the bronze tools himself. It was the same story with the blades for his tools.

As his volume increased, he found the right foundry and the right people in the steel and heat-treating industry to provide him with cast bronze and ductile-iron tool bodies and quality irons.

The company has outgrown its building several times and construction seems constant. During this visit in early 2004, Lie-Nielsen is juggling his warehouse and new chisel-making operation and he's about to break ground on a 7,500-square-foot expansion. He's even had to acquire a factory in a nearby town for his saw-making, handle-making and his patternmaker. He now employs almost 70 people.

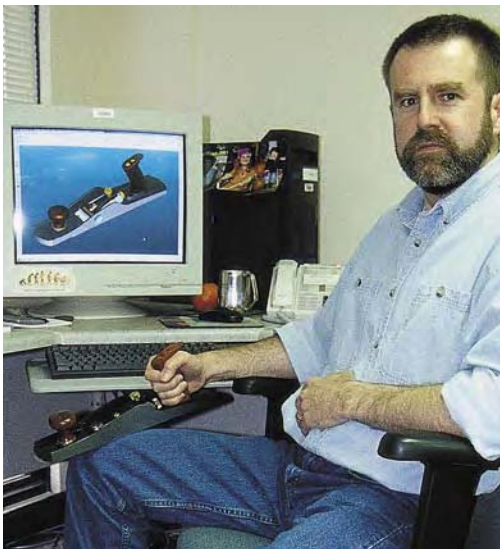
Lunch today is at his laptop with some fellow employees – the debate is pizza or hamburgers. The work is constant and every year seems to be a pivotal one. After building up his line of hard-to-find specialty planes, Lie-Nielsen then took a gamble by building bench and block planes, which competed directly with mass-produced Stanley and Record planes. Lie-Nielsen planes can cost five times as much as a new Stanley plane, but people continue to buy them.

"There was some price-resistance at first," he says. "But we proved that quality sells. I price the tools so I can make money but people can afford them."

And some of his tools have changed the way people work wood. His low-angle jack plane launched a revolution in the hand-tool world and people began embracing larger tools that cut with the iron's bevel facing up. He now offers chisels that have raised the bar among Western tools, and he struggles to keep up with demand, despite dozens of competitors that make chisels. Next up is workbenches. And then?

"We want to offer as complete a kit as possible for the hand-tool woodworker," he says. "Future planes will obviously be more specialized now that we have the full range of bench planes: compass plane, spokeshaves, panel saws, veneer saws. My list is longer than it has ever been."

A Veritas employee checks the machining on a plane's frog. Most home woodworkers don't have the correct instruments to measure tolerances or the skills to correct them. If you think your premium plane isn't right, contact the manufacturer before fixing it yourself. You could make it worse.



Terry Saunders, the chief plane designer at Lee Valley Tools, shows off the CAD drawings that led to the prototype low-angle jack plane he's holding.

Listening to Customers Is a Family Tradition

Somehow, Robin Lee violates the laws of time and space. Visit almost any woodworking discussion forum on the internet, and you're sure to run into him there. He monitors and chimes in almost daily on these forums – though he's never trying to directly sell product. Mostly he's reading about woodworkers' experiences, answering questions asked directly to him and occasionally tantalizing others on the forum with images of the tools that are coming from Veritas, the manufacturing arm of Lee Valley Tools.

Competing tool manufacturers are often bewildered by the energy Lee pours into this endeavor, but Lee sees it as the same thing he has done his entire life while growing up under the wing of Lee Valley Tools: He's listening and responding to the needs of customers.

Lee was 15 when his father, Leonard Lee, started Lee Valley Tools from his house in 1978. The company's first catalog was laid out on the family's kitchen table with the assistance of Garry Chinn, the founder of the Garrett Wade catalog (and the person who also gave Lie-Nielsen his first job in the tool industry).

"We do share roots," Lee says of Lie-Nielsen, Chinn and Lee Valley. Lee Valley's first taste of manufacturing tools was actually the result of a partnership with Garrett Wade to produce a line of tools under the name "Paragon." That short-lived venture led Lee Valley to become a tool manufacturer, though planes were not at the top of the company's list then. "Stanley and Record were still pretty good at the time," Lee says.

From those humble beginnings at the Lee home, the company has grown to more than 900 employees that run the catalog operation and 11 retail stores in Canada. With more than 5,200 woodworking products in the catalog – 550 of which they make – Lee Valley is likely the largest hand tool catalog in the world.

Part of that success is the result of offering good tools at a fair price. And part of that success is the result of the company's legendary customer service. Lee learned that lesson well as he worked full-time hours after school and during summers for Lee Valley.

"I enjoyed every minute of what was virtually slave labor," Lee says with a laugh. "That's typical for a family business. But I really found that I enjoyed not only the tools, but the industry and the people we serve."

When he was home between sessions at the University of Waterloo (where he studied engineering, specializing in management sciences and ergonomics) he sifted through the comment cards and letters from customers. He estimates he has personally read tens of thousands of these.

"My real education came from customers," he says. "The formal schooling will teach you how to think. In dealing with the customers, I learn something every day."

In fact, Lee points to customer comments as the starting point for designing a tool. About a third of the company's tools sprout from customers. "We read every comment card," he says. "We file them and keep them as a reference so we can go back and see trends."

One of the big challenges for Lie-Nielsen and Lee Valley is to produce handles that are comfortable but that can be made with a minimum of hand work. Here a Lie-Nielsen saw handle is machined to shape.

Lee Valley employs 12 people in research and development (R&D), including five product designers. Tucked under the eaves of the company's headquarters in Ottawa, the designers work in sleek office cubicles with high-powered computers. But their shelves are packed with prototype, vintage and new tools.

Though Veritas planes have modern lines, it would be a mistake to say they are a rejection of past forms. Many of the details and features on Veritas planes have appeared on tools, if however briefly, some time in the last 200 years. Yet some of the features on the tools are truly original – the company holds a number of patents on its line of hand tools.

Through a doorway from R&D is a large storage room with a woodworking bench where these ideas are put to the test.

Though Lee isn't part of the R&D department, he spends a fair amount of time guiding their efforts. Today the product designers and Lee are working with three tools: a concave-sole spokeshave, a low-angle jack plane and the company's spokeshave kit.

Lee takes a couple swipes on a board with the jack plane and offers some comments about the tool's balance. Then he shows off one of the features of the plane he's proud of. It's a small, adjustable stop in front of the blade that prevents the adjustable mouth from striking the iron and damaging it. It also allows you to rapidly clear the mouth of shavings should it clog. He demonstrates this feature by quickly clicking the mouth open and shut. If you want you can even slam the mouth open and shut without striking the iron.

The knob is simple and ingenious. Innovations like this get Lee very excited.

It's fair to say Lee's passion for product development comes natu-

rally. His father recently turned over the reins of Lee Valley to Robin. Now Leonard Lee focuses his efforts on designing and producing new surgical instruments and procedures for Canica Design, including a scalpel that sprung from the Veritas Carver's Knife.

And the Lee family tradition is likely to continue. Both Robin's son and daughter – now college age – have grown up working in every department. "They started with the manual labor – the landscaping," he says.

And they are both refining one of the most important traits of the Lee family. His daughter is now doing product management work for the company.

"She really enjoys the research," Lee says, with obvious pride, "and listens well."

Comparing the Brands

The tools that spring from the labor of these two companies are indeed different, from their price tag to how they feel in use.

But you should know that any comparison of two planes is troublesome – planes are personal tools. So the following opinions should be taken as only one person's experiences. But for what it's worth, I have worked with both brands for years. And I have a long history with many of the tools.

On the topic of price, the Veritas planes are almost universally less expensive than the Lie-Nielsens. There are 12 styles of planes made by both companies. If you bought all 12 from Lie-Nielsen, you'd spend $2,580. From Veritas, that same line-up would cost $1,799 – 30 percent less.

Price is only one factor. Unlike a router or drill, planes are lifetime tools. So I personally don't focus as much on price as I do on the tools' working characteristics, how it behaves during use. Does it fight me or work for me?

Veritas Bench Planes

The overall design of Veritas's four bench planes is quite different than a Stanley plane. Many of the Veritas's features have appeared on other tools, but the Veritas combines them in a new way.

The frog – the metal casting that supports the iron – is the most unusual part of the design. The rear handle is actually screwed to the frog. And the bottom of the frog is incorporated into the sole of the plane. This unusual frog allows you to close up the plane's throat without changing the depth of cut.

I've never had problems with the stability of this frog – functionally, it's a success. It does have two aspects that annoy me slightly. Having the frog visible on the sole makes it trickier to sight down the sole when setting the blade – the back of the frog creates a black line that looks like the black line created by your blade. Also, you have to navigate a screwdriver through holes in the lever cap, chipbreaker and iron to reach the screw that allows you to open or close the throat. That takes fiddling.

To adjust the depth of cut, Veritas planes use a Norris-style adjuster. This adjuster, made popular on English smoothing planes, allows you to change both the depth of cut and to center the blade in the mouth with one mechanism. (Stanley planes use two separate mechanisms.)

Veritas's Norris-style adjuster is precise and robust, with a respectable half-turn of slop in its mechanism. Even better, the Veritas designers have avoided a common problem with Norris adjusters: When used in an infill plane, it's easy to cinch down the lever cap so tight that when you turn the Norris adjuster it commits suicide by stripping out. With the Veritas plane you can tighten the lever cap as much as you please and the worst that can happen is that you'll push the chipbreaker out of position. I cannot destroy this adjuster – and I've tried.

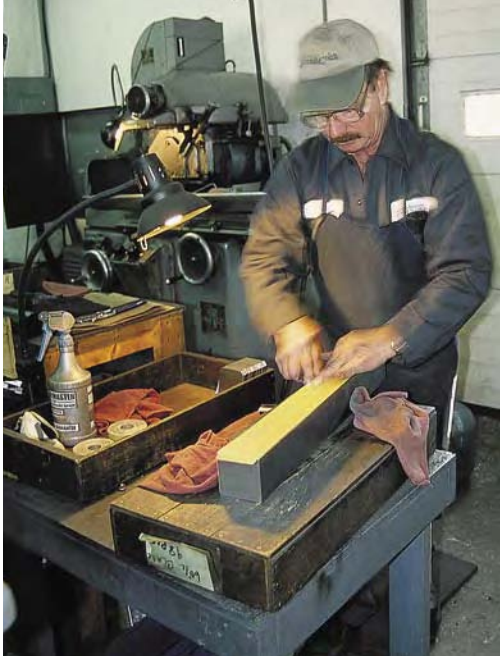
I don't like the position of the adjuster above the tote, however. This is personal preference, but I like the adjustment mechanism directly in front of the tote.

The sidewalls of the Veritas hold two small set screws. These finely center the cutter in the mouth and prevent the cutter from slipping out of position. I'm of the opinion that lateral adjustment levers on all planes are too coarse for high-tolerance smoothing. I usually end up tapping the iron with a small hammer for my final adjustments. The set screws are slower than tapping the cutter with a hammer, but beginners will

Lie-Nielsen low-angle jack planes being readied for shipment from the factory in Maine. Both companies hand-assemble each tool.

> "Generally, in hand tools there has been little or no development over the last 50 years. Look at routers and drills. There's a new one every year. They're just like cars."
> — *Robin Lee*

The Veritas bullnose plane shown with a vintage Preston version of the same tool. The Veritas plane has features and a shape that favors ergonomics and function over the classical form.



A surprising amount of hand work is involved in building hand planes. Here a Lie-Nielsen employee flattens the unbeveled side of a plane iron using sandpaper.

likely find them an asset. I don't use them much on the bench planes.

The cutter is made from A2 steel and the chipbreaker resembles the Stanley version. Though I'm not wild about this classic chipbreaker design in principle, I must admit that Veritas does a fine job of making them – I haven't had one give me trouble since my first encounter with them on Veritas's first-generation No. 4½ plane.

The handles are now made from bubinga (my No. 4 has the original stained maple knob and tote). The rear handle is larger than I prefer, though other craftsmen I respect disagree with my assessment. I don't consider it uncomfortable. Veritas has been tweaking its totes and knobs, and a redesigned tote is being worked on, Lee says, so stay tuned.

Lie-Nielsen Bench Planes

The Lie-Nielsen bench planes, from the diminutive No. 2 up to the No. 8, are modeled after the Stanley Bed Rock line of planes, but with better materials and machining tolerances.

The Lie-Nielsen frog is mated to the plane's body via a large machined area. This stable design was abandoned by Stanley years ago in favor of cheaper methods – and is one of the things that make new Stanley planes squirrelly today. The Lie-Nielsen frog is bulletproof and rock solid.

You open and close the mouth of the plane by first loosening two screws behind the frog and then turning a screw centered between them. Finally, you retighten the screws and adjust the cutter before going to work. I've never been a fan of the trial-and-error method of adjusting the frog. I admit that opening and closing the mouth of a bench plane is an infrequent activity; when I do change it, it takes some fiddling. Here's why:

Because the frog rests on a machined ramp, moving the frog also changes the depth of cut of the blade. So to find out how tight your mouth is, you tweak the frog, reset the blade and make a sample cut. I usually go through three rounds of this before I find the opening that reduces my tear-out and allows the shaving to pass.

The plane uses a "Bailey-style" system of regulating the depth of cut: You turn a large wheel in front of the tote to change the cut. A lever above the handle tweaks the cutter's position left and right.

The blade adjuster of the Lie-Nielsen is precise and responsive, though I wish it had a little less slop – it's almost a full turn of the wheel. This is a function of the Bailey-style mechanism; on vintage planes there can be as much as two turns of slop. The adjuster is positioned perfectly in front of the tote so you can make adjustments by simply moving your fingertips. As I mentioned with the Veritas, the lateral adjustment of all planes is coarse – hammer taps get you where you need to be.

While all those elements resemble those found on a vintage Stanley, others do not. The iron is cryogenically treated A2 steel, and the chipbreaker is different than the one found on vintage Stanleys. The Lie-Nielsen resembles chipbreakers found on some vintage infill planes: It's flat, thick and has a small lip on the end where it mates with the iron. The chipbreaker is the cat's pajamas – I wish all planes were equipped with it.

The handles are available in cherry or rosewood. The knob and tote are attractive and comfortable in my hands. My only complaint is that the screw for the rear tote works loose after heavy use – an annoyance on many other planes as well.

Comparing Bevel-up Planes

In addition to bench planes, both companies offer "low-angle" jack and smoothing planes. These tools are essentially oversized block planes. Unlike bench planes, these have a cutter with the bevel facing up (it faces down on bench planes).

These tools are simpler than a bench plane – there's no chipbreaker, the blade adjustment mechanisms have fewer parts, and you open and close the throat of the tool by sliding an adjustable shoe forward. As with the bench planes, there are differences between the brands.

The Lie-Nielsen low-angle jack plane is simple and robust. The depth of cut is regulated by a knob in front of the tote. However, there's no lateral adjustment mechanism. Sharpen your iron as square as possible and center it in the mouth of the tool with hammer taps. The Lee Valley version of this tool is equally robust and offers a Norris-style adjuster with lateral adjustment. Plus, the plane has set screws in its sidewalls to tweak the iron's position. I find both planes easy to set, though first-time plane users might like the extra blade-adjustment features on the Veritas.

You adjust the throat of both tools by loosening the front knob and sliding an adjustable shoe forward and back. The Lie-Nielsen

Modern planes have far more machining than vintage tools. On this Veritas spokeshave, the mouth and sole are milled out on precision equipment. This extra work means less blade chatter for woodworkers.

SUPPLIES

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

Lie-Nielsen Toolworks
800-327-2520 or
lie-nielsen.com

At Veritas, every tool has a checklist that must be followed at assembly-time. These checklists are continually fine-tuned for better results and faster work.

has a lever to assist this process, though I occasionally bang the shoe into the iron using this system. The Veritas is a bit different. There's no lever to help dial in the setting. But there is a small knob in front of the throat that acts as a stop (preventing you from hitting the cutter's edge) and it helps you dial in the throat opening precisely. I quite like the system.

The Veritas is wider – it has a 2¼"-wide cutter compared to the Lie-Nielsen's 2" cutter. Wider isn't always better; it depends on the scale of your work. The cutter on the Veritas is 1/16" thicker than the Lie-Nielsen's, and the Veritas is heavier – 5.7 pounds compared to 4.6. One significant design feature worth noting is the position of the mouth on each plane. The Veritas's mouth begins 4¾" from the toe of the tool. The Lie-Nielsen's begins 3 15/16" from the toe. Having the mouth set back a little makes the tool easier to start because you don't have as much of the tool hanging off the board. Also, positioning the mouth back a bit offers some advantages to planing the edges of long boards.

The other differences are subjective. I prefer the handles on the Lie-Nielsen, though Veritas has some forthcoming changes coming to its handles that could make them more comfortable for me.

Both companies also make a smoothing plane using the bevel-up configuration. For the most part, the differences between the brands mirror those for the jack planes. The one notable exception is that the adjuster on the Lie-Nielsen version, the No. 164, is quite different. It's actually a Bailey-style adjuster that has been reconfigured to work on top of the lever cap. It's a smooth-acting adjuster, but there are some extra parts involved, including a small plate that has to be affixed to the cutter to engage the adjuster. This plate has to be removed when sharpening with a jig and has to be precisely placed for the adjuster to work. This is the way the original Stanley worked, and I've always thought it was a little fussy.

Conclusions

Every week, someone asks my opinion on which brand is better. Let me tell you what I tell them: Both brands are machined to tolerances that exceed those of vintage tools (and, in some cases, exceed what's necessary for woodworking). Both brands are made using materials that are superior to what's needed for home woodworking, such as the A2 irons. Both brands of tools can be tuned to do the finest work. I can consistently make equally thin shavings (.001" thick or less) with either brand with equal ease.

So the differences come down to looks, price and features. And that's where my biases come into play. For bench planes, I favor the Lie-Nielsens. I prefer the Bailey-style adjuster, especially its location by the tote. I also like the wide range of plane sizes available. Though the Veritas line of planes makes sense as a system, I've found that after using all of the sizes available, I like having a small smoother, such as a No. 3, in my arsenal. And I also gravitate to the long bench planes, including the No. 8. My preferences could be debated, but they are real.

For the bevel-up planes, I prefer the Veritas low-angle smooth plane to the Lie-Nielsen version. The adjuster is simpler and my fingers feel less crowded on the tool. For the low-angle jack plane, it's a toss-up. I cannot argue with the features or engineering of the Veritas. It's likely the best plane the company has ever built. But the Lie-Nielsen was one of my first premium planes, and I have a lot of miles on it. It's always appealed to my eye and my hands, and was the tool where I first discovered the benefits of a bevel-up tool.

So for this tool, I choose both. I keep the Veritas low-angle jack at work and the Lie-Nielsen version at home. Like many woodworkers, I end up using both brands of tools. And Lee says this is something he's seen time and again.

"The difference is like jazz or classical, which do you prefer?" he says. "We co-exist in the market. And the existence of the other is better for both businesses. And for woodworkers." **PW**

These two low-angle jack planes are quite different when you start comparing the details. They both work quite well, but different woodworkers will prefer one over the other.

Building Planes One at a Time

Wayne Anderson's planes are inspiring workhorses.

Most woodworkers appreciate things that are well-made, fashioned by hand and extraordinarily useful. So it's little wonder that Wayne Anderson stays quite busy.

From a small basement workshop in Elk River, Minn., Anderson makes custom infill planes one at a time to sell to woodworkers and collectors. Unlike many manufactured tools, Anderson's planes marry solid plane mechanics with fluid curves that would be difficult – if not impossible – to create using machines. One recent chariot plane from his workshop resembles a scarab beetle. The front grip of the small plane at right is filed into the shape of a curved acanthus leaf.

And though some of these tools look delicate, they have the souls of small tanks. The sides and soles of the planes are joined with hand-filed double-dovetails. The wooden infills are secured with brass or steel pins that are peened in place. The soles are hand-lapped dead flat. The mouths of the tools are extremely fine.

The result of this alchemy are tools that are extraordinarily beautiful to the eye and spookily responsive in your hands.

During the last year I've examined more than a dozen of Anderson's planes and used four of them in my shop for a wide variety of tasks. They all work as well as any hand plane – vintage or new – I've ever owned.

Despite the fact that many of his tools lack a mechanical adjuster, I find it unnecessary – in some ways, the lack of an adjuster can be quite liberating. Because every part fits so perfectly, the tools respond predictably and precisely every time I pick them up.

SUPPLIES

Anderson Planes
P.O. Box 552
Elk River, MN 55330
763-241-0138
andersonplanes.com

Photo by Al Parrish

Two planes from Wayne Anderson: A full-size smoothing plane with ebony infill (top) and a small plane inspired by some of the earliest metal-bodied planes from Europe.

Setting the irons is an easy task with a hammer. Anderson's planes generally have a generous surface for bedding the A2 irons. When you drop a freshly sharpened iron on the bed it practically sticks there because the parts fit so well. A couple hammer taps and a turn of the lever cap screw are all it takes to get the plane working beautifully.

I'm not alone in my assessment. Ralph Brendler, one of the ringleaders of the Internet-based e-mail list called "oldtools," owns a few of Anderson's planes that he uses regularly.

"If I had my druthers, every plane in my cabinet would be from Wayne," Brendler says. "The miter plane he built me so far exceeded my expectations. I was just stunned when I opened the box. … My jaw hit the floor."

Engineering & Artistry

For Anderson, his plane-making business is the logical culmination of his artistic tendencies as a boy and his career path as an adult. He worked as a machinist, then in a metal fabrication shop and now is a mechanical designer.

This training makes Anderson equally adept with both a file and the high-powered computer he uses at his day job for a defense contractor, where he is currently working on designs for a weapons system for the Army.

Add to that a passion for collecting vintage tools and it's little wonder that Anderson stays busy on nights and weekends building tools. Or that he has recently shifted into high gear by going part-time at his day job so he can focus even more on building planes for clients,

almost all of whom are repeat customers. One enthusiast owns 14 of Anderson's planes.

"I find myself in the enviable position of having loyal customers and an understanding employer who allows me to do this thing that I love so much," Anderson says.

Anderson's path to becoming a professional plane maker began several years ago when he and a friend would haunt the local woodworking supply stores. One day Anderson was in a used tool store where they had a copy of the now-famous poster of the H.O. Studley tool chest – a small wall-hung tool chest that holds more than 300 artfully fit hand tools.

"I found myself riveted to that image," he says. "Something clicked. And I decided to amass a small collection of vintage tools."

So Anderson began buying old tools (he now holds the title of director of area A for the Mid-West Tool Collectors Assn.). As he plunged deeper into collecting, Anderson stumbled on a story about British infill maker Bill Carter and was so intrigued that he decided to make an improved miter plane for himself. He still owns that tool.

"I call it 'plane-a-saurus,'" Anderson says with a laugh. "It had 3/16"-thick sides and a 1/4" bottom. It's butt-ugly, but it functions well. It's like your kid's artwork. It's not worth a nickel, but you wouldn't sell it for a million bucks."

Encouraged that he could make a functioning tool, Anderson built more planes (lots more) and started posting pictures of them on the Internet. Woodworkers began to take notice and ask Anderson to make planes for them. Now he spends most of his free time in his shop filing and fitting and fussing with all the details that go into one of his planes.

He has a few machines that assist his work: a small drill press and band saw lend a hand. And he recently purchased a small benchtop milling machine to cut the mouth of the planes. But much of the work is by hand and by eye.

What's most striking about his finished tools is how they don't look much like anyone else's tools. Unlike some contemporary planemakers, Anderson doesn't revel in making reproductions of classic infill tools from Norris, Spiers, Mathison or Slater. Instead, Anderson's keen eye and impressive collection of files create planes with fluid sidewalls, sculpted and scalloped wedges and details that are found on fine furniture more than on tools.

Photo by David Hyttsten

Wayne Anderson files the bed of a chariot plane in his basement workshop. Tools on the back wall serve as inspiration and they lend a hand with the woodworking on occasion.

"I was never one to copy a Norris or a Spiers," Anderson says. "Those were the production planes of the era. I was never impressed with the style."

As you can imagine, one-of-a-kind handbuilt planes are more expensive than manufactured ones. Anderson typically charges $100 per inch of length of the finished tool, plus extra for exotic options such as inlay. So the 9"-long Scottish-style miter plane below cost me $900. For someone on a writer's salary, that was a lot of saving and scrimping.

But I have to say that I consider it money well spent. Anderson's tools have an undefinable appeal to me that cannot be boiled down to price alone. A lot of hand work goes into the furniture I build for this magazine and myself, and there is something fitting about using a hand-made tool in my work. As I wipe the plane down and put it away, I often find myself marveling a bit at the workmanship and detailing of the tool. And I hope that my own work can measure up to Anderson's.

From a pragmatic point of view, Anderson's planes are quite reasonably priced compared to the cost of the vintage infill planes that are prized by tool collectors. Vintage tools of this caliber are far more expensive and may or may not even be usable. In fact, other tool makers and collectors consider Anderson's planes an astonishing bargain for what you get.

Anderson says he isn't driven by money. He merely prices his tools so he can stay busy making them, that he can do the kind of work he wants and make a tool that's within reach of the serious plane user.

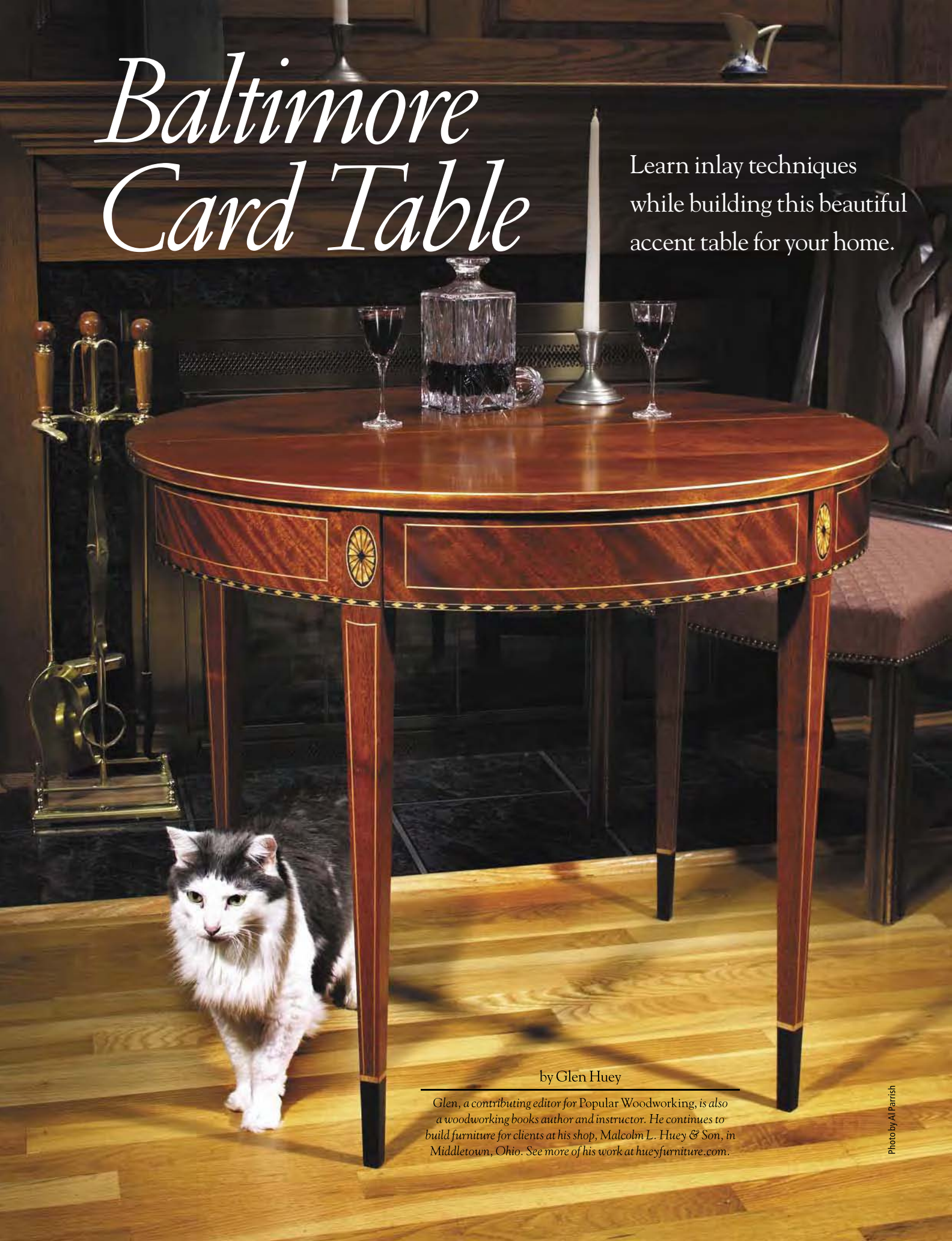
"These are user planes," he says, tapping the table for emphasis. "It's a tool. Take it into the shop and use it." **PW**

— CS

Here is an improved miter plane with Scottish influences. The infill is ebony with a small ivory inlay on the front bun.

Baltimore Card Table

Learn inlay techniques while building this beautiful accent table for your home.



by Glen Huey

Glen, a contributing editor for Popular Woodworking, *is also a woodworking books author and instructor. He continues to build furniture for clients at his shop, Malcolm L. Huey & Son, in Middletown, Ohio. See more of his work at hueyfurniture.com.*

Photo by Al Parrish

A beautiful demilune side table always catches your eye. Some of these tables also open into an equally attractive and more functional four-legged round table. The table here is a inspired by an original attributed to Levin S. Tarr (1772-1821) and built between 1795-1810 in Baltimore, Md. The original is now part of the Colonial Williamsburg Collection of Southern Furniture in Williamsburg, Va.

The ornamentation on card tables from Baltimore varies quite a bit, but the construction details and design are consistent. Tarr's table has all the construction details common to post-revolutionary Baltimore card tables. These features include the half-round shape, a laminated apron, two rear swing legs that overlap the ends of the front rail when closed and a dovetailed rear apron. Oak and/or yellow pine are the secondary woods used in construction.

On my table, the inlay has been simplified and some of the inlay was purchased rather than hand-fit, as in the original. This saved time without affecting the overall grace of the piece.

Because of the detail involved in this table I've focused on the inlay work and swing legs. A comfortable level with basic woodworking skills is advised for building this piece. If helpful, more step photos are available at woodworkersedge.com.

Shaping the Apron

The apron, which is built up using rows of pine blocks, is a detail faithful to the original. It's a stable way to make an accurate curved shape. Begin by cutting a half-circle template from a piece of ¾"-thick medium density fiberboard (MDF) that's 18" x 34". The finished diameter of the template is 33½". To make the circular cut I used an auxiliary table that clamps to my band saw's table. This setup lets me insert a ¼"-diameter guide dowel at 16¾" from the blade.

A matching diameter hole is made in the MDF board centered on one long edge and set in ¾". This allows the hole to not be precisely at the back edge. The resulting shape will be larger in circumference than a half-circle, which is fine. Save the falloff pieces for later in the project.

Now divide the template into 10 pie-shaped wedges to help align the pine blocks. To lay out the wedges, start with a line at the pivot point running parallel to the back edge. Then get your protractor out and divide the top into 18° sections. You should end up with a center line perpendicular from your base line.

Next, cut your pieces of yellow pine to size and trim the ends at 9°. The 1⅜" dimension is the height of the blocks. The blocks are located on the template with the center of the block flush to the edge of the template. Glue the pine blocks onto the template around the outer edge.

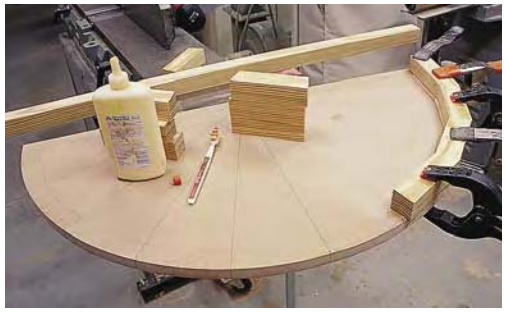
When the glue on this first row has dried, use a bearing-guided flush-trim router bit to sculpt the front face of the blocks to the template. Then repeat the process with the second row of yellow pine blocks (staggering their location) and rout the face again. Repeat the steps for the third row.

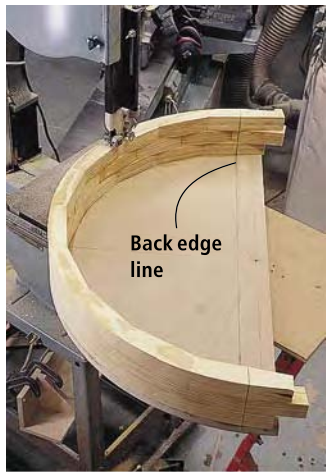
With the bricking complete and the outside curve routed, carry the line from the template that marks the back edge of your apron (the true half-circle location) up the sides of the apron. Then move back to the band saw and reposition your center pin to 15⅝" from the blade to shape the rear surface of the apron.

Next, head to the table saw and carefully make two cuts. The first is to separate the apron from the strip of MDF template still attached. The second is to rip the apron to its 4" width.

Then clamp the apron to the miter saw so that you can make 90° cuts exactly at the lines marking the back edge of the apron.

I have oriented the grain on the blocks so the quartersawn edge is to the front. This helps reduce the movement of the face when complete.





Step photos by the author

Set the template and bricking onto the guide pin and make a slow, steady cut using a ½" skip-tooth blade. The resulting apron thickness is slightly over 1" thick, completing the curved apron.

Make your first cut to remove the template piece. Hold the apron as tight as possible against the fence during this step. Then reset the fence to the finished height of the apron, rotate the piece to the opposite edge and make your second cut.

To trim the ends of the apron, patience and accuracy are required. I clamped the apron to my miter saw, carefully checking the squareness of the end mark to the blade before making the cut.

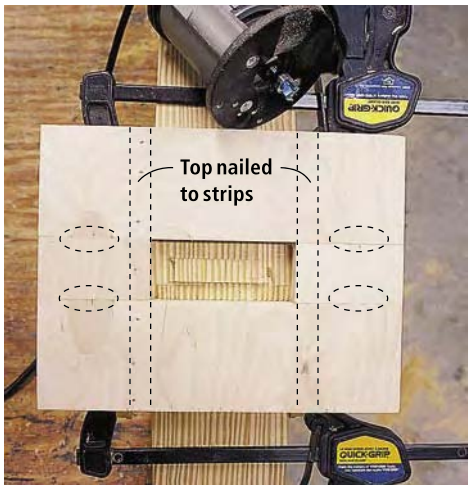
Making the Apron a Frame

To join the curved front apron into the frame of the table, the rear apron is dovetailed to the curved front apron at both ends. Lay out the dovetail pins on the just-cut ends of the front apron. Define the pins with a backsaw and remove the waste material, keeping the bottom of each tail area at a right angle to the apron end. Transfer the pin layout onto the rear apron and cut the tails. Once fit, glue it in place.

Finally, cut a medial stretcher that fits snugly between the rear and front aprons. Attach the stretcher with screws and plug the front screw holes.

The front legs have a bridle joint at the top that straddles the front apron. To add strength, the bridle joint also slips into a dado cut in the face of the apron.

I used a template to locate the front leg dado in the apron. The center of the legs actually falls on the 36° arc from the center of the top, where the first level of bricking was laid. Place the template (shown above) into position and clamp, making sure that the inside edges are tight to the apron. Use a dado or planer router bit with a top-mounted bearing to cut away the material to a depth of 3/8" in the apron. Do this in both front leg locations.



I make my routing template using 1/2" Baltic birch plywood. Rather than cut out and clean up a hole, I make my template from four pieces and hold them together with biscuits. This method leaves an accurate opening that is 1 5/8" wide x 4" long.

My miter gauge cradle isn't fancy, but it is accurate. It needs to hold the centerline of the leg parallel to the saw table during the cut. Don't worry about how high off the table the cradle holds the leg. Adjusting the blade height will set the cut's depth perfectly.

Tapering the Legs

To make the tapered legs, first rough cut the lumber to size. I prefer using the jointer to taper the legs. It gives me nearly identical tapers on all the pieces.

Draw a line on each leg 4 1/2" down from the top. Draw a second line at the center point of the total length of the taper, measuring up from the foot. Set the jointer to cut at a depth of 3/16". Then run each face of each leg flat on the jointer starting at the foot. Stop the cut at the half-way mark, carefully lifting the leg from the knives.

Flip the leg end-for-end and take a second pass on each side by holding the foot and the stop point of the first cut flat on the infeed table. This will cause the top of the leg to "pop a wheelie" over the knives and start the tapering cut at the 4 1/2" mark.

Mounting the Legs

Select the legs that will be the front legs and lay out the area to create the bridle joint to attach the legs to the apron. Measure down 4" from the top of the leg and 5/8" from the front face. Remove about 9/16", leaving about 1/2" at the rear of the leg. You'll need to fit this notch to your apron making several cuts at the band saw and finishing with sharp chisel.

The rear legs attach to the swing rails with the more traditional mortise-and-tenon joint. Cut the 1/4" x 3" x 1"-deep mortises on the inner face of each of the rear legs.

Preparing the Leg Inlay

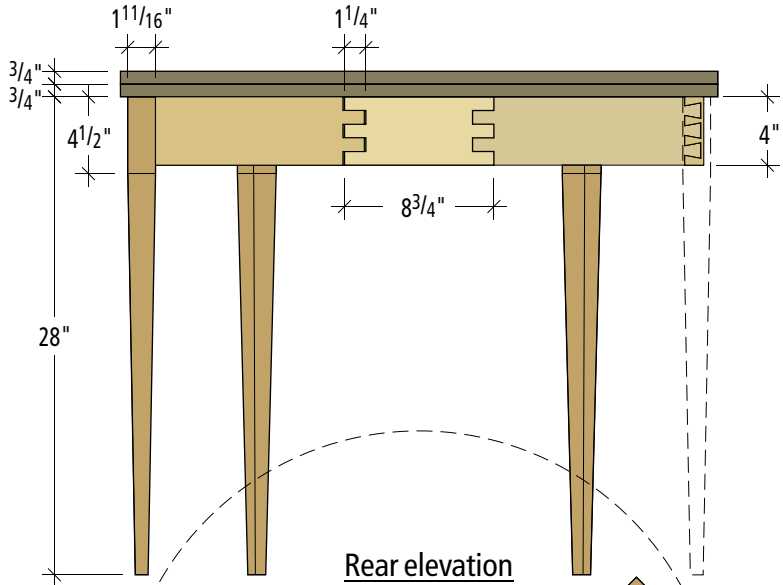
The inlay work on this table starts on the legs. Using the miter gauge on your table saw, make a cradle that will hold each leg in position and level to the table saw top. Install a dado blade to cut the 1/4"-wide x 1/8"-deep dado for the cuff starting 4" up from the foot of each leg. Cut all four sides of all four legs.

The next inlay to prepare for is the banding that runs across the front of the front legs, on the outside face of the rear legs and along the bottom edge of the apron.

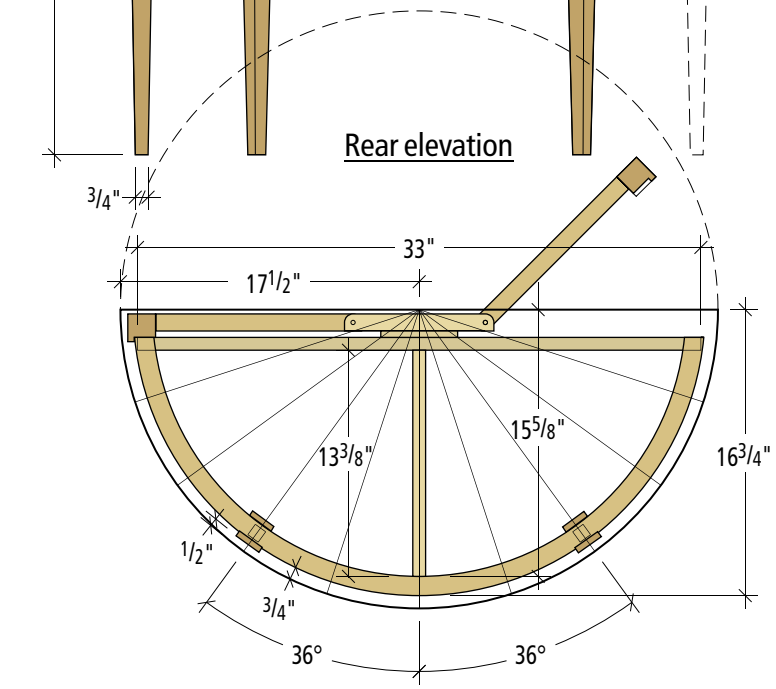
To cut the recess for the banding on the legs, load a 1/4" straight router bit into the router table. Set the fence 3 3/4" from the bit and set the bit height for 1/16". Make the cut. Because the leg tapers just below the cut, it's important to keep the face side flat against the table during the cut.

BALTIMORE CARD TABLE

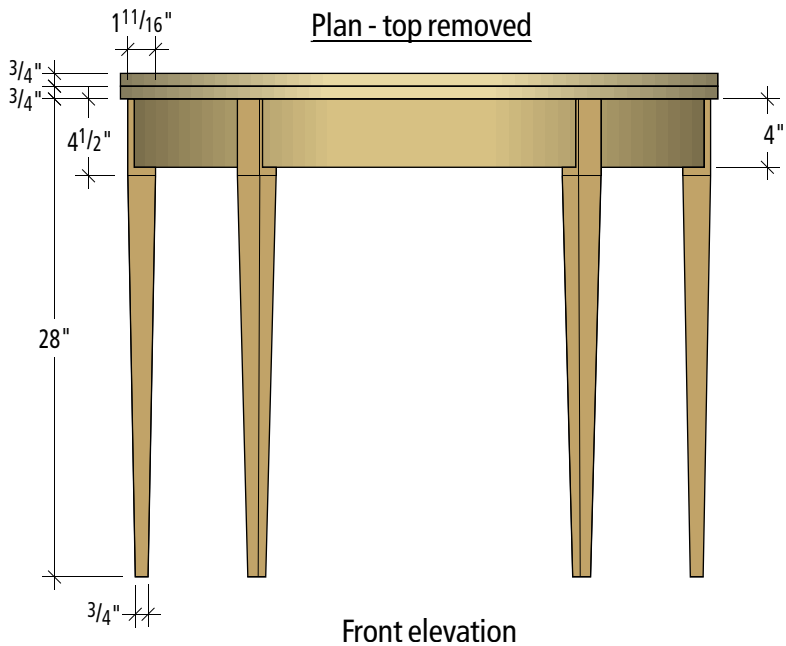
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	32	Blocking pieces	1 3/8	1 1/2	5 3/16	Yellow pine	
❑	1	Rear apron	3/4	4	33	Poplar	Dovetails both ends
❑	4	Legs	1 11/16	1 11/16	28	Mahogany	
❑	1	Medial stretcher	3/4	4	13 3/8	Poplar	
❑	1	Fixed rear rail	1	4	8 3/4	Poplar	
❑	2	Swing rails	1	4	14	Poplar	Cut to fit
❑	1	Swing rail spacer	3/8	4	5 1/2	Poplar	
❑	2	Tops	3/4	18	36	Mahogany	Half round
❑	2	Leg string inlay	1 1/2	1/16	24	Maple	Shop-made
❑	2	Cuff inlay	1/4	1/8	24	Maple	Shop-made
❑	2	Top edge inlay	1 1/2	1/8	36	Maple	Shop-made
❑	1	Top stringing	1 1/2	1/8	36	Maple	Shop-made
❑	1	Veneer inlay		8	10	Madrone burl	
❑	10	Table top clips	3/4	7/8	2 1/2	Poplar	



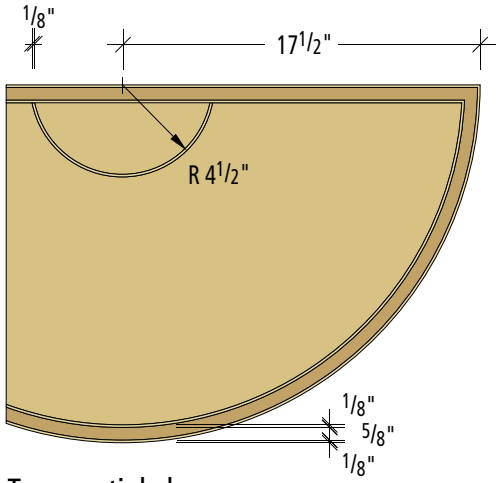
Rear elevation



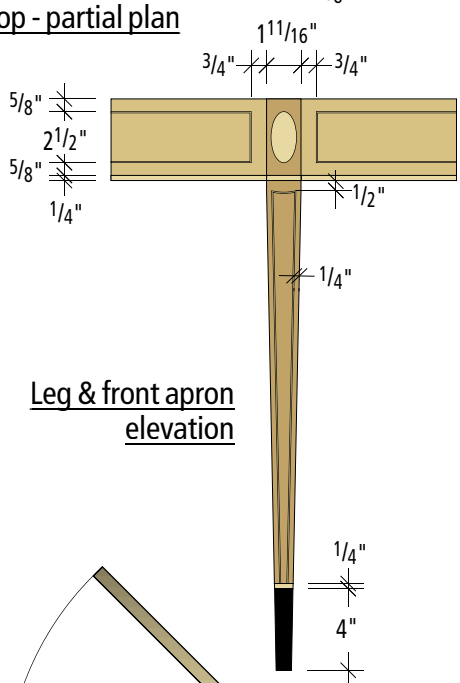
Plan - top removed



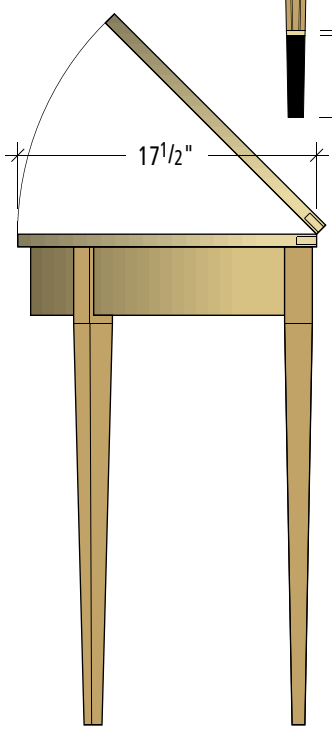
Front elevation



Top - partial plan



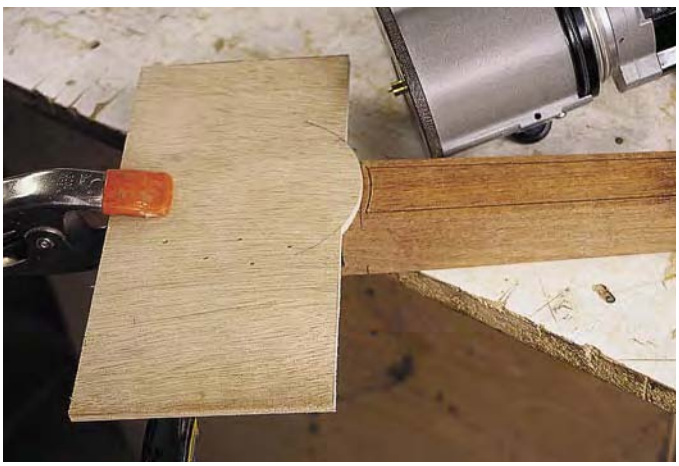
Leg & front apron elevation



Profile

Holding the top of the leg against the fence and the face side toward the table (remember that the face side of the rear or back legs is the side facing outward, opposite of the mortise) make a pass over the bit, cutting the thickness of your inlay.

Install a 1/16" bit in the router table and set the fence 1/4" from the bit. Set the bit to cut 1/8" deep. Run the cut on two edges of the face, from the 4 1/2" line at the top of the leg into the area that was cut for the cuff.



Start the scalloped stringing cut by inserting the bit into one side of the existing cut and move toward the opposite side until it just enters the second side cut. Keep the bushing against the pattern.

The cradle supports the leg from underneath. The top piece with the oval template is clamped to the box, centering the cut between the top of the leg and the lower edge of the apron as well as the middle of the leg. Note that the orange-handled clamp serves to keep the leg positioned lengthwise in the cradle.

The next step is to cut the string inlay groove along the length of the legs as shown in the photo above right. For the scalloped stringing at the tops of the legs make a simple arched pattern that will act as a guide for your router bushing, as shown above. It's a good idea to mark the beginning and ending edges of the router base for reference.

Cut and install the stringing. I cut the necessary thickness at the table saw and ripped the width at the band saw. It helps to install a zero-clearance throat plate at the band saw. Add the glue sparingly into the cut, start the stringing at the top, and gently force it into position. Sometimes I use a larger piece of dowel as a rolling pin to help. Also, cut and fit the 1/4"-wide and 3/16"-thick cuff. I like to miter its corners for appearance.

Oval Inlay

The last inlay pieces are the two ovals at the top of the front legs. You need to build a simple three-piece U-shaped cradle that will hold the leg steady. Another piece of plywood is cut out for the oval pattern and makes a fourth side to create a box. Use an inlay bushing and bit (I've included information on one in the Supplies box on page 73) to cut the oval inlay recesses on the legs.

To trim the purchased oval inlay to fit the leg recess, use double-stick tape to attach the inlay onto a scrap piece of wood. Place the same pattern used to cut the recess into position over the inlay and again, using the inlay kit as directed, cut the inlay to match.

Carefully remove the cut piece of inlay from the scrap, apply the glue and install. Place a piece of wax paper over the inlay, then cut a small oval scrap to act as a press over the wax paper and inlay. Clamp the scrap in place over the inlay until the glue dries.

Knuckle-joint Legs

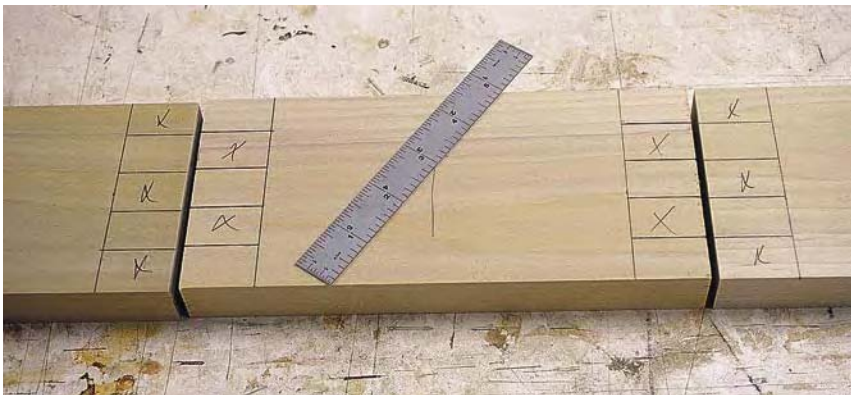
The knuckle joint at the rear of the table is one of the magical parts of this project. While closed, the table looks like a solid demi-lune table. The knuckle joints and swing legs allow the table to open into a stable, full-size table.

Begin the twin knuckle joints by cutting the three pieces to size that create the mechanism. Scribe a line 1 1/4" in from the ends, and begin by laying out five equal spaces. Mark the blocks as shown to designate the waste areas. Mark the top edge of all three pieces to ensure they go back in position.

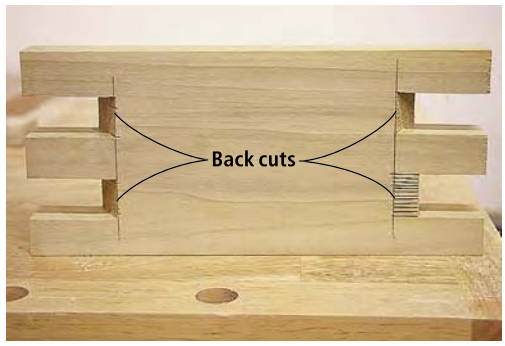
At the table saw set the blade height to the 1 1/4" line and make

MORE READING:

Southern Furniture 1680-1830
by Ronald Hurst
(Harry N. Abrams)
williamsburgmarketplace.com



To mark out the knuckle spacing, set one end of a ruler (at zero) on one side of the board and set the 5" mark on the opposite edge of the board. Then transfer each of the inch marks to both ends of the center rail and one end of each swing section.



To allow enough room for the swing rails to open, on the back side of the center rail draw a line 3/4" behind the shoulder cut at the saw. With a hand saw cut small cuts to that line while maintaining the front edge shoulder. With the cuts made, chisel away the waste.

the cuts that define the joint's fingers. Cut on the waste side of the line and nibble away the waste.

With the fingers all cut, the fixed rear rail needs to have 45° back-cuts made in the notches to allow the fingers on the swing rails to open correctly.

Round the outside edge of the fixed rail and the inside edges of the swing rails. I used a quarter to draw the circle and rounded over the edge with the sander.

Position the pieces into place against a tall straight fence on your drill press leaving a small space between the ends of each set of fingers. Use a 3/16"-diameter drill bit to drill for the steel-rod hinge. The hole should be 3/8" from the end of the fingers and 1/2" in from the outer edge.

To determine the final length of the two swing legs, clamp the knuckle assembly to the rear apron, and mark and cut each swing leg 1/4" longer than the apron corner at each end. This is the outside edge of the leg. Then lay out the tenon for joining the swing rails to the rear legs.

With the mortise and tenons made on the swing rails and legs, add the swing-rail spacer centered on the inside face of the fixed rail with glue and brads. Set this assembled section aside for now. Don't attach the legs to the swing rails or the knuckle assembly to the table yet, there's still some work to do on the apron section.

Apron Veneer

Now it's time to veneer. The front of the apron is veneered from a single sheet of mahogany veneer. I followed the pattern on the antique table and oriented the grain at 45°. Roll out the veneer and mark the three pieces on a 45° angle. I made the panels 1/2" oversized to allow for trimming. Lay out and cut the panels for the apron with a utility knife.

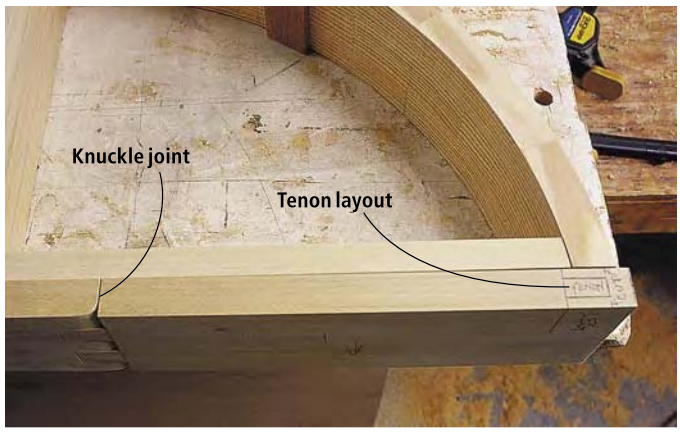
Apply a generous amount of contact cement on the apron and panels. When the cement is ready, carefully place the panels onto the apron. Use a flush-trim router bit to trim the edges of the veneer. To help make a clean cut, work in the direction of the veneer grain. Carefully trim the ends with a straightedge and a sharp knife.

Apron Stringing

To cut the recesses for the stringing on the apron faces I used the scrap pieces from the MDF apron template to set up a jig on the router table, which should still be set up for the stringing on the legs.

With the jig in place (see photo, next page), plunge the apron onto the bit and spin the assembly in the jig to the opposite line. Repeat this process on each panel. Reposition the fence to 3 1/8" and make the same cuts, creating the string inlay line for the bottom of the apron.

To complete the work using this jig, install a 1/4" straight bit,



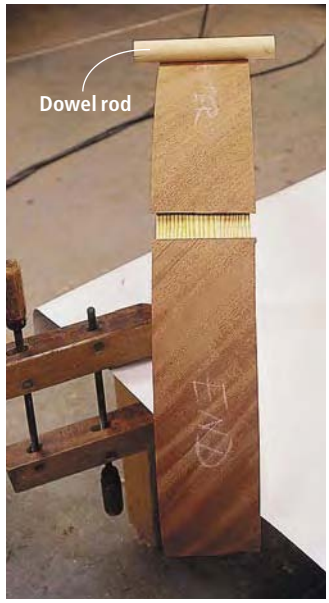
With the length of the two swing legs determined (1/4" beyond the apron corner) you're ready to lay out the tenon location on the end of each piece. Then cut the tenons and the corresponding mortises in the legs.

reposition the fence and cut the bottom edge of the apron for the banding inlay.

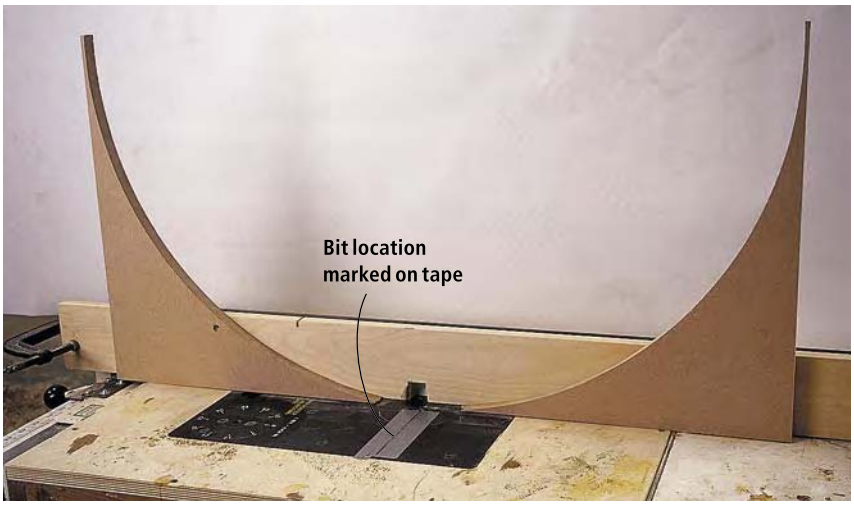
Next it's back to freehand routing to connect the recesses you just cut. Install the 1/16" bit into a trim router along with a small bushing to act as a pilot. Clamp a straightedge into position that's long enough to allow the bit to begin in one of the string lines. I mark the edges of the router base plate to help me with this cut.

Using contact cement, install the banding along the bottom edge of the apron. The banding I've listed in the Supplies was somewhat expensive and there are alternatives available from Rockler for significantly less.

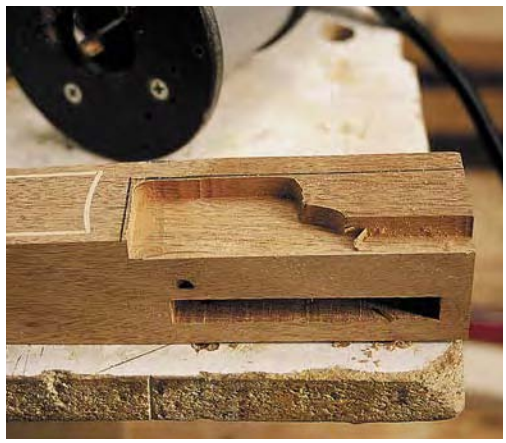
Cut to size and fit the shop-made string inlay using wood glue. Here you will need to take your time to install the inlay. A little



With the oversized veneer panels you should not have trouble placing the veneer panels on the apron. Make sure to roll the panels to smooth any small air bubbles. I use a section of dowel rod for this step.



To rout the grooves for the apron stringing, attach the template scraps to a sacrificial fence on your router table. Attach them so that the apron just fits inside the pair. Install a 1/16" straight bit set to an 1/8" height and mark both sides of the bit width on a piece of tape that extends about 5" from the bit. Mark a line that is 3/4" from each end of all the panels of the apron. Set the fence 5/8" from the bit and you're ready to rout.



After marking the legs at the meeting point of the apron, remove the legs from the swing rail. Use a router and straight-cutting bit to remove as much of the material as possible. Don't cut past the lines. Finish up any remaining material with a sharp chisel.

With the template secured, install a 5/8" straight-cutting bit with a 3/4"-outside diameter bushing into the router and remove waste material to create the recess for the edge banding.

To cut the veneer sections, simply make a first cut on the end of the veneer strip, then slide the veneer out about an 1 1/4" and make a second pass. This creates the first piece of edge band veneer. You will need 22 or more pieces of this curved edge banding.

This is the edge of the table that everyone will look at, so take your time fitting the veneer sections. Hold each piece in place after fitting to accurately match the next piece to it.

glue goes a long way in that small line. Roll the inlay into the groove with a section of dowel.

With everything dry and set, carefully use a scraper to bring the inlay flush to the veneer surface.

Fitting the Legs

Assemble and clamp in place the swing leg assembly, then pull the rear legs tight to the apron while leveling the top edge, and mark the area on the leg that is to be cut away to a depth of a 1/4". I used a router to remove the waste. Then glue the legs to the swing rails and attach these to the table.

Now make the final connection of the front legs. Add glue to all surfaces of the bridle joint, clamp in place until set, then finish with a #12 x 1 1/4" wood screw from the inside of the leg.

Cut and fit glue blocks into the corners of the table. These will need to be cut on a slight angle to ensure a secure fit.

The Top & More Details

Set up and cut the half-round pieces for the tops at the band saw as you did the template in the first step. Cut the top halves oversized by placing the pivot hole at 17 3/4" back from the front edge of the top and centered in from side to side. The pin on your circle-cutting jig should also be at 17 3/4".

To begin the detail work on the top, first create a half-circle template guide to rout the recess for the edge banding. The template is made the same way you cut the top pieces. Start with a 17" x 35" blank and use a 16 7/8" location on the pin. Once the template is cut to half round, it's necessary to cut the back edge to achieve the 7/8" area at the rear of the top. The goal here is to have a 7/8" set-back showing on all sides of the top once the template is in place.

Attach the template with double-stick tape at the edges of the tops and two screws (located in the area that is to be covered with a veneer inlay). You're now ready to rout the recess for the veneer.

Use patience to set the depth of cut to the veneer thickness. This has to be worked in a couple passes. Be sure to keep one pass with the 3/4" OD bushing tight against the template. Leave the template in place (we'll need it again shortly).

To ensure the edge banding will accurately follow the curve of the top, you need to make another jig and head back to the band saw.

Start with a scrap piece of plywood that is 4 1/2" wide and 18" long. Locate a pin hole at one end, place the circle-cutting jig pin in the 16 7/8" hole, then make a swing

To cut the string inlay on the top, install an 1/8" bit and the bushing from an inlay kit without the additional spacer, and run the groove guided by the top template that's still in place. This groove runs around the entire top edge.

Clamp this template in place, and follow the direction on the inlay kit to cut the area and the matching inlay.

cut on the piece, creating a small radius on the jig.

Next, with strips of veneer cut to 4", lay one strip onto the plywood, lay a second piece of plywood on top of that to keep things flat, and with the veneer extended, make a pass on the end (see photo at center left).

To trim the veneer pieces, use a sharp utility knife and straightedge to match up the edge of the cross banding while fitting the pieces to the top. Work around the entire top and number the pieces as they are fit. Remove the pieces and apply the contact cement. When ready, carefully apply the edge band to the top. Press the pieces for a tight fit. Allow the adhesive to dry, then trim the veneer flush to the outside edge with your router.

SUPPLIES

Rockler
800-279-4441 or rockler.com

2 • oval inlays 1¼" x 2½"
#18440, $13.29 each

1 • mahogany veneer, 36" x 96"
#13953, $59.99

1 • inlay bushing and bit
#83642, $29.99

Dover Inlay Mfg. Co.
301-223-8620 or doverinlay.com

1 • apron banding, 1/16" x 1/4"
#356, $25 minimum order

Londonderry Brasses Ltd.
610-593-6239 or
londonderry-brasses.com

2 • card table hinges
#H-34, $24 each

Prices correct at time of publication.

Stringing and More Inlay

To complete the inlay work on the top there are more string inlays and another veneer insert. Start with the string inlay that separates the veneer edge banding you just attached from the main top (see photo above left).When you need to join two pieces of the stringing, do so with a scarf joint, as shown.

Move to the back edge of the top. Remove the top template, then make a 9"-diameter template for the inner inlay (seen only with the top closed). Because we need to re-install this template I mark the center line of the template and a corresponding line on the top.

The inlay piece was made from a section of Madrone burl veneer that I had in my shop, again using the template bushing kit. Glue the inlay into position and when dry, replace the template and cut a groove around the inlay for another band of string inlay.

With all the grooves cut it's time to make the stringing and install the pieces in the top. Remember, a snug fit is required on the stringing. Because of the tight radius of the inner circle, it may be necessary to dampen the stringing before installing. Leave it in the groove to dry. It will hold its shape when dry.

Here I have changed the bearing on a flush-trim bit to allow for a 1/16" cut. You need to run the top and bottom of both the top and the sub-top.

The hinge I used allows the joint to remain loose when moving. This gives the joint space to move without rubbing the two parts of the top together.

All that's left is creating the final bit of stringing on the top's edge. Create the shop-made stringing for the edge and install this with the contact cement. When dry, scrape and sand all the inlay flush with the top.

Completing the Top

The installation of the hinges is all hand work. Lay out the location and hinge shape, and cut the area with chisels.

To attach the top to the base I use a 1/4" three-wing slot cutter bit in the router table to make the slots in the apron. I then use wooden clips to attach the top. Space them equally along the front and rear, and place a few along the medial stretcher. The cut should be a 1/2" down from the apron edge.

Make the wooden clips, which are 3/4" thick x 7/8" wide x 2¼" long. Rabbet one end to fit into the grooves and install using #8 x 1¼" slot-head wood screws. Final sand the entire table and you're ready to finish.

The finish begins with black paint. Place tape at the lower edge of the cuff inlay and paint two light coats of acrylic latex paint on the foot of the legs. This will create the ebonized look. Once the paint has dried, apply two coats of blonde shellac, a coat of dark brown glaze and finish with three additional coats of shellac. Let the shellac dry and hand rub the table to a satin finish with steel wool and wool lube. Then apply a few coats of paste wax.

Whether you build this table with or without the inlay details, you should be very pleased with the beauty – and function – of this Southern furniture classic. **PW**

A Writer's Workshop

A funky Victorian-era workspace serves as a shop for *Popular Woodworking*'s editor.

In the basement of Steve Shanesy's 1870s Victorian home is a woodshop. Like many of today's 50-something woodworkers, Shanesy discovered woodworking only after the corporate world left him longing for a career that involved doing something with his hands. This carefully planned 395-square-foot space, along with his position as *Popular Woodworking*'s editor and publisher, symbolizes his achievement of blending his collegiate skills with a desire to create.

Photos by Al Parrish

Although space is tight, Editor and Publisher Steve Shanesy is able to cut 4' x 8' sheets of plywood with relative ease in his basement shop.

From Shop Rat to Home Woodworker

Shanesy didn't grow up a woodworker nor did he go to college to become one. Instead he attended Ohio University in Athens, Ohio, and earned a degree in journalism. After college he landed a gig working as a promotion manager for the Delta Queen Steamboat Co. in Cincinnati. Two years of blizzard-like winters, his wife's desire to break into the entertainment industry and an overall yearning for something different led his family out west to the Golden State.

While at a party in California, Shanesy met an ex-convict who learned woodworking while in prison. Shanesy, who was quickly tiring of office work, was intrigued. So the ex-con told him to look into a night school woodworking program offered at Los Angeles Trade Technical College. He did.

Shanesy signed up and stretched the one-year, two-nights-a-week, four-hours-a-night program into a two-year program, in part because he was able to use the school's vast array of equipment. But mostly, he wanted to learn all he could from his teacher-turned-mentor, Charles A. Porter (affectionately known as Cap). Porter, a world-class craftsman, is best known for his billiard table designs. In 1981 Shanesy left the school and began a two-year transition from his marketing career to full-time woodworking.

His humble beginning in woodworking, like so many other woodworkers' beginnings, started in his home garage. A year later he rented a small space in a Los Angeles industrial park. He filled it with a table saw, a jointer, a few hand tools and some clamps.

From 1983 to 1994 Shanesy worked for high-end commercial and residential furniture makers in Los Angeles and later, in Cincinnati. While in Los Angeles, he worked at AE Furniture Manufacturing company.

"The best woodworking in the United States was going on there on a day-to-day basis," he says. It was the mid-80s, the era of junk bonds. Shanesy says customers would request 40'-long marble conference tables and didn't bat an eye at the $60,000 quote. "AE did incredible work and had incredible people there," Shanesy says. "I learned so much."

While at AE, Shanesy served as the company's project manager, coordinating all the work that went through the shop. At any one time the company's 25 employees could be working on 150 projects resulting in 1,000 or more parts. In Cincinnati he worked for two furnituremakers, Heartwood Furniture Co. and The Workshops of David T. Smith. During these years he came home from work and, having spent all day in a woodshop, didn't give his home woodshop much thought.

Ten years ago he took on the editor and publisher position at *Popular Woodworking*.

by Kara Gebhart Uhl

Comments or questions? Contact Kara at 513-531-2690 ext. 1348 or kara.gebhart@fwpubs.com.

Since then, he has dedicated more time and money to his home woodshop and lately, his home metal shop. Despite the fact that there's only 7' of space between the floor and the ceiling of his woodshop, *Popular Woodworking* magazine projects such as a Shaker tall clock and personal projects such as 9'-high columns for a renovated porch have been built here. His shop space works thanks to careful planning, a hot-water heating system and the mobility of certain key machines.

Machines, Tools and Tiles

When first entering the woodshop few people comment on the impressive 18" Laguna band saw (which barely fit down the stairs) or the new-but-already-broken-in Delta steel-bed 1642 lathe. Rather, they notice the floor. Underneath a few scattered anti-fatigue mats, hundreds of mismatched tiles cover the shop's floor in colors ranging from a pumpkin orange to a lovely pale yellow to a nauseating shade of green. Rumor has it that the home's former owner owned a tile manufacturing company and every one of those colorful tiles is a second or a reject.

On the ceiling is a network of fluorescent lights and pipes insulated in foil. Because the house is heated with hot water, there's no forced-air heating system sucking dust throughout the upstairs rooms. The foil wrapped around the pipes keeps the shop from becoming unbearably hot in the winter. The limestone and brick walls keep the shop cool in the summer. Glimpses of grass can be seen through two ground-level casement windows on the west wall.

One of the biggest space hogs in Shanesy's shop is his Delta Unisaw with its large table board, Unifence and two shop-made trestle outfeed tables, which also are the perfect height for his 10" Hitachi C10FS miter saw. (The shop is wired for both 120 volts/240V.) Behind the table saw is a doorway covered in burlap. The burlap keeps the dust from entering another basement room and the doorway allows Shanesy to rip long pieces of wood despite the small size of his shop.

Shanesy's 8" Grizzly jointer similarly is located next to another door that leads to another room in the basement. This allows Shanesy to joint long pieces of wood.

In addition to the burlap dust barrier is a trash can with a cyclone lid connected by hose to a Jet dust collector. Shanesy simply moves the hose in order to keep dust under control in the shop.

A large plywood board hangs on the south wall. More than 100 tools, ranging from chisels and squares to spokeshaves and bits hang from pegs or slide into custom-made holders. The board contains a mismatch of newer tools and older ones, including an E. Williamson rosewood marking gauge, a Yankee screwdriver with interchangeable bits and an old drawknife with folding, adjustable handles.

On another wall, to the left of the tool board, is Shanesy's first tool cabinet, which he built in 1982 while living in California. If you look closely, you can see that the top portion has been cut off and then put back on – he had to do that to get it down the stairs.

In front of the tool board is a well-worn workbench, which belonged to Shanesy's father-in-law. You can still see where his then-kid brother-in-law went at it with a hatchet. In front of it is a large assembly bench, with a welded steel base, which Shanesy made.

More than 100 tools are stored on this tool board, which is located above Shanesy's workbench.

One of Shanesy's first woodworking projects, this tool cabinet is the major storage unit in the shop.

Pipe clamps hang from the wall next to the assembly bench and a 17" Jet drill press sits in front of that. In front of the assembly table is a 100-percent turned stool, which Shanesy made. While attending a photo shoot at columnist Judy Ditmer's shop, Shanesy picked up the idea of storing his turning tools on boards that have two strips of wood with notches cut in each strip to hold various parting tools and gouges. Underneath a small table that holds one of his turning tools' boards is a Porter Cable CF24000 compressor.

A Delta drum sander and a 13" planer/molder from Jet are on mobile bases for easy accessibility.

Plenty of Room(s) for Storage

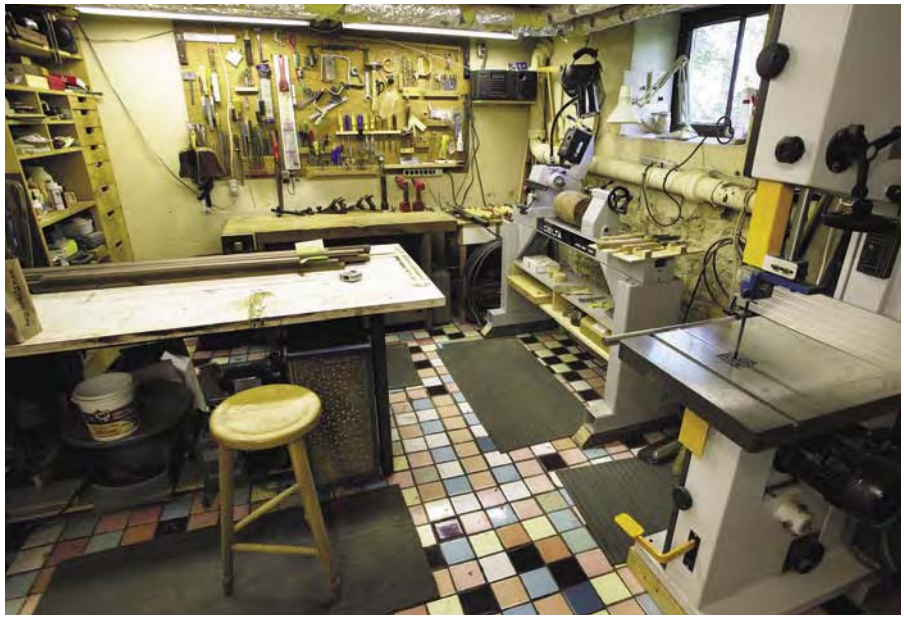
Shanesy stores most of his lumber in two of the basement's five rooms (yes, these rooms are tiled, too). In the basement's laundry room, below a large wire basket hanging from the ceiling that catches clothes from the house's various laundry chutes, are large planks of walnut. Most of the walnut is from a tree that fell a couple blocks down Shanesy's street. Turning stock is littered around the laundry room. Every time Shanesy sees a tree being cut down in his neighborhood, a doorbell rings.

More lumber, including a stack of cherry that has been drying for four years is stored in the basement's weight room. (This cherry came from a tree that fell in his own yard.) Additional wood is stored wherever Shanesy can find space for it. All wood enters the shop through a walkout basement door. Four-by-eight sheets of plywood thicker than 1/4" must be cut before they can fit through the basement's various doors.

Shanesy stores his finishing supplies in his wife's basement craft room. In warm weather he does spray finishing outside. In cold weather he does brush finishing in the basement.

Then there's the metal shop. Shanesy began metalworking three years ago and already he has incorporated metal into various turning and furniture projects. Several metal sculptures are on display in his home. Scraps of metal, a cut-off saw, a grinder and a welder sit on top of an old pool table. (The pool table, by the way, was built into a multi-colored tiled base and sits next to an old, tiled wet bar. One can only imagine Porter's reaction to the tiled pool table.) Shortwave radio equipment and a trunk filled with electronic train pieces are reminders that the shop – like any basement shop – serves multiple purposes, especially when a family is involved.

Shanesy's home is populated with turnings that came off this Delta steel-bed 1642 lathe.



On average, Shanesy spends eight to 10 hours a week working in his shop. When he's really involved in a project, he'll spend up to 24 hours a week woodworking downstairs.

Wandering around the large, airy upstairs rooms one stumbles across many projects that began in the small shop downstairs: George Nakashima-inspired tables, sideboards, a king-size curly maple four-post bed, desks, shutters, wide moulding and various turned pieces. Shanesy even built his entire porch – including eight 9'-tall columns, 60' of spindles and rails, and 40' of cold-bent laminations bent on an 8' radius in his small shop.

All of this represents Shanesy's ability to blend his vocation with his avocation – a feat many of us desire but never are lucky enough to accomplish. And although his position as editor and publisher occasionally requires a button-down shirt and tie, rarely are his dry-clean-only pants free of sawdust. **PW**

Turn Your First Bowl

Taking the time to learn a few basic cuts and moves will help you succeed.

Photos by Al Parrish

Forget the salad bowl for now. Instead, turn a small bowl such as this one made from spalted maple. Focus on your cuts; there will be plenty of time to turn bigger bowls later.

Bowl turning was my first love in woodturning. There is something special about a bowl: The wonderful way the shape shows off different aspects of the wood, the roundness and the ability to contain and present nourishment. I still find it magical to do something that is so different from any other woodworking job (including most turning projects). And I am not alone in this; I have observed that many, if not most, new turners are especially drawn to bowl work.

As with all lathe work, it takes time and practice to develop skill at bowl turning. But the basic process is relatively simple and there are only a few basic cuts. If you focus on learning to make those cuts well, the rest will come.

Wood Selection and Proper Mounting

If you are a beginner, choose your wood carefully, and don't try to make a huge bowl your first time out. You will progress better (and faster) if you really pay attention to the process and learn to understand the cuts. This is easier if you aren't struggling with a piece that is too large or with wood that is especially difficult to cut cleanly.

Moderately hard wood that is fairly close-grained and even-textured works best. Most domestic hardwoods make good bowl wood; maple, ash, honey locust, hackberry, beech, persimmon, hornbeam and hophornbeam are some of my favorites. Almost any nut or fruit wood will work well. Softwoods such as fir, cedar and pine, and some softer hardwoods, such as willow, will be more difficult to cut well until you have some experience. But sycamore, while relatively soft, actually turns quite well. At the other end of the spectrum, extremely dense, brittle and hard exotics may be problematic; they will take a very clean cut if you are using the tool correctly, but they will fight back hard if you are not.

The topic of processing green wood is beyond the scope of this month's column. I will discuss it in future columns, along with the many different possibilities for mounting your workpiece on the lathe. But for purposes of this article, I am assuming the use of a dry piece of wood that will be turned from start to finish in one session. This will mean a piece probably no more than 3" to 5" thick and about 8" to 10" in diameter.

This bowl, like most, is turned into the side grain. The grain is perpendicular to the axis of the lathe. You may wish to cut the piece into a circle on the band saw if you have one; it will make the initial roughing-out of the bowl easier. Mount the workpiece by screwing a faceplate to the side that will be the top of the bowl; the screw holes will be in the area to be excavated later for the interior.

by Judy Ditmer

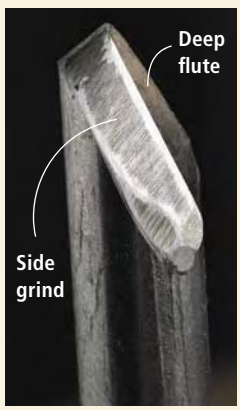
Judy, author of two turning books and many articles, has been turning since 1985. She teaches and demonstrates her skills throughout the United States and Canada.

Turning the Outside First

Begin turning the outside of the bowl, working from the foot to the rim (smaller diameter

BOWL GOUGE

A bowl gouge is a necessity for bowl turning. It differs from spindle gouges in having a much deeper flute (or groove). When it is ground back on the sides, as here, there are several ways it can be used for a variety of cuts.



to larger diameter). Cutting in the correct direction helps to produce a clean cut. For this roughing cut, the bowl gouge is more-or-less parallel to the floor, the flute (groove in the tool) is pointed to the left and the tool is moving to the left. The edge to the left of the center of the tool is doing the cutting, but it's the bevel at the tip of the tool that is riding on the workpiece. The edge itself is horizontal where it is cutting.

You can remove a considerable amount of wood with this cut, depending on how far back your gouge is ground on the side and how powerful your lathe is. Start out with the lathe going fairly slowly (around 800 to 1,200 rpm, depending on the size of your blank and the sturdiness of your lathe); you can always speed it up later as the bowl becomes round.

Here you can see the roughing cut.

A higher-angle cut is good for removing a lot of material once the piece is round.

Here you can see the very high-angle finishing cut.

The fingernail-grind spindle gouge is perfect for detail work on the outside, foot and rim.

Cut a recess in the foot for remounting the workpiece on the chuck.

Another cut I often use is a higher-angle cut. The handle is lower than in the first cut, which presents the edge to the wood at a higher angle. The cut is quite smooth. If you have it right, you'll know it. In fact it can get away from you; correctly done, the tool almost seems to pull itself into the wood. The bevel right behind the cutting edge is rubbing the wood. This cut works best after the workpiece is all the way round; it's hard to control if the surface is still uneven, as the tool will tend to just bounce along the irregularities.

For a finishing cut, drop the handle even lower. The edge should be almost vertical. It takes a bit of practice to get this right; it's harder to control the shape you are making, but you can take a very fine shaving. This cut will usually allow you to get a very clean surface even on soft or stringy wood, or across the end grain.

Continue shaping the bowl. Practice the cuts carefully; you have to get all that wood off anyway, so pay attention to what is happening. If it's not working, make sure the bevel is rubbing and you are cutting in the right direction. Make sure the gouge is sharp.

Footwork and Finishing

I use a fingernail-grind spindle gouge to make the grooves on the rim and foot. The tool is held so the flute is nearly vertical. The edge just to the left of the center is cutting, and it removes a very small amount of wood. This leaves a very clean groove.

Prepare the foot for the chuck: Cut a recess almost to the finished depth (deeper is more secure on the chuck; err on the side of caution if you are new to this), and with straight or slightly dovetailed sides (a wider opening toward the bowl than at the outside edge). Make sure the opening will fit on the jaws of your chuck. Leave the walls of the foot fairly thick; you are going to expand the jaws inside the recess to hold the workpiece, and if there isn't enough wood, part of the foot ring may break from the outward pressure and the piece can fly off the lathe.

The idea here is to have the entire outside of the bowl completed from the top of the rim to the bottom of the foot. Then if the piece is not perfectly concentric when remounted on the chuck, it won't matter, because you

aren't going to work on any of that surface again. When you are happy with the shape and surface quality of the bowl, sand it to your satisfaction. I usually go to about #320 or #400 grit; very hard woods such as ebony or rosewood may still show sanding lines, so you may need to use a finer grit on such woods.

Apply finish to the completed exterior. I like a bowl with a bit of a sheen, but not a glossy finish. For salad bowls, I use Kerf's Wood Cream (available at Woodcraft, 800-225-1153 or woodcraft.com). Apply this finish fairly liberally, then turn the lathe on and buff the surface with a clean cotton rag.

Apply finish to the completed exterior.

Mount the bowl on the chuck. Here the chuck jaws will expand in the cavity to hold the work.

Hollowing the Inside

Remove the bowl from the lathe and faceplate, and remount it on the chuck. Be sure the jaws are expanded very snugly into the recess. The bowl should center itself either on the ends of the jaws or their bases, but if it doesn't run true, loosen the jaws, tap the piece to center it and then re-tighten.

Begin hollowing the bowl. There is one main cut on the inside of the bowl. It is very much like the roughing cut used on the outside. The handle is close to parallel with the floor, and you should be cutting with the right side of the tool as you move it from left to right, and from the rim to the bottom (larger to smaller diameter). A finish cut is made simply by taking a lighter cut, moving the tool more slowly, and possibly speeding up the lathe somewhat, if appropriate. Keep in mind you will have to swing the handle around widely from the right (when you begin cutting the steep side of the bowl) to the left (as you approach the bottom of the interior).

Note the position of the tool as I begin the cut. To keep the bevel rubbing while cutting the side of the bowl, the handle must be held far to the right and must swing around to the left as you cut to the bottom or center of the bowl.

Complete turning the inside of the bowl, sand and apply finish. I'll go into more detail on sanding in a future column.

I use a doughnut jig (also called a sandwich jig) to finish the foot. It's cheap, easy to make, holds the bowl securely, and allows full access to the foot. The jig is a disc of plywood attached to a faceplate and turned round, with another disc that has a hole cut in the center. The discs are bolted together to hold the bowl securely between the two discs.

Protect the finished rim and exterior of the piece with pieces of carpet foam as shown above. Mount the bowl loosely in the jig, put it on the lathe, turn by hand and tap it as necessary to center it. With a little practice, you'll be able to do this very quickly. Tighten the wing nuts (which should be on the back of the jig, never the front where they become dangerous protrusions).

Here you can see the nearly completed bowl mounted in the doughnut jig.

Here I'm finishing the inside of the foot.

Now turn the inside of the foot, sand and apply finish. Liberate your now-completed bowl from the jig. Sign the bottom, if you like. I use an engraver; it's unobtrusive and it doesn't spoil the clean appearance of the foot. Your bowl is complete. **PW**

This is my completed bowl. Here you also can see another view of the doughnut jig.

Advanced Chisel Techniques

When you know what you're doing, chisels can be wonderfully helpful tools.

If all you want to do with your chisels is adjust machine-cut joints or slice glue drips, any technique or tool will work. This sort of work is occasional in nature, and not particularly strenuous. But chisels offer woodworkers the opportunity to do much more.

For machine-using woodworkers, chisels provide the opportunity to explore new possibilities. You can cut shapes with a chisel that are not achievable by other means. For the beginner lacking specialty machinery, chisels can be used to cut all manner of joints quickly and efficiently. But this work requires more effort than the occasional paring of a joint.

For this sort of work to be practical, we need much more thoughtful tools and techniques. The trouble is, neither the tools nor the traditional techniques are well-understood. What we need is a professional to show us his tricks and the tools we'll need to perform them. That's where I come in. Oh, no, I don't mean me. See, the guy we need died more than 300 years ago.

In this, my second article on working wood quickly and efficiently with hand tools, we'll look back in time in hopes of discovering the effective and efficient use of chisels.

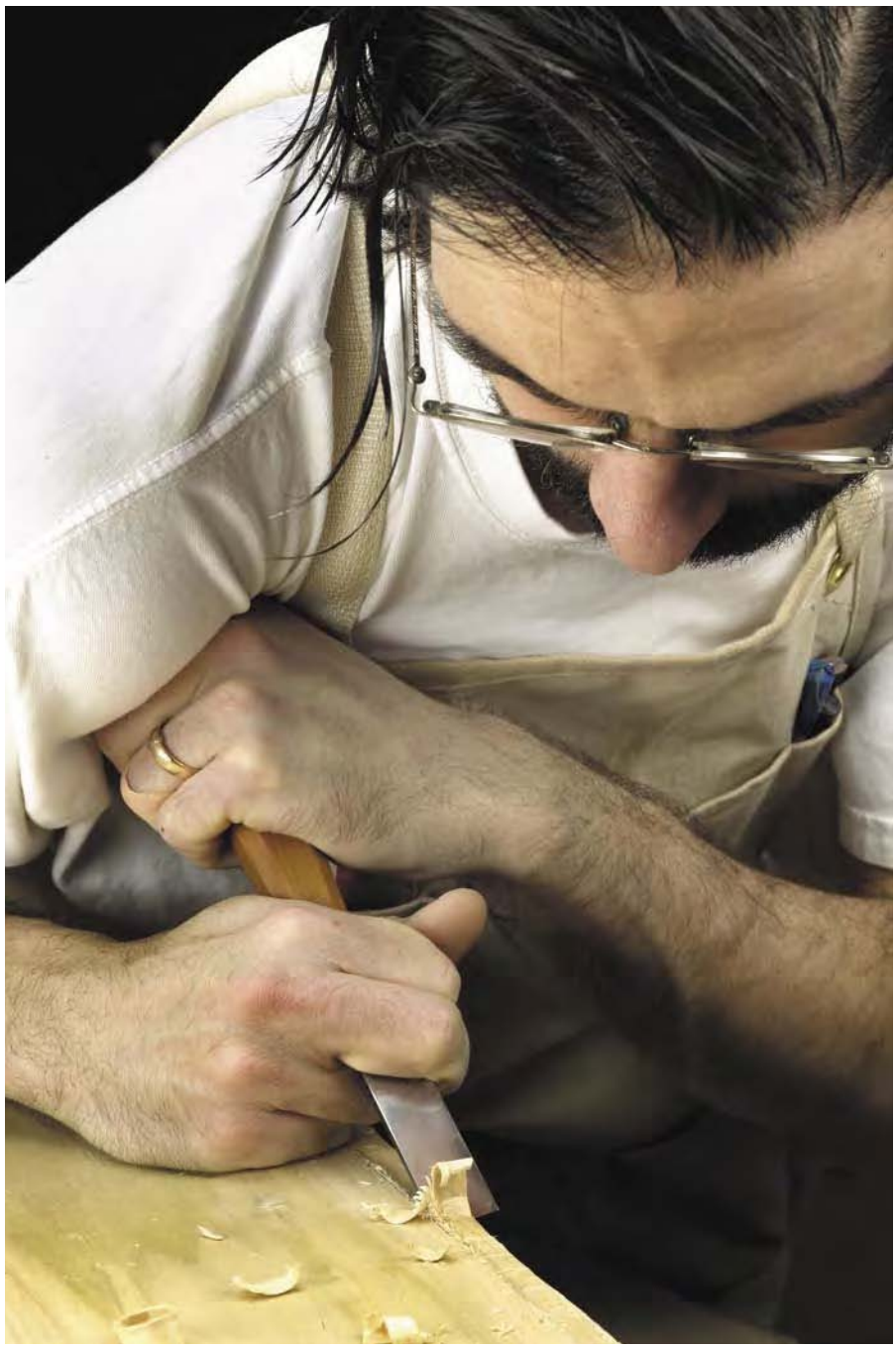
Paring

"This way of handling may seem a prepos-terous Posture to manage an Iron tool."
— Joseph Moxon, "Mechanick Exercises"

When examining period chisels, one can't help but notice the strange design of their handles. Surviving examples and period illustrations from the 17th, 18th and early 19th centuries indicate chisels typically had tapered or wedge-shaped handles.

by Adam Cherubini

Adam Cherubini makes reproduction furniture using the tools and techniques of the 18th century. He demonstrates his craft at Pennsbury Manor in Bucks County, Pennsylvania, on Historic Trades Days. You can contact him at adam.cherubini@verizon.net.



Photos by Al Parrish

Executive Editor Christopher Schwarz makes a rabbet using an 18th-century chiseling technique: After scribing the lines for the joint, you can quickly rough out the rabbet by wielding the tool as shown. Then come back with a rabbet plane and clean up the joint to your scribed lines.

Shown here are tanged firmer chisels with traditional octagonal handles scaled from those found in the famous Benjamin Seaton chest. Also shown is a socket firming chisel that is also a copy of one found in the Seaton Chest.

Holding such a chisel is like pinching a watermelon seed. It's difficult to hold at first, then it grows increasingly slippery the harder you squeeze. The rationale behind the design of these handles is unknown to me.

But rather than immediately tossing out the design as 18th-century muddle-headedness, which is clearly what modern toolmakers have done, we might assume the design served a purpose we do not yet fully understand.

"With pressing the shoulder hard upon the [handle], the edge cuts and pares away Irregularities."

—Moxon, "Mechanick Exercises"

Joseph Moxon, a chronicler of woodworking techniques in the 17th century, describes a technique in which one's shoulder is used to drive the chisel. The chisel's blade is held a bit like a pencil with the heel of the hand resting upon the work. The pinky must be behind the blade so it cannot be cut, and doesn't obstruct the view of the edge. The other hand guides the chisel handle to the shoulder where it can be pushed with great force.

I tried this technique with my beloved Hirsch firmer chisel. Its downright pointy handle wore a hole in my shoulder in minutes and left a bruise that lasted for days. What I needed instead was a chisel with a much wider butt end. Hmmm.

Creating Joints With Chisels

With the proper chisel, this technique can be used whenever a low angle or paring cut is desired. We usually associate paring with fine cuts, but this technique can produce chips that would make a scrub plane blush.

Paring Grooves

Grooves can be created quickly using this technique. In the example shown below, a groove in a drawer's front is pared to accept the drawer bottom. A marking gauge establishes the top of the drawer bottom. A sharp firming chisel, usually 1/4" to 3/8" wide, is used. With the board well clamped, start at the far end and begin paring, bevel down, with a few degrees of clearance between the bevel and the work. The edge of the chisel must rest against the marked line to ensure a straight groove. You needn't mark out both sides of the groove because the width of the chisel dictates the width of the groove.

Paring Dados

Dados can be similarly pared out, but both sides of the dado must be marked to prevent fiber break out. I typically strike the first mark with my striking knife (see "The Striking Knife," April 2005), square to the edge (using a large square). I reposition the square for the second mark using an appropriately sized chisel to establish the distance between the lines (and the width of the dado). When it's time to make the mating part, I simply set my marking gauge to the width of the chisel I used and transfer that measurement to the edge of the board. Planing to that line on the mating part is then a simple procedure.

Shown here are handles of German firmer chisels. The handles' shape makes them unsuited to the traditional paring technique that uses your shoulder to drive the tool.

To pare a dado with your chisel, first strike a line on the workpiece using a knife and your square. To set the width of the dado, use the chisel's width to properly position a square and straightedge. Then scribe your second joint line.

A groove for a drawer bottom can be created quickly with one scribed line and a chisel that is the width of the desired groove. Use the paring technique described in the article to cut the joint.

Paring Rabbets

This same technique can be used to make rabbets or fillesters (sometimes called filletsters or cross-grain rabbets) quickly without adjusting any planes or temporarily attaching a batten. Because of the grip I described, it's easy to work right to the scribed line and leave a nice straight edge behind. The rabbet plane can then use that straight shoulder to clean up the bottom of the rabbet and bring it to final depth.

Raised Panels

What is a raised panel but a board with angled rabbets and fillesters? This technique is a good match for roughing-in raised panels; it's a sensible approach when the panel has an arched or otherwise curved top.

Mallet Work: Embrace the Bevel

In Moxon's day, the standard all-purpose bench chisel was called a "forming" chisel or "former." This later became the "firming" chisel or "firmer." Today we define firming chisels as general-purpose chisels suitable for use with a mallet and this was probably true in Moxon's day as well. We shouldn't look at mallet work as brutish. In fact, using a mallet with a chisel requires a fair bit of skill. Moxon illuminates a little-discussed technique worthy of your consideration:

"...you must bear the [handle] of the Former a little inwards over the stuff."

— Moxon, "Mechanick Exercises"

When chopping straight down, you must be cognizant of the fact that the wood sees the chisel's blade as a wedge. As such, the wood wants the direction of the cut to be the bisection (center) of the chisel's bevel angle (the 25° to 30° you honed on the edge). Driving the chisel straight down typically results in an undercut. Thus, to produce a 90° cut you must pull the handle back ever so slightly away from the scrap side. This is precisely what Moxon meant in the quote above.

Chopping Dovetails

When chopping out dovetail waste, the tendency for the chisel to undercut can be used to one's advantage. Begin by placing the firming chisel 1/16" to 1/32" on the scrap side of the scribed line (base of the dovetails) exactly as Moxon described:

"...set the edge of the Former, a little without the scribed Stroak, with its (bevel) outwards..."

— Moxon, "Mechanick Exercises"

Holding the firmer as vertical as possible by eye, strike the chisel two or three times, not more. Each blow drives the chisel's edge back toward the scribed line. Embrace this.

Now pare away the waste material starting 1/8" from the edge of the board to the depth of your chopped line using the shoulder-powered paring technique discussed earlier. Always leave behind the full thickness at the extreme edge of the board.

With the wedge-shaped chip removed by paring, repeat the process until you are halfway through the board. When you flip the board over and work the opposite face, the force of chopping will not simply break the waste, as a portion of it still touches the bench. When the waste is removed you will notice the material you have removed has left an undercut or "V" shape through the end grain of your tail board.

No further work is done to this half of the dovetail joint. This tail board can now be knocked onto its mating pin board. The little extra material created by the initial place-

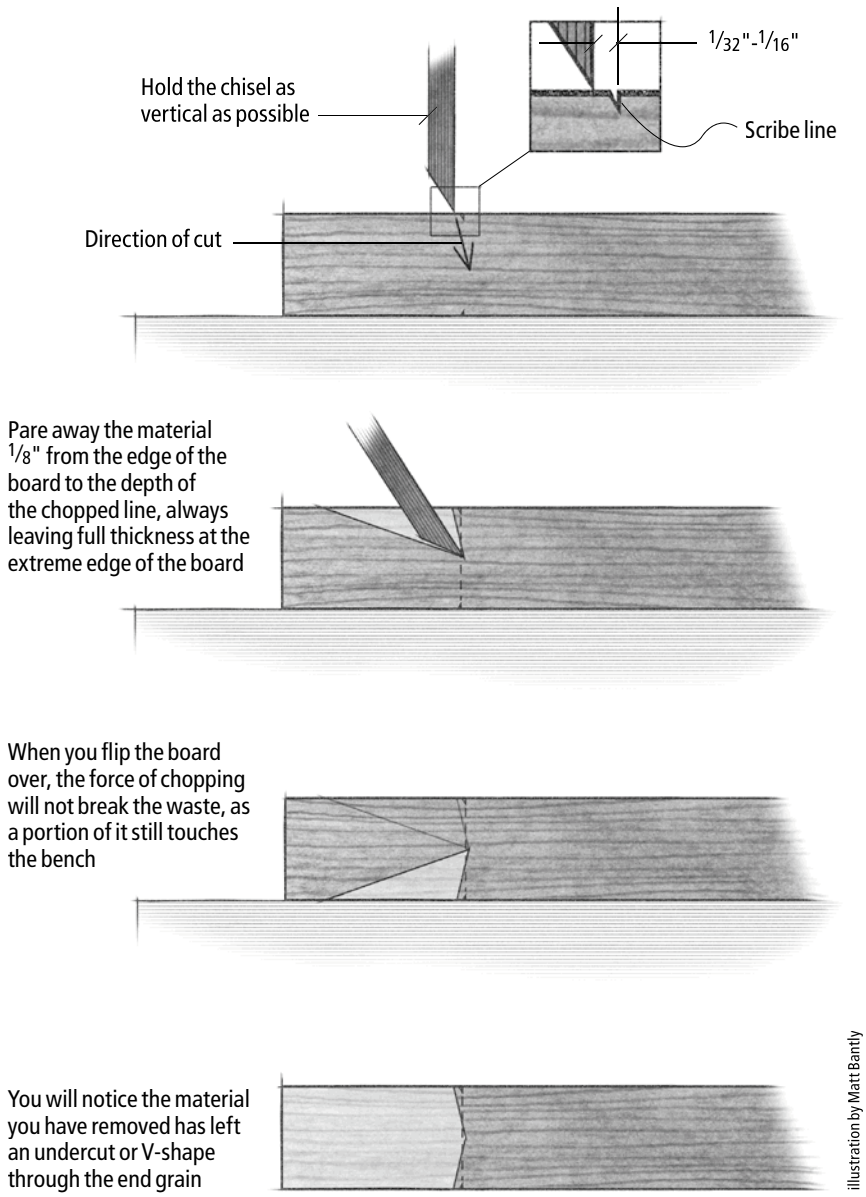


Illustration by Matt Bantly

Removing dovetail waste

ment of the chisel will simply yield away as the joint is assembled. With experience the initial placement of the chisel will be governed by the hardness of the stock and exactly how you transfer marks and saw.

I find this only helpful with the tails. The pins should be chopped exactly as Moxon said, with the chisel leaning away from the waste slightly to create a perfectly square edge.

While we're on the subject, another trick I use is to lay out my dovetails using the chisel I want to chop them out with. Now my chisels have square sides and my initial placement is not right on the line, so the width of the waste must be slightly greater than the width of the chisel. Theoretically this should be a problem, but in the many years I've been chopping dovetails this way, a problem has never arisen. It may be worth mentioning that although bevel-edged chisels were known in the 17th century, they were not generally used by Anglo-American cabinetmakers in the 18th century. Our modern partiality for them may be arbitrary.

Chopping Mortises

My mortising technique is a bit unorthodox. It uses portions of both of the advanced techniques we've discussed so far. Begin the mortise with a single marking gauge line representing one wall of the mortise. The chisel's width will determine the width of the completed mortise. Place the chisel 1/8" from each end, and with the chisel leaning slightly away from the center of the mortise (to make a square cut), apply no more than three mallet blows.

Using the mortise chisel in precisely the same technique as the firmer was used to make a groove, pare a shallow groove between the chopped ends, carefully aligning the chisel's edge to the marked line. Repeat the mallet blows at the ends of the mortise, and remove the waste between them as before. As the mortise gets deeper, the paring can become more aggressive. The low angle of the chisel during the paring will allow the walls of the mortise to guide the chisel, keeping the mortise nice and straight. Finish the mortise by lightly chopping the ends to the desired length.

Choosing the 'Right' Tool

The 18th-century toolmakers offered a variety of chisels. In addition to the standard firming chisel, tool dealer Christopher Gabriel offered a heavy-duty version of this tool called the strong firmer. Socket firmers were known and used by carpenters and wheelwrights. But their use was not exclusive to any single trade. Mortise chisels were available in both socketed and tanged varieties, but we shouldn't confuse these with the large socketed firmers used by carpenters for framing.

The dizzying array of chisels is no mere testament to personal preference. Substantive differences between seemingly like tools indicate a degree of optimization long since lost. For example: Socketed firming chisels weren't generally available in sizes smaller than 1/2" or so. It's also notable that tanged firmers were generally available in 1/8" increments while socketed chisels were not.

True mortise chisels, socketed or tanged, were rarely available in widths over 5/8", while socketed firmers (framers) were available in widths exceeding 2".

In addition to the variety of patterns, chisels were available in a wide range of sizes. The standard 18th century set of firming chisels included 12 to 16 tools. Such a set would include chisels from 1/8" to 1" wide, roughly in 1/8" increments, then 1" to 2" by either quarters or eighths. Artisans would likely add to this basic set, a set of eight joiner's mortise chisels sized 1/8" to 1/2" or 5/8" by 1/16" increments, a few paring chisels, and several firming gouges (for coping). The total cost of these tools could approach a week's pay. It can be difficult for those of us who have only four chisels, (1/4", 1/2", 3/4" and 1"), to understand the sense in having so many chisels.

Here you can see cabinetmaker's or joiner's mortise chisels.

But the rationale behind these large sets is probably the single most advanced chisel technique we can learn. It is directly responsible for making the use of chisels efficient

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A PROPER SET OF CHISELS FOR HAND JOINERY

If you want to be able to make furniture with traditional joinery by hand here's what I think you need:

Firmers: 1/8" to 1" by eighths. I grind the small chisels pretty low, maybe 20° to 25°. Hitting one with a mallet is like driving a nail. Edge retention isn't usually a problem. I grind larger chisels, 7/8" and larger, pretty low as well. The edge is so long that it spreads out mallet force and is thus well retained. (Don't ever compare the edge retention of two chisels of different sizes. The larger one will always win!) The chisels in the middle receive the majority of punishment, so I grind these close to 30°.

It's nice to have one really big chisel. A really sharp 1 1/4" to 2" framing chisel will suffice. There are plenty of good blades on the market. Trouble is, they are often paired with unfortunate handles. If you love the steel but hate the handle, consider immediately re-handling it.

If you can only have one mortise chisel choose 5/16" – it'll work for most materials roughly 1" thick. The larger sizes are only helpful for the larger stock found on chairs and large tables. When you start getting into mortises over 1/2", I think you are better off to first bore holes and use a framing chisel to clean out the waste. Mortises this big aren't typical in furniture I'm familiar with. This is more like general carpentry.

A paring chisel with a long blade, and possibly a curved edge is nice to have. A 1" tool of this form is a nice size. Besides that chisel, it's nice to have one or two paring chisels in the 3/8" to 5/8" range because those firmers see so much use, they may not be quite as sharp as you'd like when you need to take a small shaving. *— AC*

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and productive, while at the same time is not limited solely to the use of chisels.

"Joiners use (mortise chisels) of several Breadths according as the Breadth of their Mortesses may require."

— Moxon, "Mechanick Exercises"

By carefully applying a chisel to a board, one can make a cut of a consistent and repeatable width. With regard to mortising, one chooses the width of the chisel based on the stock size: Use a 1/4" chisel for 3/4"-thick, 4/4 surfaced stock, a 5/16" for 4/4 rough or 5/4 surfaced, and a 3/8" for 6/4 and so on. In these instances we can create mortises of very uniform width with no extra effort on our part.

Similarly, we can "custom design" projects to match our tools. Dovetail layout, for example is a highly arbitrary process many woodworkers fuss with. During carcase joinery, through-pins and tails can be sized and laid out using one or preferably two firming chisels. The chisels themselves can be used to make the marks. Dovetails could be one firmer chisel wide and one firmer chisel (usually a smaller one) apart. Just remember to leave a little extra space between the marks to account for the thickness of the firmer blade and the dovetail saw kerf.

Conclusion

I hope I've convinced you that there are things we can learn about using hand tools quickly and efficiently by investigating historical methodologies. Did you ever think to push a chisel with your shoulder? It's wild isn't it? And I think it could be useful. But I don't think this specific technique alone will be responsible for a dramatic increase in your efficiency.

But the ancient and forgotten "Arts & Mysteries" are much more than a mere collection of hand tool techniques. They encompass hundreds of years of industrial evolution and are characterized by consistent philosophical approaches to solving workshop problems.

We have our own "Arts & Mysteries" today such as "measure twice, cut once." By measuring carefully, we create accurate pieces that fit together. We are aided by a slew of tools that were generally unavailable in Moxon's day. One can't help but wonder how craftsmen managed 300 years ago without tape measures, dial calipers and (my favorite) the micro-adjustable marking gauge – if only it had a digital display.

Through our examination of chisel technique, we have discovered the answer and one of the most important of the "Arts & Mysteries." It allows accurate work to be performed very easily. Like any other technique, it must be practiced to be mastered. **PW**

"...This Posture, all workmen are at first taught, and Practice doth so inure them to it, that if they would, they could not well leave it."

— Moxon, "Mechanick Exercises"

The Many Faces of Varnish

Despite their names, many of your finishing products simply are a form of varnish.

You are surely familiar with varnish. It is one of the oldest and most widely available wood finishes, and it is a very popular finish with amateur woodworkers. Varnish is easy to brush, and it provides excellent protection for wood surfaces and resistance to scratches, heat, solvents and chemicals.

You may not realize it, but varnish is packaged and sold under many different names, some with no indication that the product is simply varnish. If you count all the supposedly different finishing products that are actually just varnish, you probably have a shelf full. Here are the eight categories of varnish:

- alkyd varnish
- polyurethane
- spar varnish
- marine (boat) varnish
- wiping varnish (sold under many different names)
- salad-bowl finish
- wood conditioner
- gel varnish

Varnish is made by cooking a hard resin with an oil that has the ability to cure when exposed to oxygen. The resins used are alkyd, polyurethane and phenolic. The oils used are linseed oil, tung oil, modified soybean (soya) oil and modified safflower oil. The cooking combines the resin and oil chemically to create something different from either.

It's easy to tell that a product is varnish. If it thins with mineral spirits (usually labeled "petroleum distillate") and cures hard, then it is varnish. No other finish both thins with mineral spirits and cures hard.

(Linseed oil, tung oil and blends of varnish and oil thin with mineral spirits, but they cure soft and they usually wrinkle. So to tell if a finish is varnish or if it is oil or a blend of the two, pour a puddle of the finish on the top of the can or on another non-porous surface and check it after it has cured.)

Eight Categories of Varnish

Here is an explanation of each of the eight categories of varnish.

Alkyd varnish is the common varnish available at paint stores and home centers. It is meant for interior use and is made with alkyd resin, cooked with one or more of the oils. It is always labeled "varnish," so far as I know. There are some varnishes made with phenolic resin and also labeled "varnish," but these are rare. Phenolic resin yellows significantly more than alkyd resin.

Polyurethane is varnish made with both alkyd and polyurethane resins (called "uralkyd"), usually cooked with modified soybean oil so there is relatively little yellowing. Polyurethane is more durable than "varnish," and it is almost always labeled "polyurethane." Some manufacturers use variations on the word, such as "Defthane" and "Varathane."

Spar varnish is meant for exterior use and is made with a higher ratio of oil to resin than interior varnish. This makes it more flexible to withstand the greater wood movement that occurs outdoors.

Marine (boat) varnish is spar varnish with ultraviolet-light absorbers added to resist penetration by ultraviolet (UV) light. (Many marine varnishes are made with phenolic or polyurethane resin and tung oil because these provide the best water resistance.) There is a big difference in the amount of UV absorbers added to products labeled or marketed "marine" varnish. The products sold in home

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by Bob Flexner

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

Photo by the author

Varnish is the only finish that both thins with mineral spirits and cures hard. All of these products are varnish. From the left: alkyd varnish, polyurethane, spar varnish, marine varnish, wiping varnish, salad-bowl finish, wood conditioner and gel varnish.

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centers and most paint stores have very little of the absorber added, so they are only a little more effective against sunlight than spar varnish. The marine varnishes sold in boat marinas are by far the more effective against UV light. They are also more expensive.

Wiping varnish is a name I made up 15 years ago to identify this class of varnish because so many brands are sold with non-descriptive or inaccurate names. You may very well have several brands on your shelf without realizing that they are all the same. Wiping varnishes are usually alkyd resin cooked with one of the oils, but some are made with polyurethane resin, and the wiping vanish "Waterlox" is made with phenolic resin. Whatever they are made with, they are thinned a lot, usually about half, with mineral spirits (paint thinner).

You can easily make your own wiping varnish from any of the above four categories of varnish. Making your own gives you control over the viscosity. Add less thinner than manufacturers do to achieve a better build with each coat. Add more thinner to improve flow out and leveling. Some of the more widely available wiping varnishes are shown in the photo above right.

Salad-bowl finish is simply a wiping varnish. The implication in the name is that it is safe for contact with food and for small children who might chew on the finished wood. It is safe of course, once it has cured, but so are all the other available varnishes and wiping varnishes.

The safety concern is the metallic driers used to speed the drying of the finish. Lead was once used and it isn't safe. But lead isn't used anymore. It takes several driers to replace the lead, and there are only a few driers available. So all varnishes use essentially the same driers. There is no difference in the safety factor of any of these driers. All are safe.

It's amazing to me how the food-safe myth continues to be repeated in woodworking circles. (And more amazing still that salad-bowl finish is considered safe while the other wiping varnishes aren't!) Food safety is a non-issue. All finishes currently available to woodworkers are safe to eat off of or chew on once the finish has fully cured. Curing occurs faster the thinner the film and the warmer the surrounding air. Press your nose up against the hardened finish and take a whiff. If you can smell anything, the finish isn't cured. Give it some more time.

Photo by the author

Wiping varnish is any full-strength varnish thinned about half with mineral spirits so it's easy to wipe on wood. All of these products are wiping varnish – though, as you can see, many are labeled to make you think they are something else.

Wood conditioner (or "stain controller") is sold to prevent blotching and is an alkyd/soybean-oil varnish thinned with about two parts mineral spirits to one part varnish. Again, you can easily make your own. Wood conditioner is the varnish variety of what professional finishers call a "washcoat." Professionals commonly use lacquer thinned a little more than half with lacquer thinner. Because varnish has a higher solids content (less thinner) than lacquer to begin with, varnish needs to be thinned with two parts thinner to make an equivalent product.

The problem with wood conditioner is that the directions on many of the brands are wrong. You need to let the varnish cure hard before it becomes effective at blocking the penetration of a stain into the wood. This usually takes six to eight hours (better overnight) depending on the temperature. Curing can't happen in the two hours or less claimed by some manufacturers unless you put the coated object in an oven.

Gel varnish is commonly made with alkyd resin and one of the oils, but it's sometimes made with polyurethane resin. The finish is given a gelled thixotropic quality (like mayonnaise or latex wall paint) in the manufacturing process so that it becomes easy to wipe on the wood. You have to wipe off most of the excess to avoid severe ridging. Gel varnish is very popular with amateurs because, like wiping varnish, it can be applied to produce a smooth, ridge-free result without an expensive spray gun. **PW**

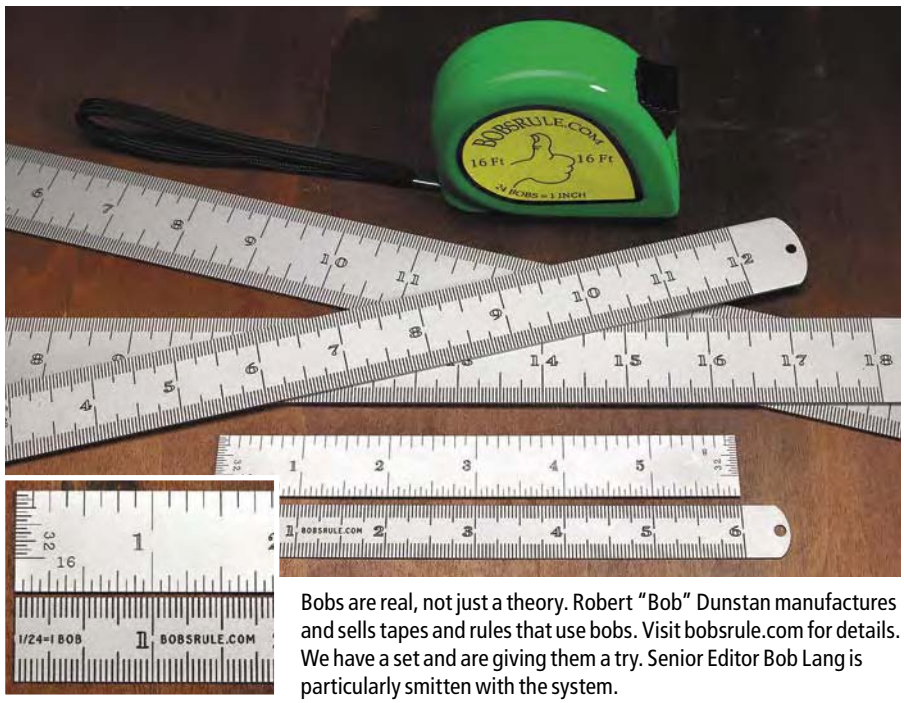
You can brush any of the varnishes I've discussed, such as the polyurethane shown here. But brushing a gel varnish can cause severe ridging.

Photos by Al Parrish

Wiping varnishes are very popular with amateur woodworkers who don't own spray equipment because these finishes are so easy to apply.

Farewell Fractions – Hello Bob

A new unit of measure attempts to trump the troublesome imperial and metric systems.



Photos by Al Parrish

Bobs are real, not just a theory. Robert "Bob" Dunstan manufactures and sells tapes and rules that use bobs. Visit bobsrule.com for details. We have a set and are giving them a try. Senior Editor Bob Lang is particularly smitten with the system.

For as long as I can remember, the woodworking community has been divided between metric people and imperial (feet and inches) people. Each is willing to argue their cause until blue in the face but unable to persuade the other. I know why – I grew up in Britain during the transition from the imperial system to the metric system and used both systems in my workshop to the extent I can categorically claim neither is suited to the type of measurement and calculation woodworkers and other craftspeople use day in and day out.

I propose an elegant solution in the form of a new unit of measure I call the "bob." Twenty-four bobs comprise the inch just as 12" comprise the foot. The bob allows the integration of all that is good in the metric system into our familiar imperial system and should please adherents of both. My argument is as follows:

The metric system excels at smaller measurements while the imperial is better suited to larger ones. The metric system's real asset is the particular size of the millimeter. This happens to be an ideal "small" unit of measure, smaller than a 1/16" and larger than a 1/32". In other respects the metric system is unsatisfactory. The reason we divide the day into 24 hours not 20 and the circle into 360° not 300° is because the building block of 12 is vastly more flexible than 10.

The imperial system offers a manageable series of larger increments. Feet and inches break up what in the metric system tend to be long, easily corrupted numbers into readily recalled chunks. For example, a metric length of 2,362mm equals 7' 11". While 2,362 might easily become 2,326 in our fallible memories, it's hard to not notice 7' 11" becoming 11' 7". The inspired division of the foot into 12" rather than 10" allows easy division into halves, thirds and quarters.

The great failing of imperial measurement is the multitude of unsatisfactory fractions that make addition, subtraction and division an exercise in mental agility, and provide ample opportunity for error. Nobody can quickly and reliably add 11 7/16" and 4 5/32" then divide the result by two, let alone by three.

The bob sidesteps all these problems. Like the foot, which can be divided many ways, an inch made up of bobs can be divided in two, three, four, six, eight, 12 and 24. The bob is very close in size to the millimeter and so it has the same natural advantage as an ideal small unit.

By giving this new unit a name I hope to allow measurements to be remembered in much the same way as British currency was before decimalization, when a train ticket to Oxford might have cost "One pound, seven and six" (1 pound, 7 shillings and 6 pence). For example, the width of the desk I'm working at would be "four-foot eight and 10 (4', 8" and 10 bob) which is a lot easier to remember and identify than either "four-foot eight and 17/32nds" or "1,436mm." Where a greater level of precision is needed the bob can easily be divided in half by eye and further still by working to one side or the other, rather than the middle of the rule markings (the terms "fat bob" and "thin bob" come to mind). Even without the confusing profusion of tiny markings found on the standard ruler the woodworker using bobs can be consistently accurate to about 1/100".

I doubt the bob will have immediate impact against either current system but it may have a promising future in the workshop as by far the best way of measuring, marking, remembering and calculating. It is within the confines of that environment that I pin my hopes! **PW**

by Robert Dunstan

Bob Dunstan lives and works in Jackson, Wyo. His daytime work consists of ceaseless promotion of bobsrule.com and Whitechapel Ltd. Furniture making remains his secondary business and primary hobby.