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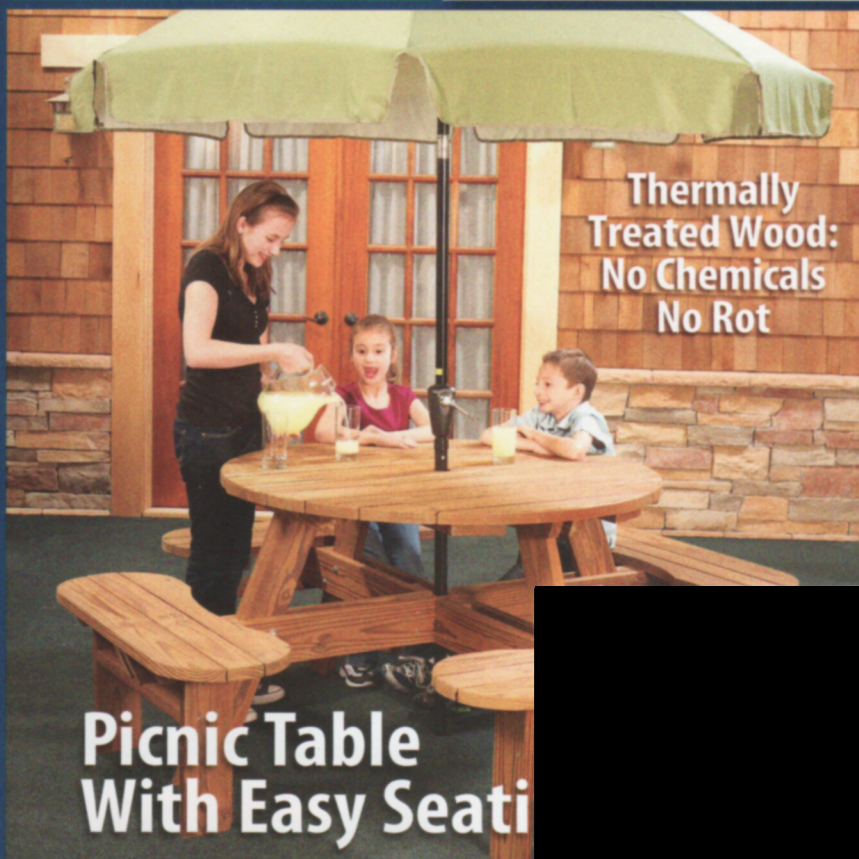
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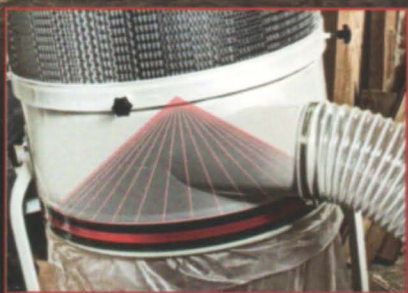
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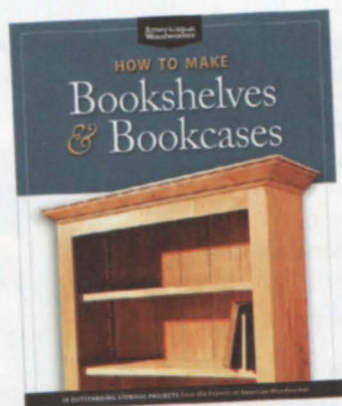
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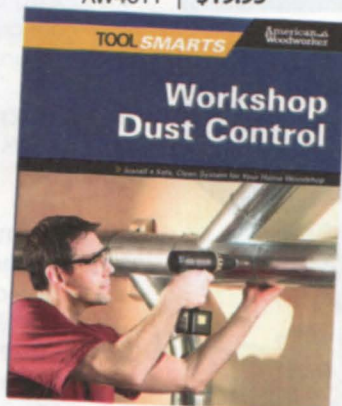
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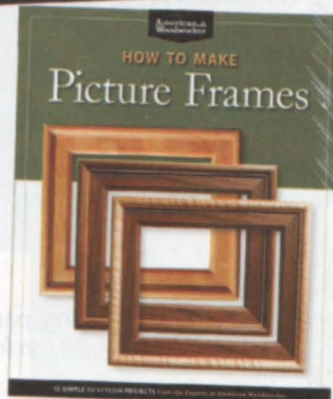
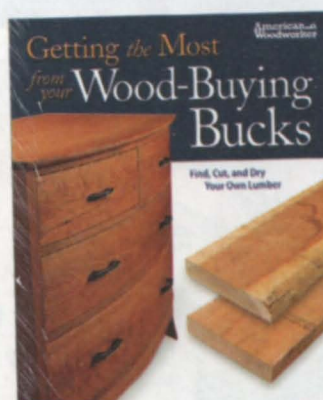
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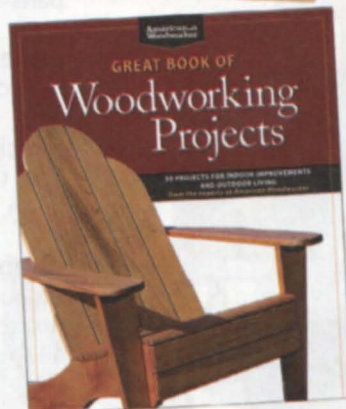
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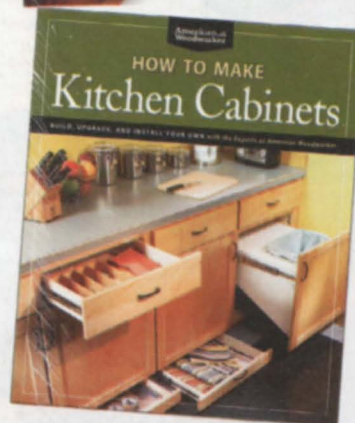
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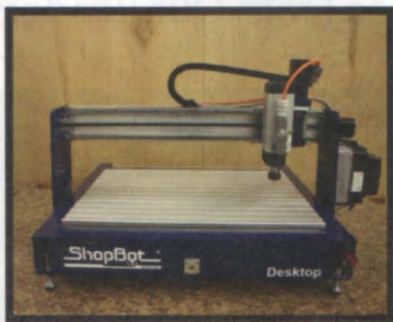
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Terrific Tip!



Small Parts Jig

ROUTING A SLOT, DADO OR GROOVE in a small part is usually an awkward operation. Small parts are hard to clamp, have very little surface area for a router to ride on and are often thinner than the router's fence. This jig solves all of these problems.

The jig's parts include a base, a fence, a pair of opposing wedges and two adjustable stops. The base is a piece of 3/4" MDF with saw kerfs cut into it 1" apart. The bottom of one of the wedges has similar kerfs, cut 3/8" apart (see inset). These kerfs allow you to position the wedge anywhere on the base using a loose spline. The other wedge locks the workpiece in

place. Both wedges are cut at the same angle.

The fence is the same thickness as the wedges and is glued to the base. Together, the fence and wedges provide a wide bearing surface for the plunge router. The router's fence rides against the outside edge of the jig's fence. The adjustable stops (made with this jig!) limit the router's travel, defining the length of a slot or dado. The stops are attached to the top of the fence with small knobs.

To hold a workpiece perpendicular to the fence in order to cut a dado, use a second pair of wedges.

Doug Perlick



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Rare Earth Hinges

RARE EARTH MAGNETS make really slick hinges for small boxes. The lid on this ring box pivots on two hinges made from 10mm magnets—nothing more.

Each hinge is composed of two magnets: one is glued to the box's side; the other is glued to the cleat under the lid. The cleats are carefully positioned so the magnets touch each other. I glued a 10mm pearl above each cleat magnet for decoration.

Mark Thiel



Web-Clamp Keeper

STUFF THE LOOSE TAIL of a web clamp into a bathroom tissue tube to keep it out of the way. This will keep you from getting all tangled up when you can least afford a distraction—right in the middle of a complicated glue-up.

Charles Mak



JASON ZENTNER

Magnetic-Strip Seal

MY SAW IS PRETTY WELL SEALED for dust collection—except for the huge slots around the blade-elevation handwheel in front and the blade-guard bracket in back. The slots need covers that can be moved, but for a long time I couldn't figure out how to make them.

After some brainstorming, I went to my local hobby shop and picked up a sheet of flexible magnetic material. Using scissors, I cut the sheet into pieces that cover the slots—two for the front and two for the back. When I tilt the saw's blade, I just peel off the magnets and move them.

Michael C. Blank



One More Drawer

THERE'S NEVER ENOUGH storage space in a shop, is there? When I recycled some old kitchen cabinets to use in my shop, I added one more drawer to each one—in the toe-kick space.

Mitch Palmer

JASON ZENTNER



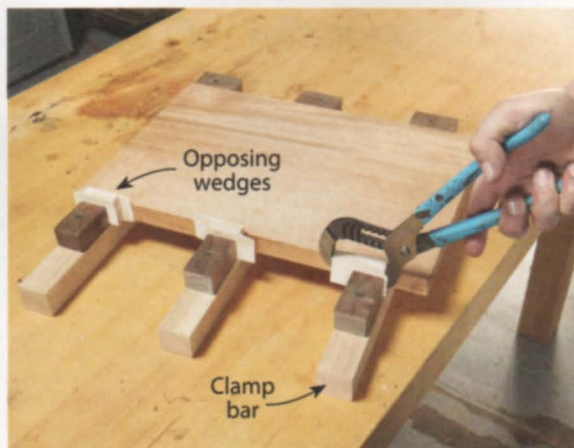
Knob-Drilling Jig

HOW DO YOU SUPPORT an uneven piece on the drill press? Make something that's the opposite shape, of course.

After making 60 of these knobs (AW #136, "Shop-Made Arts & Crafts Knobs," p. 45), I realized that the directions didn't include any advice on drilling the holes for mounting them.

My tablesaw was still angled at 15°—the same angle as the bevels on the knobs. I grabbed a board from the scrap bin that was about the same width as the knobs and about 12" long. I stood the piece on edge and made the two bevel cuts you see here. I cut a short piece from the board and placed it between two boards clamped to the drill press table. I marked the center of one knob, fine-tuned the position of the boards and fence, and merrily drilled away.

Steve Keller



JASON ZENTNER

Cheap Panel Clamps

I RAN SHORT OF CLAMPS in the heat of making a set of panel doors, so I quickly made more from stuff I had in my shop. These clamps are based on an old design, but the idea still works as well as ever—and I came up with a new twist for tightening them.

The clamps can be any length. For each one, you'll need a piece of hardwood for the bar, two small blocks for stops and some short wedges cut at the same angle. (Carpenter's shims—always good to have around the shop—work well as wedges.)

Screw the blocks to the bars about 1/2" further apart than the width of the panel. Cover the bars with tape to keep glue from sticking to them. To tighten the clamps, place the wedges in opposing directions and squeeze their thick ends with channel-lock pliers.

Alan Wesley

Digitize Your Miter Gauge

HERE'S A HI-TECH WAY to set your tablesaw's miter gauge to within 1/10 of 1° of any angle. It really works well for cutting picture-frame miters.

The key is to use a digital angle gauge. I bought one designed for woodworkers that has a handy magnetic base (see Source below).

For this degree of accuracy, you'll also need to adjust your miter gauge—one way or another—so it doesn't wiggle in the saw's slot.

To set your miter gauge, clamp it to the saw as shown. Place the digital angle gauge on the top of the saw, push the device's zero button, then move it to the miter gauge's bar. Adjust the bar to the angle you want.

You'll find that the digital angle gauge is so sensitive that even tightening the miter gauge's head affects the reading. The trick is to tighten the miter gauge most of the way when you're within 1° of your target, then tap the bar by hand until

you're spot on. Fully tighten the gauge and you're good to go.

Brad Holden



JASON ZENTNER

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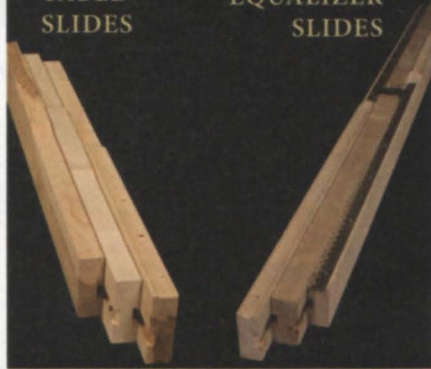
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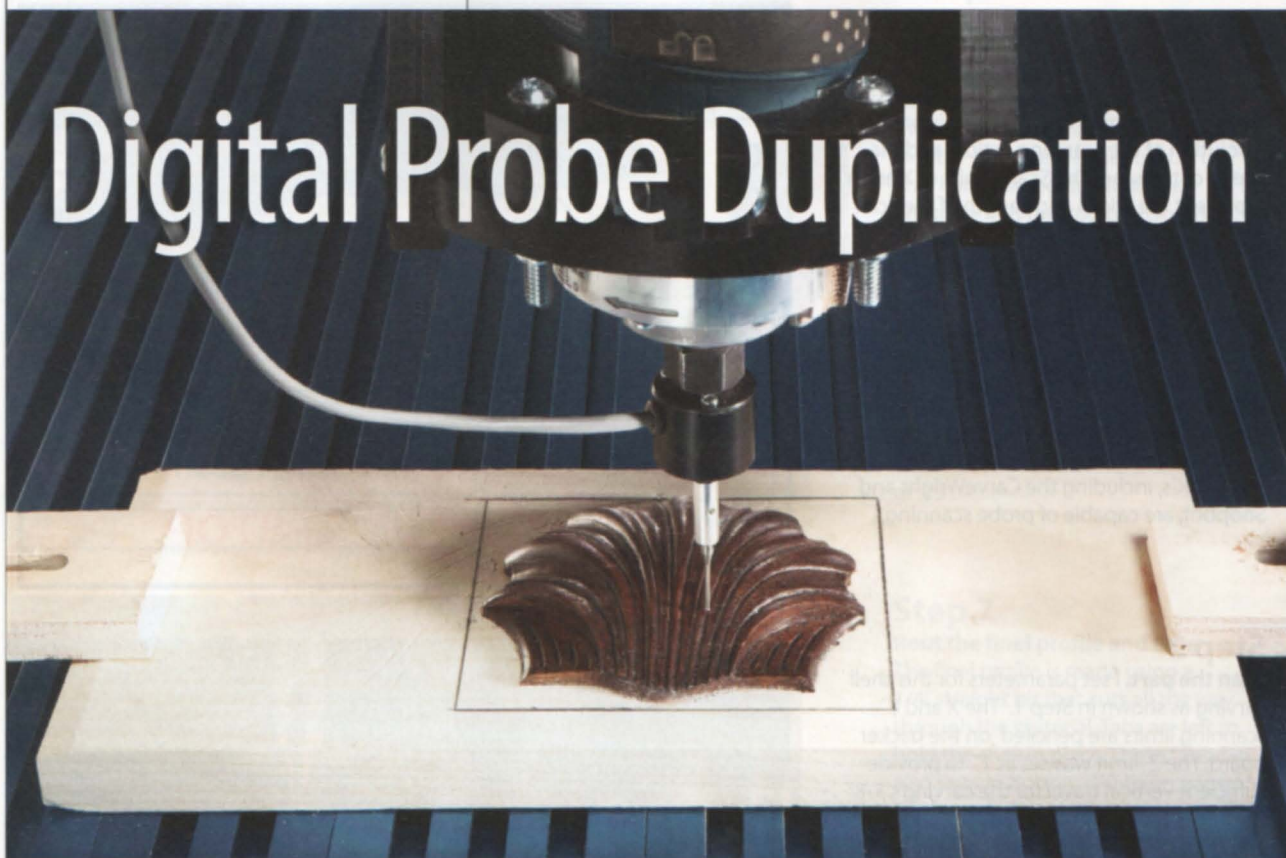
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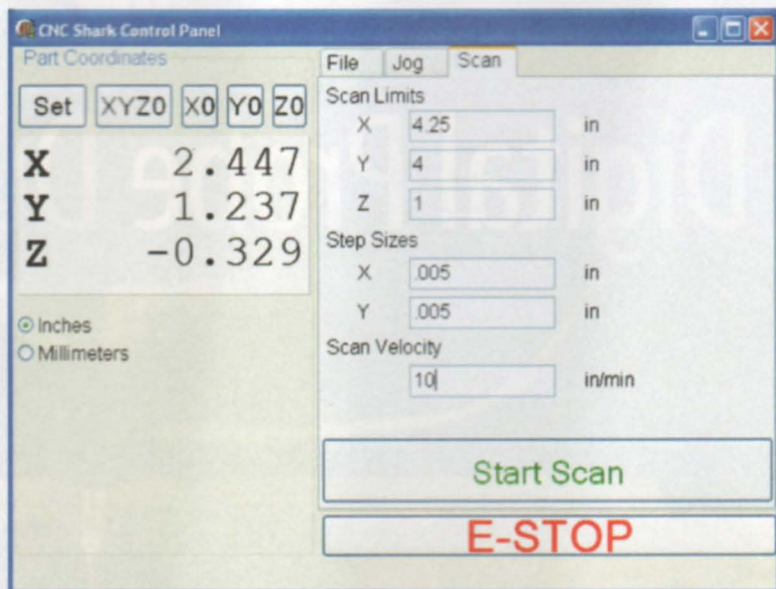
ROUTER DUPLICATION HAS BEEN AROUND A LONG TIME. Early machines used stiluses to follow the shape of a pattern or master, while on the other end of the machines, routers did the carving. In a similar but computerized fashion, CNC routers are also capable of duplicating existing carvings and furniture parts. A digital “touch” probe is first used in the CNC to sense the surface of the object, while the probe’s accompanying software creates a digital image of the part. The digital image is then converted to a 3D model and used to program CNC routing paths for a replica. To

test the capabilities of this technique, I hand carved a traditional scallop shell measuring about 4" x 4" to use as my original. My test revealed that a CNC digital probe is quite capable of accurately recording the shape of an object, with one exception; due to its ball-shaped tip, the probe rounds off the inside corners of fine details such as the veins on this shell. A little bit of hand carving easily adds the missing details. The three carvings in the photo below are duplicates of my original (photo above). Watch the digital probe in action at AmericanWoodworker.com/CNC.



Step 1

Set the scanning parameters. The software control panel is used to set the size of the scanning area, the precision or resolution of the scanning action, and the speed of the scan. The Scan Limits of X and Y represent the width and length of the scan area, while the Z Scan Limit represents the range the probe travels vertically. The Step Sizes are the X and Y distances the probe moves between measurements. The Scan Velocity controls the speed of the probe as it moves across the part's surface. The Part Coordinates show the location of the probe during operation. I used the Shark CNC Pro Plus to scan the shell for this article, but most CNCs, including the CarveWright and Shopbot, are capable of probe scanning.



Step 2

Scan the part. I set parameters for this shell carving as shown in Step 1. The X and Y scanning limits are penciled on the backer board. The Z limit was set at 1" to provide sufficient vertical travel for the carving's 5/8" thickness. The step sizes of .005" for this shell equals 800 passes across the shell for a total of 680,000 steps, or measurement points, and took about 12 hours. (I ran this overnight). The Shark CNC probe has a .075" dia. wear-resistant industrial ruby tip, so certain details such as the fine veins on this shell were not fully captured; but the remainder of the surface was captured with surprising accuracy. A larger step setting can be used on objects with less detail, such as a chair seat. Doubling the step size reduces scanning time by a factor of four.



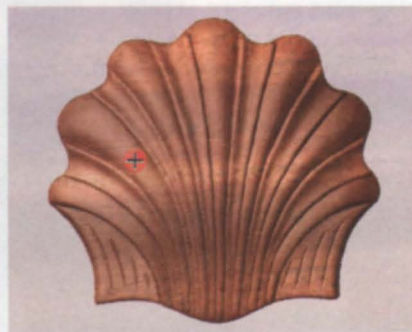
Step 3

Adjust the digital image. The scanning creates an .stl file, which is a common file type used in 3D modeling. The scanned area surrounding the shell is not needed and is removed at this time.



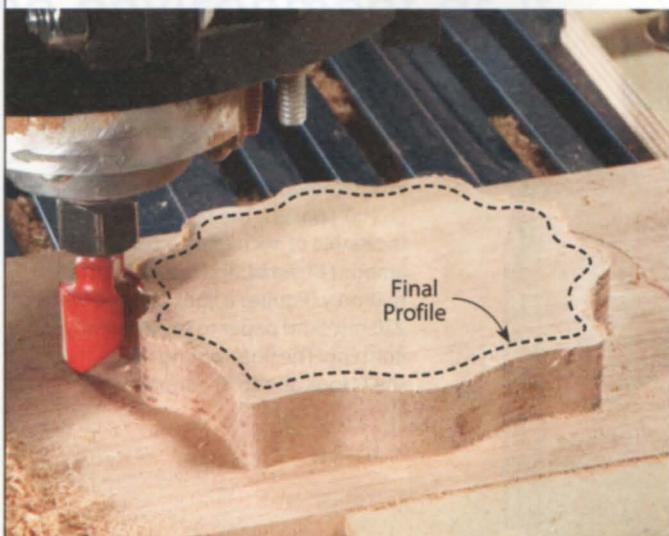
Step 4

Create the 3D model. The .stl file is converted to a 3D model with CNC design software such as Aspire by Vectric. I also used Aspire to increase the thickness of the shell's base to 1/4".



Step 5

Smooth the surface. If needed, the design software can also be used to smooth the surface of the model. My scan was fine enough so I only needed to remove a couple scratches.



Step 6

Remove the background.

I removed the background to get the waste material out of the way in order to make it easier to add the final hand carved details in Step 10. I programmed the toolpath for the 3/4" straight bit at a .1" depth-of-cut per pass and a stepover (pass width) of .2". The tool path was also programmed to leave the shell profile .125" oversize. Removing the background for the three shells took about 30 minutes. The board started out .875 (7/8") thick and the routed background is .25" thick. The shell will have a final thickness of .75".



Step 7

Rout the final profile and tabs.

The final profile is made using a 1/4" straight bit that cuts all the way through the material. Tabs are left to hold the shell in place. These tabs can also be seen in bottom photo on page 15. A piece of plywood underneath protects the metal machine bed from damage. I programmed the toolpath for the 1/4" straight bit for .125" depth passes. The profile and tab routing of the three shells took about 8 minutes.



Step 8

Rough rout the shape.

To accomplish the rough routing I used a 1/4" ballnose bit programmed to a .1" depth of cut and .1" step over (pass width). This roughing phase removes the majority of the material. The amount of material left by the rough pass is adjustable, with .02" being common for a carving such as this shell. Leaving this small amount allows the final pass to be completed in one pass, saving time and wear on the finishing bit. The rough routing of the three shells took about 60 minutes.





Step 9

Rout the final pass.

The final carving is done with a specialty .0625" (1/16") ballnose bit (available at BeckwithDecor.com). I programmed this bit to make .01" wide (1/100") passes. The tiny tip of this bit is capable of recreating a considerable amount of detail, and leaves a surface that only requires a light sanding with 220 grit sand paper to make it ready for finishing. The final routing of the three shells took about 70 minutes.



Step 10

Detail by hand as needed.

Complete the carving with some touch-up hand carving of the veins and finish sanding. There are CNC operations where the goal is to create a part that requires no additional hand work—this application is not one of them. A CNC is a tool capable of many things, but a realistic expectation of what it can do is also important. In the case of these shells, I accepted the fact that I would need to do some hand detailing to achieve the results I wanted, similar to scraping or sanding a board after jointing and planing.

Project Time Card

CNC the lids: 55 minutes each

CNC the boxes: 50 minutes each

Set up and material prep: 15 minutes each

Detailing and sanding: 45 minutes each

Staining and finishing: 20 minutes each

Total time: 3 hours 30 minutes each

I spent 5 hours 15 minutes (total for all three) doing something else while the CNC ran.



See how I designed and machined these shell boxes at AmericanWoodworker.com/CNC

Step 11

Make the boxes. After making the shells, the box shape is simple to program using the profile of the shell as a pattern. It took about 150 minutes to rout the 3 boxes on the CNC using a 1/4" up-spiral bit. They were cut out of 1-1/2" material.



Got Angles? Go Digital!

NEED A PRECISE BEVEL CUT? It's not so easy on a miter saw, is it? You've probably been frustrated by the tiny, hard-to-read scales on many saws. A new digital angle gauge from Wixey makes setting bevel angles much easier. It will tell you the exact angle of your blade to within 1/10 of 1°. That's amazingly precise.

You can also use this handy device to measure the angle of a tablesaw's blade, a jointer's fence, the table of a drill press or even a tablesaw's miter gauge (see Digitize Your Miter Gauge, page 12).

The Wixey gauge is very simple to use. On a miter saw, for example, you'd unplug the saw, place the gauge on the saw's table and push its "zero" button. This sets the gauge's scale to read 0°. Then you'd place the gauge on the blade (the gauge has a magnetic base, so it will stay put) and tilt the blade. You'd get your reading right away. The gauge's readout screen can be tilted to make it easier to view from any angle—a nice touch.

Wixey makes two versions of this gauge. The least expensive model just measures angles; for another \$10, you can get a gauge that includes a level. For most shop uses, the one without the level will be adequate. You'll probably just use the gauge to set angles that are relative from one surface to another, such as the miter saw's



JASON ZENTNER

table to its blade, so a level isn't necessary.

Both gauges are powered by two AAA batteries and are equipped with auto shut-off to extend battery life.

SOURCE Wixey Intelligent Woodworking, wixey.com, Digital Angle Gauge, #WR300, \$40; Digital Angle Gauge with Level, #WR365, \$50.

Welcome Back, Sweetheart

VINTAGE STANLEY HAND TOOLS have long been favored by users and collectors. Many of those tools were exceptionally well made. Over the years, Stanley stopped producing top-of-the-line hand tools, leaving the field to others. We're happy to report that Stanley is back. They launched a line of five redesigned planes last year; now, they've re-introduced the legendary No. 750 socket chisel.

Both chisels and planes have been given the "Sweetheart" label: a logo that incorporates an "SW" inside a heart. It's a symbol of quality familiar to collectors. This logo was widely used during Stanley's golden years, roughly 1920 to 1940. In 1920, Stanley Rule & Level Company merged into the larger Stanley Works manufacturing company, hence the "SW". Stanley Works started using the heart logo in 1915 to honor their recently retired president, William Hart.

The new 750's are very similar in design to the originals. Their hornbeam handles nest nicely in tapered sockets and are easy to remove. That's an advantage that most modern chisels don't have. With a socket chisel, you can make



your own handles to better fit your hand or to suit the job. For example, we liked the 750's handles for paring, but found them uncomfortable for chopping. No problem—we'll make a different set and interchange them as needed.

Handles aside, how about the steel? Let's cut to the chase—it holds an edge quite well. In our seat-of-the-pants test, the new 750s performed on par with other premium Western-style chisels, such as those made by Hirsch and Lie-Nielsen. (Lie-Nielsens are also socket chisels. However, they are much thicker in cross section than the new 750s. Thicker is better when it comes to chopping and sharpening without a jig.)

Lastly, how about the backs? We looked at 16 chisels—two complete sets—and found them all to be flat and smooth, right to the tip. They certainly needed some lapping and polishing—virtually every new chisel does—but these were as good, or better, than chisels of any brand, at any price. Stanley took some well-deserved lumps on quality control when they first issued those planes; these chisels, however, seem to be made to a uniformly high standard. Bravo.

SOURCE Stanley, stanleytools.com, 800-262-2161, Sweetheart Socket Chisels, Set of 4 and a leather roll, \$130; Set of 8 and a leather roll, \$230.

2-Way Plywood Cart

CARRYING HEAVY SHEETS of MDF, particle board and plywood around your shop can put a big strain on your back. When it comes to feeding one into your table-saw—well, what awkward maneuver do you use? This sturdy device, the Sheet Flipper, can save your back many times over.

The Sheet Flipper is basically a large welded-steel cart with two sets of casters. To transport a sheet across the shop, you turn the cart on its side, slide the sheet out of your storage area and onto a lip on the cart, then roll it away. To feed the sheet into your table-saw, you rotate the cart onto its base (note the cart's round corners), wheel the cart up to the saw, lower the lip out of the way and push.

Doesn't that make your back feel better, right now?

Clearly, the Sheet Flipper takes up a fair amount of room (in the horizontal position, it's 46" W x 46" D x 34" H). But it makes a handy worktable, too. The Sheet Flipper can rotate sheets up to 150 lbs. In the horizontal position, it'll carry 300lbs. Its 34" height is designed to match the height of most tablesaws; you can make it taller by shimming the casters, but you can't make it shorter. The Sheet Flipper ships to the lower 48 states



only and takes about 15 minutes to assemble.

SOURCE Beckwith Décor Products, beckwithdecor.com, 316-652-7375, Sheet Flipper Material Handling Cart, \$445.



To see the SheetFlipper in action, go to AmericanWoodworker.com/WebExtras



Chip-Free Melamine

HAVE YOU EVER CUT MELAMINE

with a standard combination blade? The top side will look pretty good, but chances are the bottom side won't. It will probably be pretty ugly, with small chips missing along the entire edge. Most combo

blades aren't designed for cutting a tough, brittle material like melamine.

The easiest way to ensure clean cuts top and bottom is to use a specialized blade, such as this new one from Delta. We've tried it out in our shop and can report excellent results. This is truly a professional-quality blade, with large carbide teeth (plenty of material for re-sharpening), a 1/8" kerf, and numerous anti-vibration and noise-dampening slots.

SOURCE Delta, deltaportercable.com, 800-223-7278, 10" 60-tooth H-ATB Carbide Tipped Saw Blade, \$85.

21st Century Slatwall

ORGANIZING A SHOP can be an endless task. Every new tool needs a new home, right? If you're constantly re-arranging your walls, using a modular system makes the most sense. Pegboard was the logical choice back in the Sputnik era, but the most technically advanced storage system for today's shop is storeWALL, a new kind of slatwall.

Made from molded thermoplastic, storeWALL is stronger, more durable and easier to install than slat-wall made from MDF. StoreWALL looks much sleeker than pegboard and is available in five different colors, including pine and cedar woodgrain. StoreWALL comes in 4' or 8' long panels. Each panel hangs from metal brackets attached directly your studs, so it's easy to install by yourself.

StoreWall is available in standard or heavy duty panels. One carton of six standard panels, 4' long and covering 30 sq. ft., costs \$190.

SOURCE StoreWALL, storewall.com, 866-889-2502.



Mobile Work Station

REMEMBER THE OLD ADAGE “a place for everything and everything in its place”? Well, Festool’s new CT Workcenter puts everything right at your fingertips. It’s a well-designed storage unit that mounts on top of a Festool dust extractor.

The Workcenter’s features include a rotating shelf, large hooks for hoses and cords, a tool rest and adjustable hooks for hanging accessories and supplies. You can adjust the height of the whole unit. Festool Systainers (Festool’s stackable tool cases) nest in the Workcenter’s base.

All Festool dust extractors are tool-actuated—when you turn on the tool, the vacuum starts up automatically. Their new dust extractors now have variable suction and larger capacity (but not a larger footprint). When sanding, Festool says you’ll get the best results by fine-tuning suction. Different grits and different materials, they say, require different amounts of suction for optimal performance.

SOURCE Festool, festoolusa.com, 888-337-8600, CT Workcenter WCR 1000, #498507, \$375; CT-26 E HEPA Dust Extractor, 583492, \$550; CT-36 E HEPA Dust Extractor, 583493, \$600.



\$1,000 Cabinet Saw

TIME TO UPGRADE to a cabinet saw? If you’re thinking about it, but are on a tight budget, take a look at this new offering from General International. The 50-200R is a 240 volt, 2 hp, 10” left-tilt saw that has just about every feature you’d want in a cabinet saw—except a huge motor. But 2 hp may be all the power you really need.

Before getting to the specs, let’s open the hood to confirm that this is a true cabinet saw—not a hybrid. What’s the difference? Both types have cabinet-style bases, but the cast iron assembly that allows the blade to tilt and go up and down isn’t the same.

In a hybrid saw, this assembly is lighter in weight and is mounted to the tabletop by two independent trunnions. This arrangement makes it difficult to precisely align the saw’s blade with the top’s miter slots, should this be necessary (and it often is). In a cabinet saw, this assembly is much beefier (resulting in less vibration) and is mounted to the saw’s cabinet as one integrated unit. Alignment is very easy—you just loosen the top and give it a nudge.

The General International 50-200R weighs 321 lbs., has a cast iron table, two cast iron wings and enough capacity to rip a piece up to 30” wide. It comes with a classic T-style rip fence and a riving knife with an attached see-through blade guard and anti-kickback pawls. You also get a separate riving knife, without a guard or pawls, for making non-through cuts. The stop



switch is large enough to double as a pancake flipper—very nice. One-wrench blade changes are a snap with the convenient arbor lock.

Accessories available include a cast iron extension wing with router inserts, a router fence, a zero-clearance insert and a dado insert.

SOURCE General International, general.ca, 888-949-1161, Model 50-200R 10” Table Saw, \$1,000.

probotix

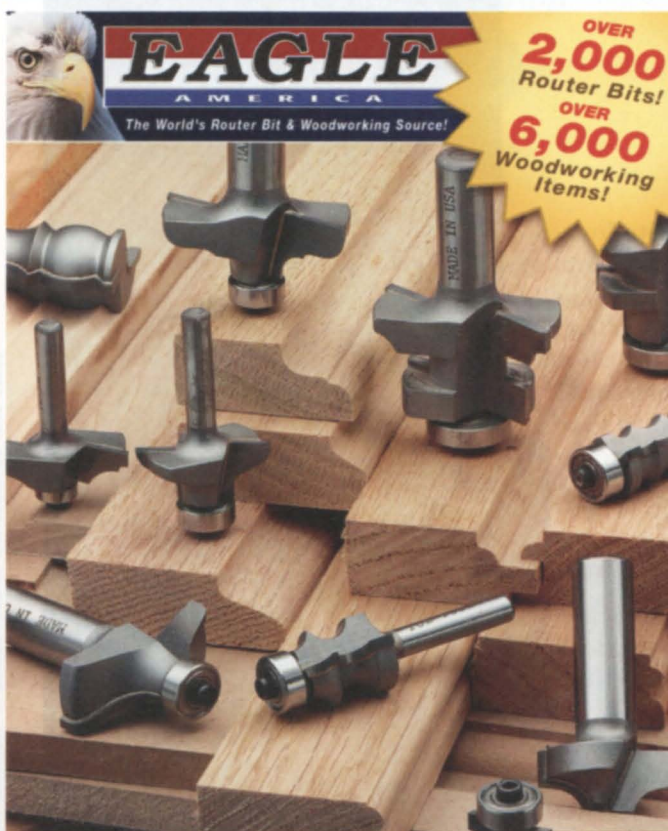
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by Spike Carlsen

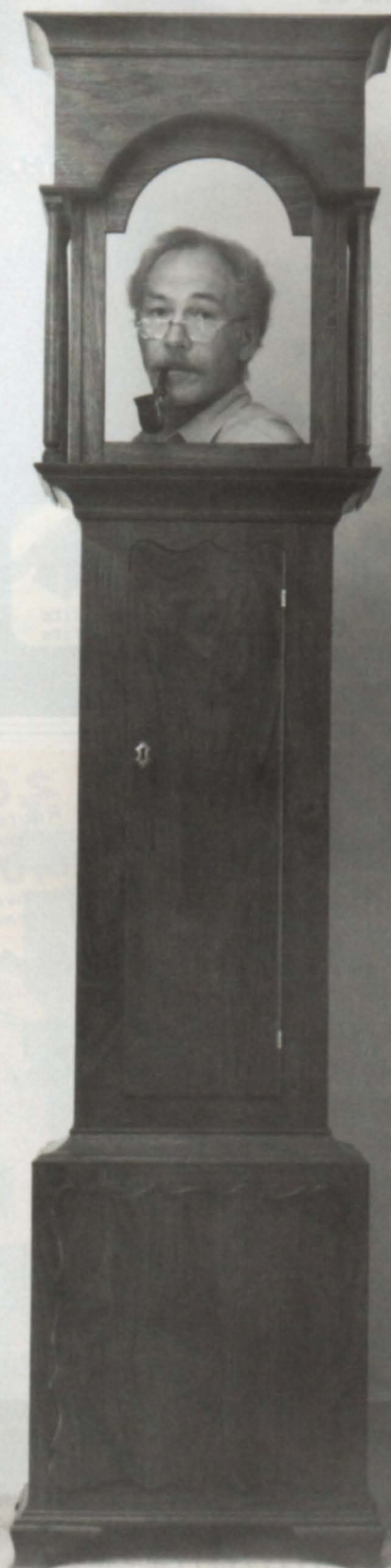
MOST WOODWORKERS have gotten a chuckle or two out of a piece of furniture they or somebody else has built—maybe an armoire that's too big to fit through the workshop door or a bookcase with two left sides. But most of the furniture Jake Cress makes will bring a smile to your face—and it's not for lack of skill or planning. He wants you to laugh. Whether it's a Chippendale chair with a wayward ball (see photo, page 25) or a grandfather clock taking a wild swing with its pendulum at a mouse running up its side (see photo, page 25), Jake's work will brighten your day.

The long and winding road

After graduating from high school and serving a five-year stint in the USN submarine service, Jake got involved in professional theater. There were long pauses between the end of one play and the start of another so he and his brother decided to open a cabinet shop. "In 1974 there weren't any woodworking schools, and even if there were I couldn't have afforded it," Jake explains. "If I'd had somebody to teach me I could have saved a fortune in wasted wood."

Now 66, Jake is completely self-taught. Part of his woodworking education came from visiting exhibits and galleries to study the craft. "One cold morning I walked into a gallery and noticed someone had left their gloves and keys on a gorgeous table. As I turned around to tell someone about it, I did a double take and realized they were part of the table," Jake recalls. That piece, *Table with Gloves and Keys* by Wendell Castle, inspired Jake to start building furniture with personality. *Crippled Table*, his first humorous piece, sports three turned legs—and a crutch.

Though some of Jake's more complex pieces sell for more than \$20,000, he recalls leaner days. Early in his furnituremaking career Jake admits he was willing to "do anything legal having to do with wood." Such legal endeavors brought him tasks as varied as refinishing 80 cherry side tables for a hotel and restoring an 18th century corner cupboard that was in such bad





Oops!

shape only one door, one stile and the center drawer front were usable. Eventually Jake's furniture began selling and though he admits "It's still a tough way to make a living," he's remained dedicated to his craft.

Jake's work may be non-traditional, but his pieces have been acquired by museums as established as the Smithsonian and displayed at the Society for Contemporary Craft in Pittsburgh. His furniture has appeared in *The Washington Post* and *Art and Antiques* magazine.

Half traditional, half animated

Jake describes his work and himself by explaining, "The pieces are made one at a time, very carefully, by one dusty old guy who works by himself in an ancient log cabin."

About half of the pieces he builds are traditional; the other half are animated. Jake names all of his pieces, which adds another layer of humor. A slanted table is called *The Democrat* when it leans to the left and *The Republican* when it's turned to lean to the right. His



Hickory Dickory Clock

Great Expectations chair has a Fudgesicle carved into the arm and an eager face with its tongue hanging out carved into the back. Jake's *Self Portrait* chair prepares to carve its leg with a chisel and mallet (see photo, page 26). *Peel Here* reveals a checkerboard beneath the veneer (see photo, page 26). *How to Build Furniture* illustrates a classic woodworking nightmare (see photo, page 26).

Some of Jake's animated designs have been exceptionally popular. He's crafted over two dozen *Oops!* chairs, *Peel Here* tables and *Hickory Dickory* clocks. Though each piece is slightly different, once



Aladdin's Mouse



Self Portrait

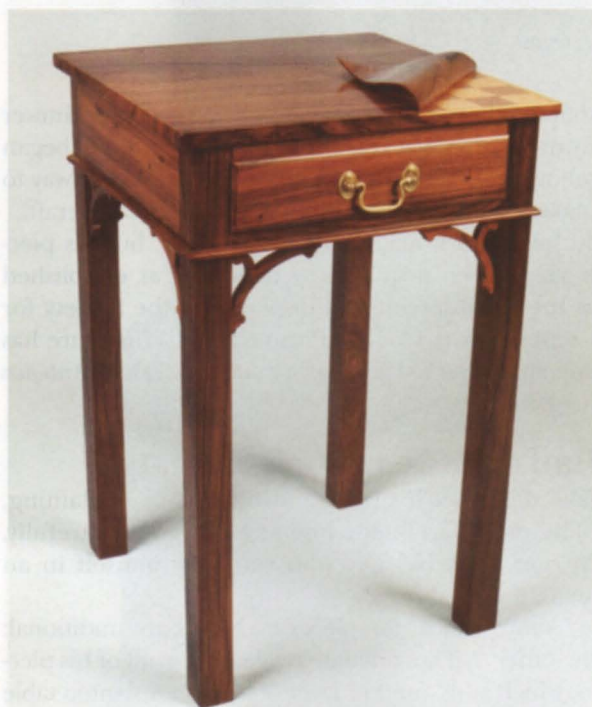
Jake has refined the basic design, he makes patterns for future pieces. Not content to rest on his laurels, he continues to push the envelope. *The Decorator*, a recent piece, features a two-dimensional painting by artist Mark Young, with the arm of a chair reaching out to pluck a flower from a vase resting on a table below it (see photo, page 27). Building one of his more complex pieces can take up to two months. "But a lifetime of experience," Jake adds. "Do not try this without adult supervision."

While best known for his animated pieces, Jake can craft a Chippendale lowboy or a Federal secretary along with the best of them, and his miniature versions of period furniture pieces are delightful (see "Small Masterpieces," page 27). Jake is a one-man show, doing all the carving, inlay and finishing work. He employs both hand tools and power tools, letting the latter do the grunt work, so he can focus on the parts that truly need the human touch. "I'm not going to plane down a 20" wide board by hand if I have a 20" wide planer," he explains. "But if I have a 21" board ... well, I guess I have no options."

Jake can turn a phrase as aptly as he can turn an armload of mahogany into a corner cabinet. In one essay on his website he describes working late into the night alongside a friend who was in dire need of a walnut box to hold the ashes of a suddenly depart-



How to Build Furniture



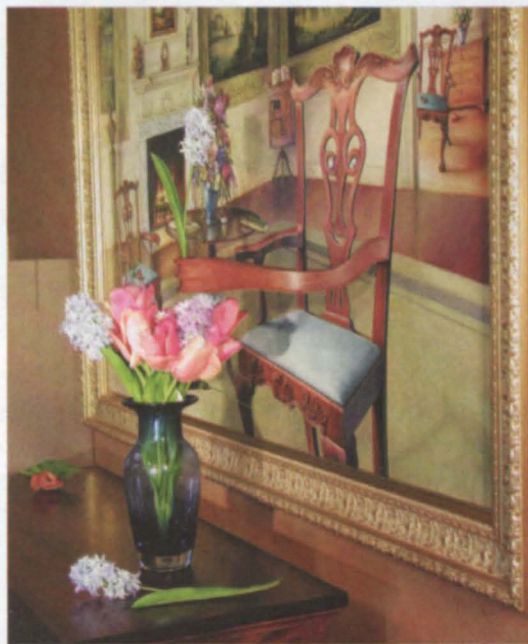
Peel Here

ed relative. "I watched the walnut become richer and deeper with a little sadness that it would disappear forever," he writes. "[But with] a lot of pride that such a human need could still be met by friends rather than companies."

When asked about his unique approach to woodworking, Jake explains, "No matter what you do for a living you have to learn the basics. You have to study the classics. You have to learn how to run a pencil before you learn how to run a computer. If you don't know the rules, then you can't break them." No one breaks the rules better than Jake Cress. 

Spike Carlsen is author of *A Splintered History of Wood: Belt Sander Races, Blind Woodworkers and Baseball Bats*. His newest book, *Ridiculously Simple Furniture Projects*, will be available this spring.

The Decorator
(Painting by Mark Young)



Small Masterpieces

Jake has mastered making miniature furniture pieces for a variety of reasons. "They're beautiful and cute," he explains. "They're also useful and elegant." But his miniatures aren't merely for show. As he normally eschews working from a blueprint or plan while building full-size pieces, he uses the miniatures to work out the details. For example, Jake often adjusts the proportions on old, traditional pieces to make them look even better. Building a miniature version allows him to try out those new proportions. Though a few of his miniatures are one-quarter scale, the bulk of them are one-

half scale. "Half-scale is easy," he says. "You just cut all the dimensions in half." Jake also explains that half-scale pieces are a perfect fit for half-scale people—such as his grandkids.

But being diminutive doesn't make one of Jake's miniatures a smaller project. You won't find him using hot melt glue to cobble the parts together; his miniatures are faithful, right down to the joints. "I cut the mortises and tenons by hand using the same tools I use for the full-sized piece," he explains. "They're challenging. In fact they can be more complex than the full size piece."

Wine Bottle Stopper

Add sparkle outside and protect what's inside.

WHETHER YOUR WINE BOTTLE is half-empty or half-full, here's an elegant way to preserve the contents until you answer that age-old question. You can make one of these classy little stoppers in just a few minutes, so turning multiples is a natural,

especially since they make such great gifts. The materials you need to get started (the metal part of the stopper and a special chuck for the lathe) cost less than \$20 and the design possibilities are limited only by your imagination.





1 Mount the blank on a bottle cone chuck. Then mount the chuck on the drive spindle. This blank was cut from a buckthorn branch.



2 Round the blank to a cylinder using the roughing gouge. A large gouge produces a smoother cut than a small one.



3 Unscrew the blank slightly away from the base of the cone chuck to prepare for the next step. The blank is tightly threaded on the chuck's post, so unscrewing doesn't loosen it.



4 Cut the bottom of the blank at a slight angle using the parting tool. This creates a concave surface so the stopper's metal bottle cone will seat flush.

Start with interesting wood

This project presents a golden opportunity to use a branch from a tree or shrub as a turning blank—just make sure the wood is dry and the pith is stable. Incorporating bark and sapwood can add a nice contrast to the edge. Buckthorn, often called “Minnesota rosewood,” is one of my favorite sources for branch-type blanks. Of course, offcuts from other projects are also excellent sources for blanks.

Components and sizes

The blank mounts on a metal bottle cone that has a threaded post and rubber seals (different styles and sizes are available; see Sources, page 31). Balance the size of the blank to the base of the cone. The bottle cone shown here measures 7/8" dia. x 2-1/4" long and the blank measures 2" dia. x 2-1/4" thick.

Cut the blank to length and square one end, so it will rest flat on a drill press. Then drill a 23/64" dia. x 3/4" deep mounting hole in the opposite end. This hole doesn't have to be centered on the blank. Screw the blank onto the bottle cone chuck's threaded post (Photo 1 and Sources). Then mount the cone chuck

on the lathe.

Round the blank to about 1-1/4" dia. (Photo 2). Then unscrew it about 1/4", just far enough to create room for the parting tool (Photo 3). Undercut the bottom of the blank to make it slightly concave, so it will seat flush against the base of the metal bottle cone (Photo 4). Then screw the blank back against the bottle cone chuck. Start the lathe to make sure the blank is still centered—you'll probably need to true it slightly.

Blanks made from branches sometimes contain imperfections (see “Hidden Treasure,” page 31). Stabilize any such areas with CA glue (Super Glue) before continuing, so they don't cause problems when you shape the blank.

Fit your hand

Turn the blank into an interesting shape that makes the stopper easy to insert and remove. For shorter blanks, a simple knob shape works well. Longer blanks allow adding decorative beads and coves. Whatever shape you choose, stop frequently while turning the stopper to test how it feels in your hand.



5 Shape the top of the blank using the detail/spindle gouge. A rounded top is comfortable to grip. Stepped details add interest.



6 Round the bottom of the blank to meet the bottle cone chuck. This automatically matches the bottom of the blank with the top of the stopper's metal bottle cone.



7 Define the stopper's body with coves and beads (seasoned turners call these "innies and outies").



8 Use a soft cloth to apply three light coats of alcohol-resistant finish. Allow each coat to dry before recoating. Multiple light coats of finish always look better than one heavy coat.

Shape the end of the blank (the top of the stopper) first, while the blank is still fully round (**Photo 5**). This is the best procedure for turning a blank that's supported only at the headstock. The idea is to maintain the most support while working the farthest distance from the headstock. Turning the blank's body first reduces its diameter (and the support it provides), so vibration and chatter is likely to occur when you try to turn the end.

Next, turn down the base of the blank to match the top of the metal bottle cone (**Photo 6**). This is a simple operation, because the bases of the bottle cone chuck and the metal bottle cone are the same diameter. Finish turning the stopper by "connecting the dots" between the base and the top (**Photo 7**).

Assemble the stopper

Sand the turned stopper, starting with 180 grit and working up to 400 grit to create a glass-smooth finish. Apply a tough, durable and alcohol resistant finish (**Photo 8**). I make my own wipe-on finish by thinning Behlen Rockhard Table Top Varnish by 50% with mineral spirits (see Sources). For a

satin sheen, try Wipe-On Gel Poly Finish or Mylands Melamine Lacquer (see Sources).

Apply three light coats of finish, allowing each coat to dry before recoating (six to eight hours). Add luster to the finished stopper by applying a hard wax such as Trewax. After the wax is completely dry, buff with a soft cloth. For oily woods such as cocobolo, a buffed wax finish is all you need.

Remove the turned stopper from the cone chuck and allow the finish to dry. Then drill out the mounting hole to 3/8" dia. (This makes it easier to mount the stopper onto the metal bottle cone.) Dab epoxy in the mounting hole and then thread on the turned stopper (**Photo 9**). Let the epoxy fully cure before popping the completed stopper! 



Mary Lacer has been turning wood since she was knee-high to a buckthorn. She has taught in a number of turning programs and has turned more than 100 different woods native to her home near River Falls, WI.



9

Epoxy the turned stopper to the bottle cone after drilling out the mounting hole to fit the threaded post. If the post and cone are separate pieces, epoxy them together first.

SOURCES

Packard Woodworks, Inc., packardwoodworks.com, 800-683-8876, Bottle Cone Chuck, #114915 (for 3/4" x 16 lathe spindle threads) or #114916 (for 1" x 8 lathe spindle threads), \$10.95 each, including proper size drill bit; Metal Bottle Cone, #154938, \$3.85 each, other styles available; Wipe-on Gel Poly Finish, #126803, \$10.95 per pint; Mylands Melamine Lacquer, #125512, \$17.95 per pint.

Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Behlen Rockhard Table Top Varnish, #80750, \$24.99 per quart.

Hidden Treasure



Discovering a bark inclusion (where a branch has grown around another branch, bark and all) presents a unique opportunity—it's a hidden treasure to be discovered rather than a defect to be removed. The first step is to stabilize the inclusion with CA glue so it won't chip out as you turn through it. Let the glue cure for at least an hour before turning—longer is even better. Now comes the challenge: displaying the hidden branch. This requires a discerning eye and a bit of luck, because you have to determine the branch's orientation inside the blank and adjust the shape that you're turning (as much as possible) to expose it. You also need a delicate touch—remove a bit too much and the treasure will simply vanish. In this case the hidden branch was oriented almost perfectly with the rounded shape I wanted to turn.

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Passion-Built Shop

MY WIFE AND I were walking through a Home Depot store about 20 years ago, when I noticed a small Makita tablesaw and mentioned that it would be fun to have a tool like that just to fool around with. That very saw appeared under the tree at Christmas, and it ignited my passion for woodworking. I bought more tools, then books and videos and even more tools.

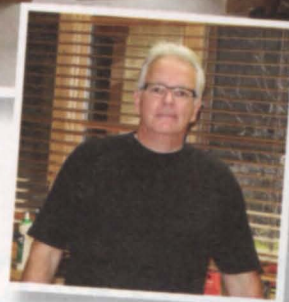
Eventually, tools were piled up in the garage. Every time I wanted to make something, I had to back the cars out and pull the tools into the space. As this struggle continued, I dreamed of having a shop

big enough to have a dedicated space for all my woodworking tools. So when the property next door came up for sale a few years back, we bought it and tore down the old house. Then I designed a shop from scratch, using my skills as a real-estate developer. From the outside, it has the look of a nice home with a landscaped yard.

The structure is essentially a four-car garage with an additional wing to house the mechanical rooms and office. I'd had it with tripping over hoses and cords in my old garage space, so one goal in laying out the new shop was to locate power,

compressed air and dust control near each tool. I also positioned the tools to maximize the work flow from one operation to the next, with work stations adjacent to the tools associated with each task. The shop revolves around two centrally located columns that are actually 24" x 24" chases for power, air and dust collection.

A large maple workbench set up for clamping and assembly occupies one wall. It has full-extension drawers to house all the clamps. (There are never enough!). Another similarly sized bench has similar drawers for hand tools. Yet another bench is



reserved for tool sharpening.

Dedicated rooms flank the main shop area: an office, a room to house noisy machines such as the compressor and dust collector, a tool room lined with shelves, a finishing room with a spray booth and ventilation fan, and last but not least, a sanding area with a down-

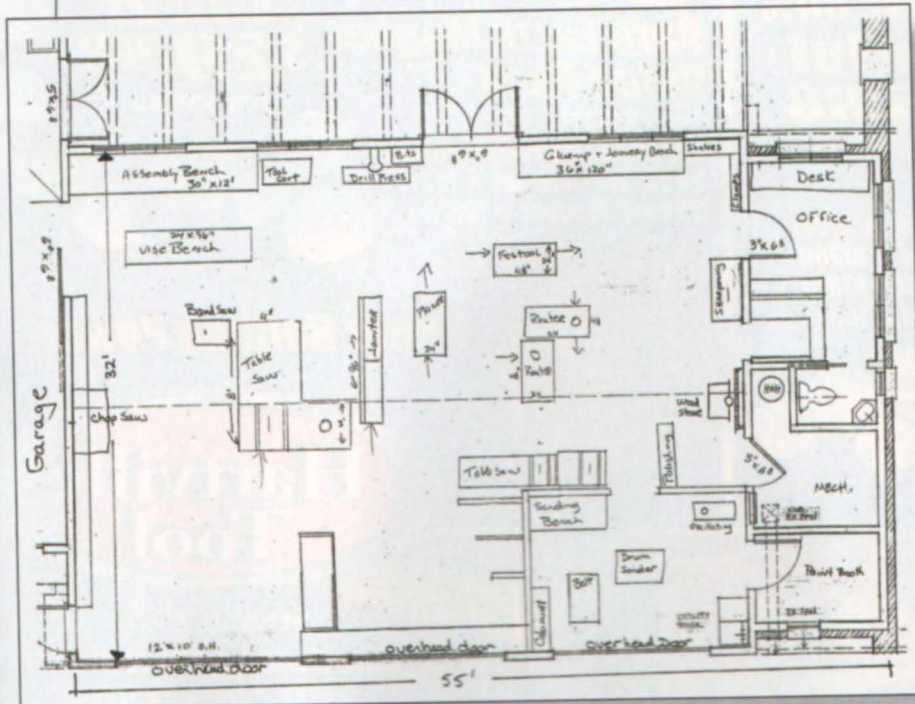
draft table.

Three large overhead doors provide virtually unlimited access and a side door opens to a nice porch, the perfect spot to rest after a hard day's work.

I build furniture for use in our house and small items to give as gifts. I still consider myself a novice

woodworker, but my skills are continually improving as I acquire new tools and learn new techniques. As a result, my projects usually end up better than originally planned. 

*Kristo Zorkin
Medina, WA*



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Send us photos of your shop, a layout drawing and a description of what makes your shop interesting. Tell us what you make in it and what makes your shop important to you. If "My Shop" features your shop, you'll receive \$100.

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Patio Bar

Fold-out design and woven bamboo plywood are sure to turn heads !

by Brad Holden

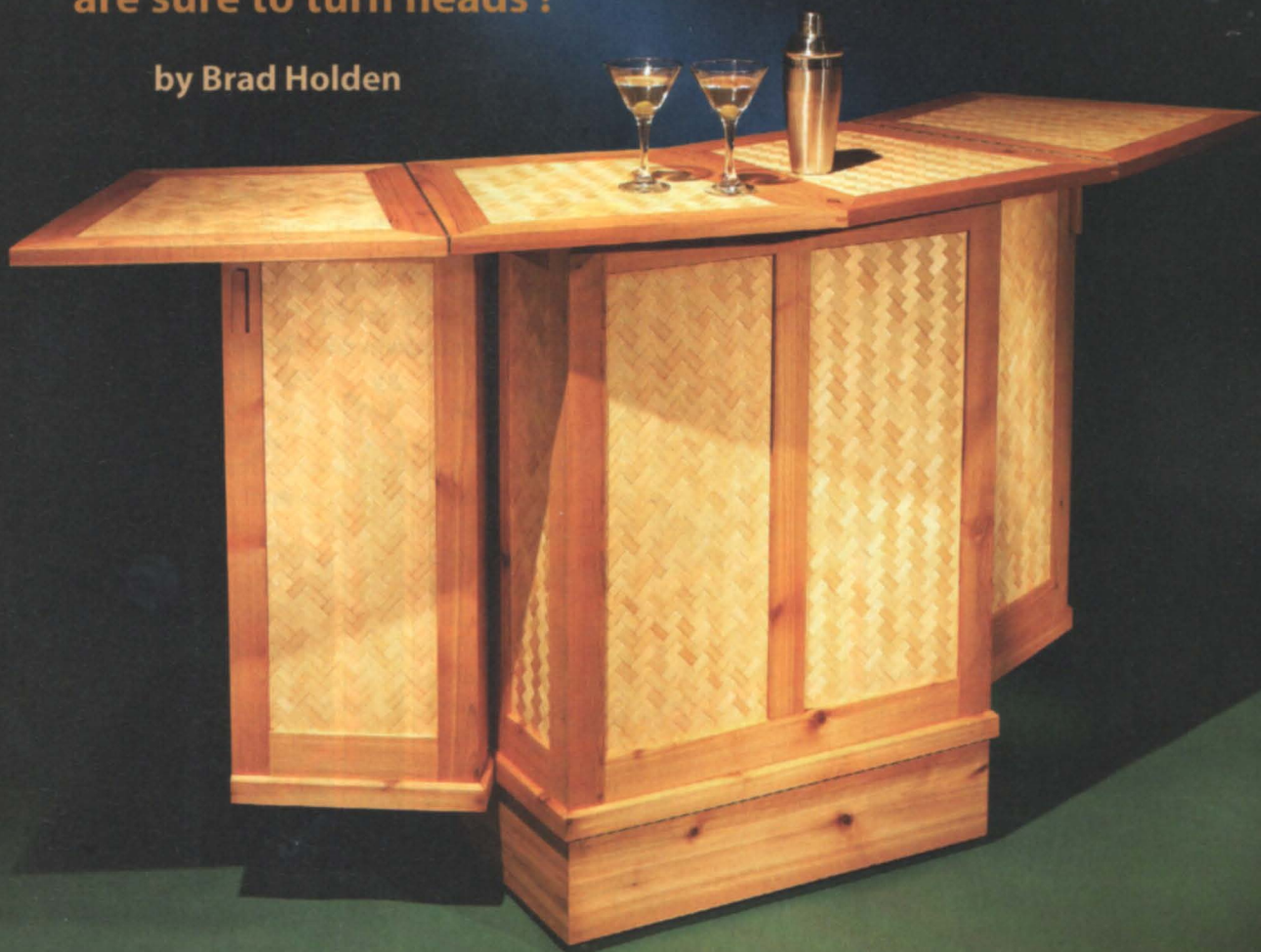
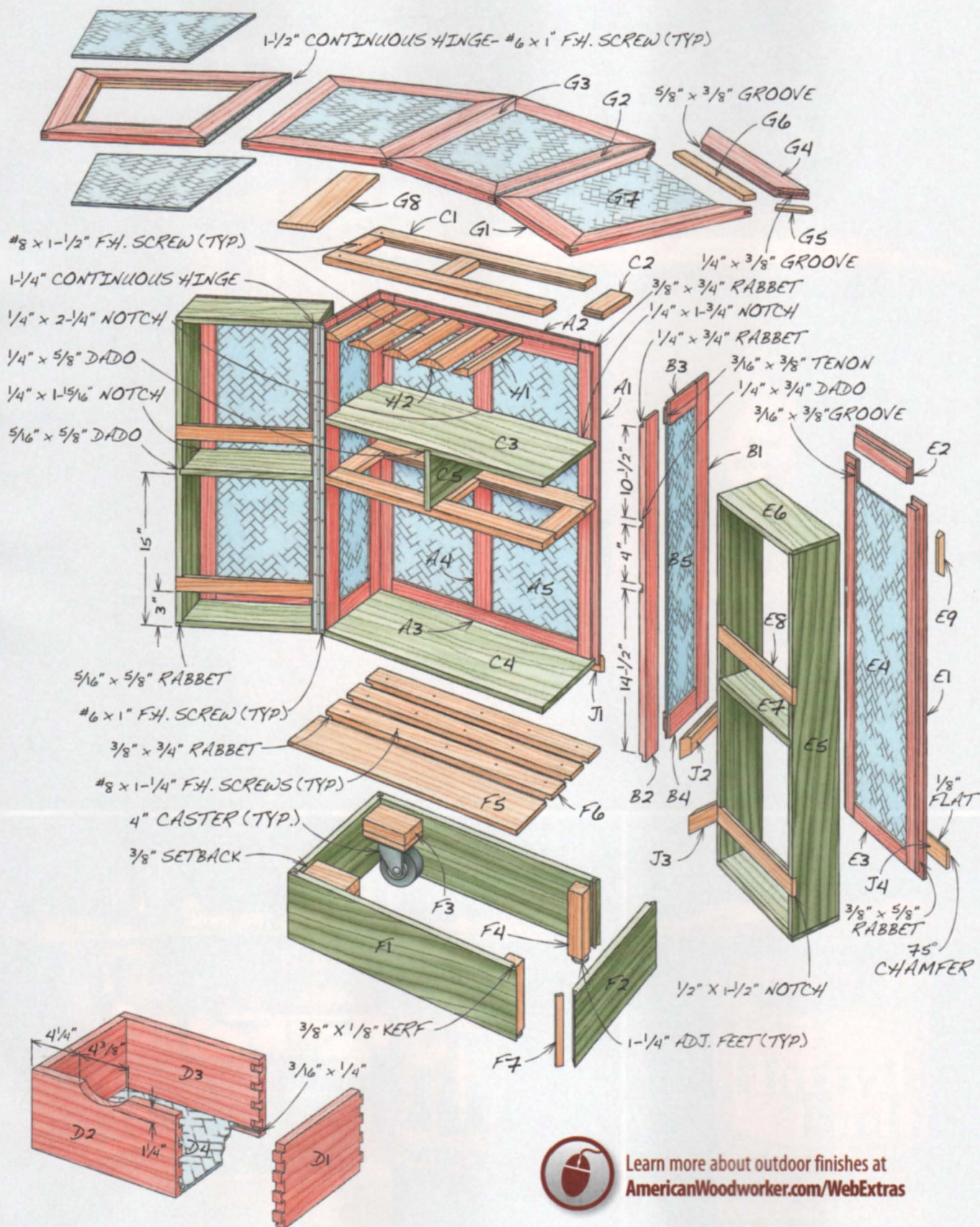


Fig. A Exploded View



Learn more about outdoor finishes at
AmericanWoodworker.com/WebExtras

YOU'LL BE THE TALK OF THE NEIGHBORHOOD when you show off your bartending skills behind your stylish patio bar. It's got plenty of room for bottles, glasses and bartending supplies. Large casters and fold-up wings make it easy to stash in a corner when you're not entertaining.

This bar is made of cedar and woven bamboo plywood. The 3/16" thick plywood consists of five plies of woven bamboo strips (see Sources, page 41). Cedar is easy to work with as long as the boards are suitably dry and flat.

Check the moisture content of the cedar—if the boards were stored outside at the lumberyard and exposed to the weather, they can be excessively wet, even for outdoor furniture (**Photo 1**). You'll need exterior yellow glue, ten 8' 1x6 boards, three 8' 1x8 boards, one 8' 2x4, and two sheets of bamboo plywood to build the cabinet and top panels, and two 8' 5/4 deck boards to make the mitered frames that comprise the bar's top.

Build the cabinet

Rip 1x6 boards in half to create blanks for the cabinet frame and web frame stiles and rails (A1–A4, B1–B4 and C1–C2, Fig. A, page 35, and Cutting List, page 41). Cut each blank to length and joint one edge. Rip the blanks 1/16" oversize in width and then joint or plane them to final width. Mill centered grooves in all the stiles and rails for the 3/16" thick bamboo panels (A5 and B5). Groove the web frame stiles even though they won't receive panels. Cut tenons to fit the grooves on both ends of all the rails and on both ends of the front center stile.

Cut bamboo plywood panels to fit the three cabinet frames. Carefully ease all the edges with a sanding block before installing them; this step is very important, because the bamboo edges splinter easily. It also helps to slide the stiles and rails onto the panels from the end, rather than pressing the panels into the grooves. Dry fit each frame before gluing (**Photo 2**).

Rabbet all four edges of the cabinet's front frame and the top and bottom edges of the two side frames. Cut dados in the side frames for the middle shelf (C3) and center web frame.

Glue up the web frames, middle shelf and bottom shelf (C4). Cut notches in the middle shelf and center web frame to fit around the cabinet's front frame stiles. Cut dados in the middle shelf and the center web frame for the drawer divider (C5). Cut the glass racks (H1–H2) using the tablesaw or bandsaw, with the blade tilted 15°. Then screw the glass racks to the top web frame.

Dry fit all the parts to make sure everything fits properly. Then glue and clamp the cabinet sides to the front. Install the web frames and shelves without glue to keep the assembly square. When the glue has dried, glue and clamp the web frames, middle shelf, drawer divider and bottom shelf (**Photo 3**).



1 Check the moisture content of your lumber. Anything below 12% is fine. Although this patio bar will reside outdoors, it also contains moving parts and precise joinery, like any fine furniture piece.



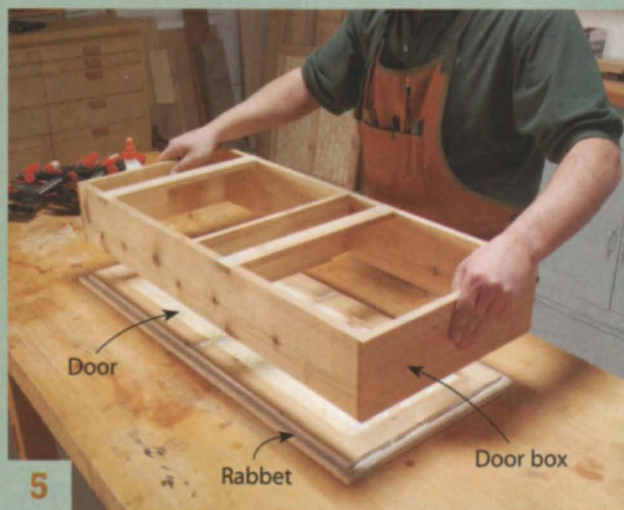
2 Make and assemble the frames for the cabinet's front and sides. These are standard stile-and-rail construction, but the panels are made from woven bamboo plywood.



3 Glue the cabinet together in stages. Add the glass racks, web frames, middle shelf, drawer divider and bottom shelf after gluing the sides to the front.



4 Attach the base to the cabinet using construction adhesive and exterior screws. Casters and adjustable feet hidden in the base add mobility and aid stability.



5 Glue the assembled door boxes to the doors. The boxes fit rabbets in the door edges.



6 Install the doors. Clamp each one to the cabinet, flush at the top, with blocks protruding beyond the inside edges. Press the open hinges against the blocks as you install the screws.

Build and attach the base

Use flat 1x8 boards or glued-up blanks to make the base. Using the tablesaw, miter the ends of the front and back (F1) and ends (F2) at 45°. Leave the blade at 45° and cut a 3/8" deep kerf into each miter. Set the fence and use the miter gauge to make these cuts. Rip splines (F7) to fit in the kerfs, then glue and clamp the base together.

Cut rabbets on the base top (F5) and nailing strips (F6) and glue them in place.

Glue caster blocks (F3) inside the base to position the casters so they'll protrude about 3/4" below the bottom edge. Install the casters. Then install adjustable feet (F4) in the other two corners.

Flip the cabinet upside down to install the base (Photo 4). Apply construction adhesive to the nailing strips and position the base on the cabinet, flush with the front and sides. Fasten the base using 1-1/4" exterior screws.

Build the drawers and doors

Cut hand grips in the drawer fronts (D2). Use whatever joinery method you're comfortable with to assemble the drawers. Half-blind dovetails provide ample gluing surface and mechanical strength, but half-lap joints reinforced with screws or nails will also work. Use bamboo plywood offcuts for the drawer bottoms (D4). (Note: Dimensions in the cutting list are for half-blind dovetails.)

Follow the methods used for the cabinet frames to cut, assemble and glue together the doors (E1-E4). Cut rabbets around the back of each door. Next, cut the door box sides (E5) and tops and bottoms (E6) to fit the rabbeted doors. Dado the door box sides to accept the shelf (E7) and cut notches for the retainers (E8). Assemble the parts without glue and test the fit before gluing the door boxes together. Finish the job by gluing the door boxes to the doors (Photo 5).

Clamp the doors to the cabinet to mount the hinges (Photo 6). Cut the hinges to length (1/2" shorter than the doors) and file down the sharp edges. Stainless steel hinges are best for an outdoor project (see Sources). Blocks clamped to the doors' inside edges automatically center the hinges from side to side, so when the doors close they'll be flush with the sides of the cabinet.

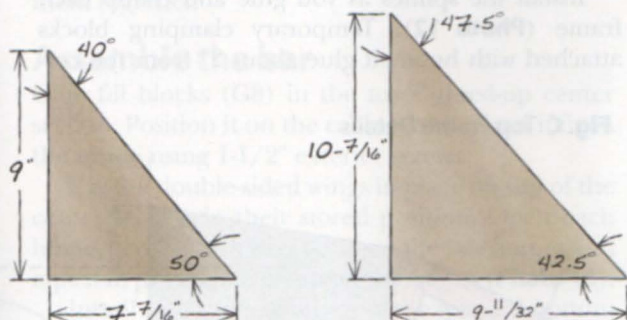
Make set-up triangles

The bar's top consists of four identical frames that have a different angle at each corner (Fig. C, page 39). This presents some challenges, but I had a long talk with Euclid, so there's no need to worry—the head-scratching is already done. All you have to do is measure and cut—accurately.

Make two right triangles to set up the saw to make the miter cuts, one with 40° and 50° angles, and the other with 42.5° and 47.5° angles (Photo 7 and Fig. B). These large triangles will help you set the miter

angles more precisely than using the marks on a standard miter gauge—if your saw is equipped with a precision miter gauge, these triangles may not be necessary. When you cut the miters, it's a good idea

Fig. B Set-up Triangles



to use sled created by attaching two miter gauges to a stout fence. This sled increases accuracy by eliminating play between the miter gauges and the saw's miter slots. It also provides excellent control and stability.

Start with two 12" x 12" blanks of 3/4" plywood; make sure one corner is perfectly square. For the 40°/50° triangle, mark 9" from the square corner on one leg and 7-7/16" from the corner on the other leg. Connect the marks to form the triangle's hypotenuse. Measure 10-7/16" and 9-11/32" from the square corner to create the 42.5°/47.5° triangle.

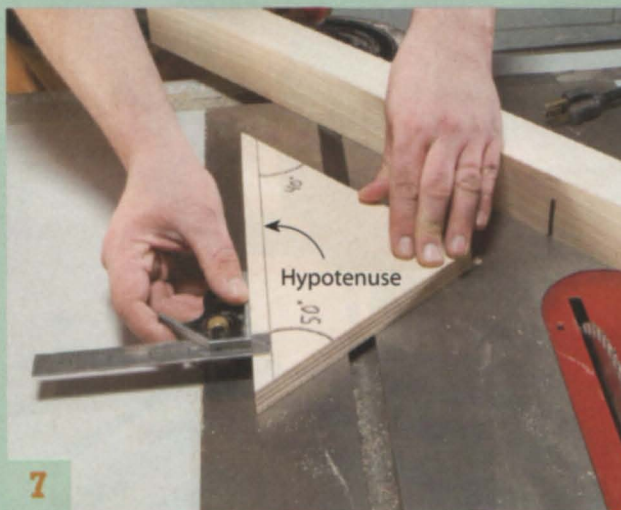
Cut the two blanks into triangles. With each blank, use a sliding bevel to set the miter gauge to match the angle of the hypotenuse. Then cut the blank 1" beyond the hypotenuse. Adjust your miter sled, if necessary, and recut until the cut edge of the triangle is exactly parallel to the hypotenuse. Clearly mark the angles on both triangles, so it's easy to tell them apart.

Make the top frames

Start by making a test frame (G1–G4). Set your miter gauge to 50° using the 40°/50°/90° set-up triangle (**Photo 8**). Then cut the two 50° miters using test stock milled to the same width as your actual stock (**Photo 9**). Use the same triangle to reset your miter gauge to 40°. Then cut both 40° corners. Use the 42.5°/47.5°/90° triangle to miter the two remaining corners.

Assemble the test frame. If all the joints fit perfectly, you're set. With miters, of course, there's a chance that one of the joints will be slightly off. Don't worry—woodworking is nothing if not humbling.

Assess the situation. You can: 1) adjust your set-up triangles and try again to achieve perfect cuts; or 2) move on, cut the real frame parts and plan to true the fit of the final joint on each frame with your block plane (**Photo 10**). If you go with the second



7

Make two triangles to set up your miter gauge for cutting the top frames. Cut each one oversize. Then measure to make sure the cut is parallel to the hypotenuse. Adjust the miter gauge, if necessary.



8

Use the set-up triangles to set the fence to cut the mitered top frames. These triangles provide better accuracy than a standard miter gauge. You need two because each frame has four different angles.



9

Cut the miters. Use the saw kerf in the fence to accurately position each piece before cutting.



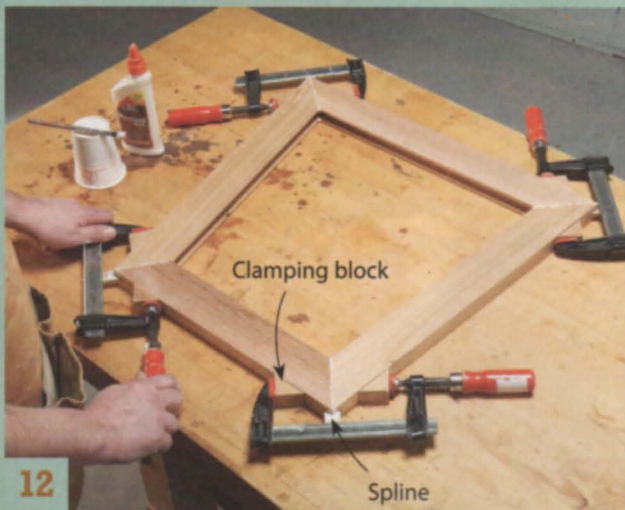
10

True the fit of each frame. Cutting these multiple-angle miters to fit precisely is a tall order, so you'll probably have to adjust one joint. Adjust the same joint on each frame so they remain identical.



11

Cut grooves in the miters for splines using a shop-made tenoning jig. Fasten a set-up triangle to the jig to hold the workpiece at the correct angle.



12

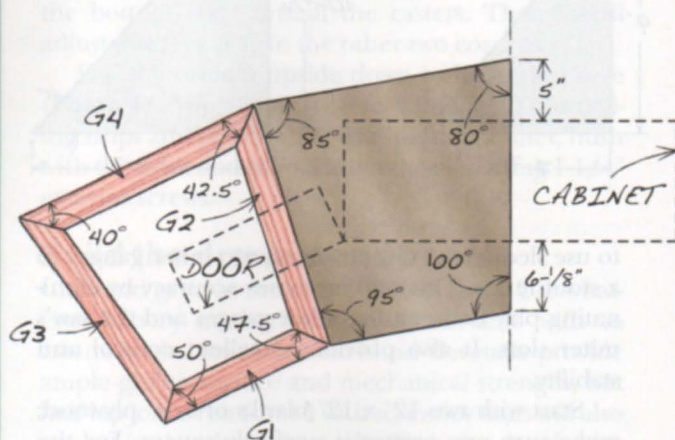
Glue and clamp the frames. Attach clamping blocks with hot-melt glue to apply even pressure across each miter joint.

option, true the same joint on each frame, so all the frames will be exactly the same.

Cut centered grooves for the panel supports (G6) on the inner edges of all the frame parts. Cut grooves in all the miters for splines (G5 and **Photo 11**). Rip a length of spline to fit the grooves and cut it into individual pieces.

Install the splines as you glue and clamp each frame (**Photo 12**). Temporary clamping blocks attached with hot-melt glue about 2" from the cor-

Fig. C Top Frame Details



ners are worth their weight in gold—by directing the clamping pressure across the center of each joint, they keep the pieces from slipping out of position.

When the glue is dry, remove the clamps, saw off the clamping blocks and trim the protruding spline. Smooth the edges with a hand plane or sanding block. Note: Don't knock the clamping blocks off with a hammer; you'll tear out big chunks of cedar.

Cut bamboo panels (G7) to fit the top frames. Note: The two fold-out wings are paneled on both sides. Making a routing template is one option, as your frames should be nearly identical, but it's better to mark and rout each panel separately. Lay each frame on the bamboo plywood, make sure the woven pattern is oriented correctly and trace around the frame's inner edge (**Photo 13**). Use a sharp pencil, so there's no gap between the line and the frame; then the outside edges of the pencil lines indicate the exact size of the panel.

Rout each panel using a piece of MDF with a straight edge, a sacrificial support board and a flush-trim pattern bit (**Photo 14**). Each panel requires four routing passes to complete. Clamp the plywood between the MDF and the sacrificial board. Carefully position the MDF's straight edge so it's perfectly flush with the outside edge of the line; the sacrificial board keeps the bottom of the plywood from splintering. After routing, use a sanding block to gently round the top edges of the plywood.

Glue the panel supports (G6) in the grooves

inside each frame. Swab glue on the supports and the frame's shallow inside shoulders. Install the panels and hold them in position with cauls and clamps until the glue dries (**Photo 15**).

Create the top's center section by cutting biscuit joints in the 50/40 edges of the two inside frames (the ones with a single bamboo panel) and gluing them together.

Assemble the bar

Glue fill blocks (G8) in the top's glued-up center section. Position it on the cabinet and fasten it from the inside using 1-1/2" exterior screws.

Lay the double-sided wings in place on top of the center section in their stored position. Open each hinge, center the barrel between the two frames and tape it in position, then install the screws (**Photo 16**).

Install rare earth magnets at the top and bottom of each door; they're strong, and there are no moving parts to corrode. Make door pulls (E9) following the same method used to make the cabinet's glass racks, only with a 70° angle on the sides and ends. To do this safely, start with a blank at least 12" long. Tilt your tablesaw's blade to 20° and bevel both of the blank's edges. Leave the blade at 20° and use your miter gauge with an attached fence and stop block to cut the pulls to length.

Attach trim strips (J1-J4) to the cabinet's sides and front and to the doors. Miter the ends of the strips at 10° where the doors meet the cabinet so they don't prevent the door from opening.

Protect your investment

Apply an exterior finish (**Photo 17**). Oil finishes are easy to apply—just brush on and wipe off—but you should plan to recoat every year or so. Brushed-on spar varnish can last several years, but it's considerably more difficult to apply and recoat.

A canvas cover will protect your bar and extend the life of any finish. This piece may live outdoors, but it's handmade furniture—your handmade furniture—and worth treating as such. Companies that make awnings can whip up a cover for you, but if you're handy with a sewing machine, you can easily make one yourself. 



Brad Holden

is a Minneapolis-based woodworker with a deep interest in making, restoring and using traditional tools. He says, "There's nothing like creating fine work with tools that you have brought back to life."



13

Trace the inside edge of each frame onto the bamboo plywood. Make sure to align the weave so it's oriented the same way on each panel.



14

Cut out each bamboo panel with a router, using a piece of MDF with a straight edge and a flush-trim pattern bit. Clamp a sacrificial board underneath to minimize tearout on the bottom of the panel.



15

Glue each panel to supports mounted in grooves cut in the frame. The supports position the panel so it's flush with the top of the frame.



Mount the fold-out wings. Place the wings on the top in their stored position. Tape the hinges in place and then install the screws.



Apply a finish to protect the bar from water and damaging ultra-violet light.

SOURCES

Bamboobarry, bamboobarry.com, 305-758-9444, 5 Ply Woven Sheet - Bamboo - Natural - 4' x 8', #WS-WSBBNT-5P0408-01, \$68.

Stainless Hinges, stainless-hinges.com, 877-266-3532, 72" x 1-1/2" Stainless Steel Continuous Piano Hinge-Countersunk Holes, #10065, \$19; 72" x 1-1/4" Stainless Steel Continuous Piano Hinge-Countersunk Holes, #10064, \$18.

Notes:

- a) Closed dimensions are 41-3/4" x 43-1/4" x 26".
- b) Cut hand grip in front.
- c) Trim the doors' width to 13-15/16" before rabbeting the edges.
- d) Trim the doors' height to 31-7/8" before attaching the door boxes.
- e) Total with adjustable feet should equal 7-1/4".
- f) Length of long mitered edge.
- g) Cut to fit.
- h) Rout to fit.
- j) Trim to fit.

Cutting List

Overall Dimensions 40-3/4" H x 83" L x 30" D (a)

	Part	Part Name	Qty.	Th x W x L
Front				3/4" x 28" x 32"H
	A1	Stile	2	3/4" x 2-1/4" x 32"
	A2	Top rail	1	3/4" x 2-1/4" x 24-1/4"
	A3	Bottom rail	1	3/4" x 3-1/4" x 24-1/4"
	A4	Center stile	1	3/4" x 2-1/4" x 27-1/4"
Sides	A5	Panel	2	3/16" x 11-5/16" x 27-3/16"
				3/4" x 9-5/8" x 32"H
	B1	Front stile	2	3/4" x 1-7/8" x 32"
	B2	Back stile	2	3/4" x 2-1/4" x 32"
	B3	Top rail	2	3/4" x 2-1/4" x 6-1/4"
Web frames and shelves	B4	Bottom rail	2	3/4" x 3-1/4" x 6-1/4"
	B5	Panel	2	3/16" x 6-3/16" x 27-3/16"
				3/4" x 9-1/2" x 27"
Drawers	C1	Web frame stile	4	3/4" x 2-1/4" x 27"
	C2	Web frame rail	6	3/4" x 2-1/4" x 5-3/4"
	C3	Middle shelf	1	5/8" x 9-1/2" x 27"
	C4	Bottom shelf	1	3/4" x 9-1/2" x 27"
	C5	Drawer divider	1	5/8" x 4-9/16" x 9-1/4"
Doors				3-7/8" x 9-1/4" x 12-7/8"
	D1	Drawer side	4	3/4" x 3-7/8" x 8-3/4"
	D2	Drawer front	2	3/4" x 3-7/8" x 12-7/8" (b)
	D3	Drawer back	2	3/4" x 3-7/8" x 12-7/8"
Base	D4	Drawer bottom	2	3/16" x 11-13/16" x 8-3/16"
				5" x 13-15/16" x 31-7/8"
	E1	Door stile	4	3/4" x 2-1/4" x 32" (c, d)
	E2	Top rail	2	3/4" x 2-1/4" x 10-1/4"
	E3	Bottom rail	2	3/4" x 3-1/4" x 10-1/4"
	E4	Door panel	2	3/16" x 10-3/16" x 27-3/16"
	E5	Door box side	4	5/8" x 4-1/2" x 31-1/4"
	E6	Door box top/bottom	4	5/8" x 4-1/2" x 13-15/16"
	E7	Door shelf	2	5/8" x 4-1/2" x 13-5/16"
Top frame	E8	Retainer	4	1/2" x 1-1/2" x 13-15/16"
	E9	Pull	2	3/4" x 3/4" x 3-1/2"
				6-5/8" x 15" x 28"
	F1	Base front/back	2	3/4" x 6-5/8" x 28"
	F2	Base end	2	3/4" x 6-5/8" x 15"
	F3	Caster block	2	2-1/8" x 3-1/2" x 7"
	F4	Foot	2	1-1/2" x 1-1/2" x 6-1/2" (e)
Glass rack	F5	Base top	1	3/4" x 5" x 28"
	F6	Nailing strip	3	3/4" x 2-1/4" x 28"
	F7	Spline	4	1/8" x 5/8" x 6-5/8"
				1" x 21-1/8" x 20-15/16"
	G1	Back	4	1" x 2-1/2" x 15-5/8" (f)
	G2	Side (42.5°/47.5°)	4	1" x 2-1/2" x 21" (f)
	G3	Side (40°/50°)	4	1" x 2-1/2" x 21-1/4" (f)
	G4	Front	4	1" x 2-1/2" x 21-1/8" (f)
Trim	G5	Corner spline	16	1/4" x 3/4" x 4"
	G6	Panel support	16	5/8" x 1-1/2" x 14" (g)
	G7	Panel	6	3/16" x 17" x 17" (h)
	G8	Fill block	2	13/16" x 5-1/4" x 13"
Glass rack	H1	Rack end	2	1" x 2" x 9-1/4"
	H2	Rack center	3	1" x 3" x 9-1/4"
Trim	J1	Front	1	3/8" x 1-1/2" x 29" (j)
	J2	Side	2	3/8" x 1-1/2" x 11" (j)
	J3	Door side	2	3/8" x 1-1/2" x 6" (j)
	J4	Door front	2	3/8" x 1-1/2" x 15" (j)

Crisscross Picnic Table

It seats up to 8, but no one has to straddle a leg.

by Chad Stanton



To learn how to build the French doors
behind this table, go to
AmericanWoodworker.com/WebExtras

Fig. A Exploded View

Hardware List

- 1 Box 4" deck screws
- 1 Box 2" deck screws
- 8 5/16" x 3-1/2" lag screws and washers
- 16 1/4" x 3" carriage bolts, with nuts and washers
- 4 1/4" x 4" carriage bolts, with nuts and washers

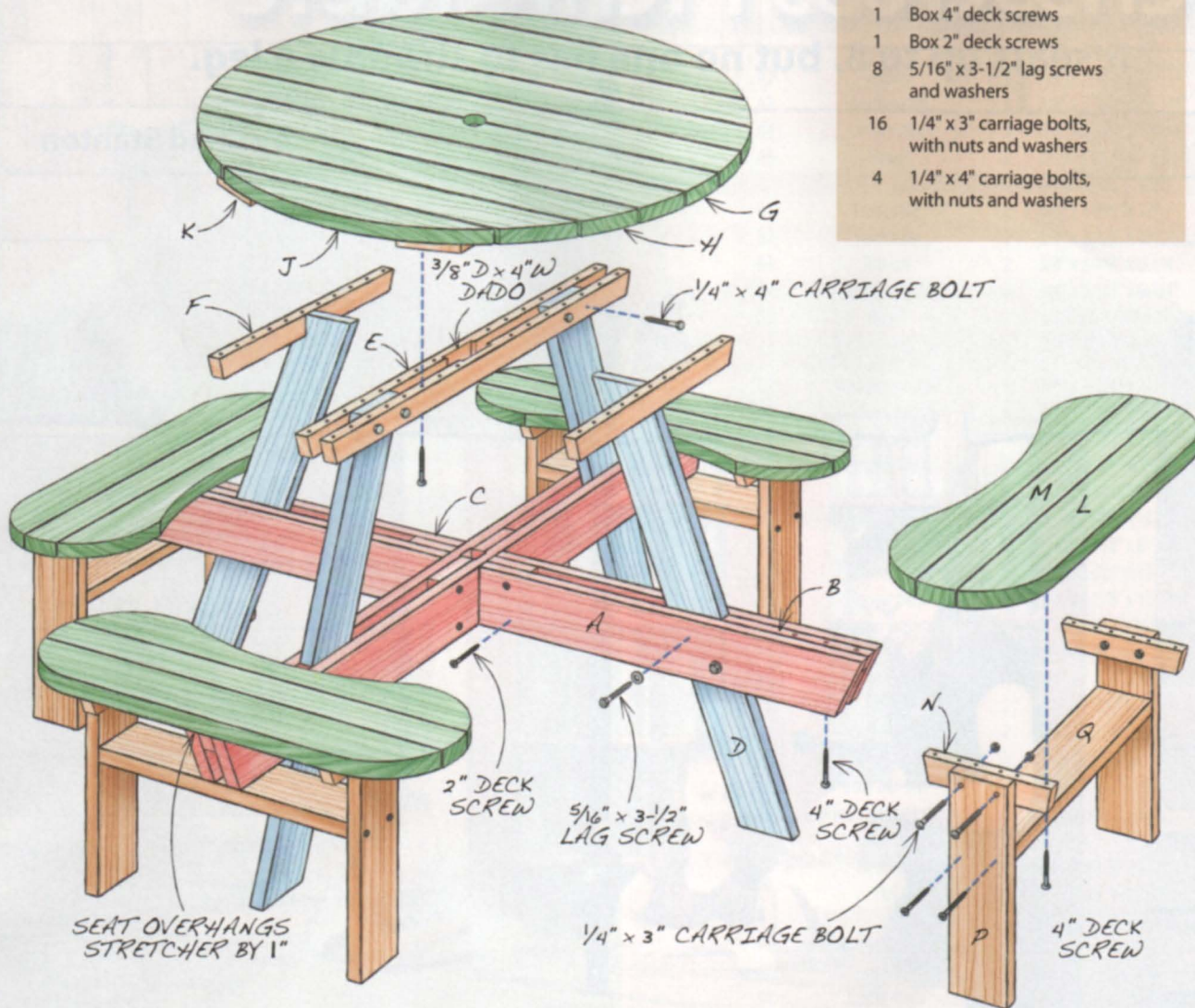


Fig. B Stretcher Details

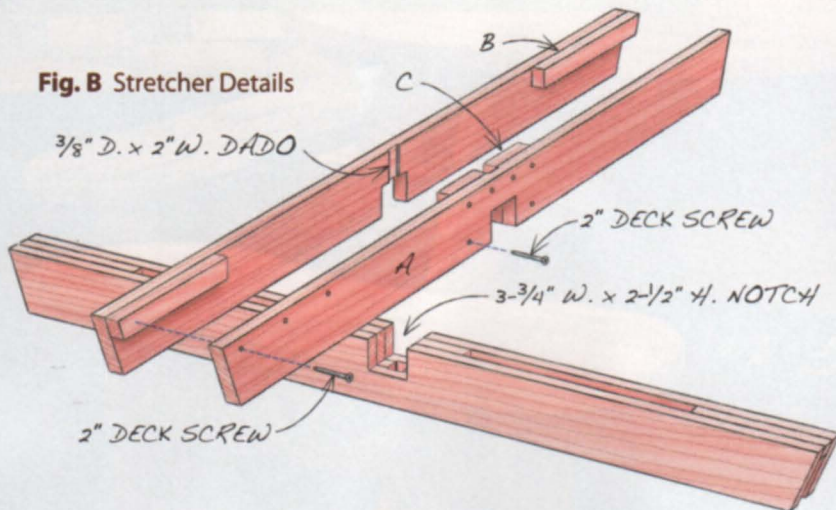
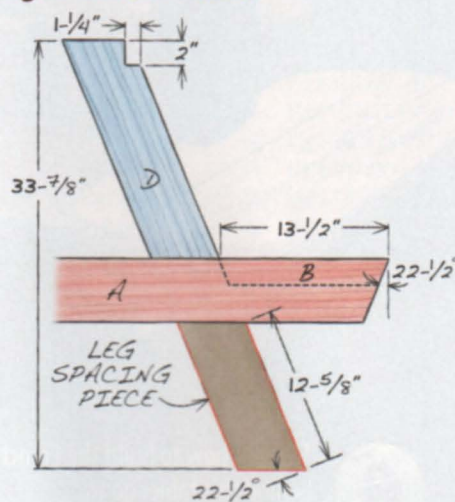


Fig. C Stretcher Details



EVERY SUMMER, my uncle Bob tends the grill at our family gatherings and is the last one to the picnic table. He always gets stuck with a middle seat. We'd cheer him on as he groaned and struggled to get into it—a lot of fun, but not a pretty sight.

Last fall, at our Labor Day feast, I resolved to build a new picnic table with seats that every person could slip right into. I call it the Crisscross, after the shape of its base. This one's for you, Bob.

The wood

I started designing the table for standard 2x6 lumber, but one day a buddy suggested that I use a new material: thermally modified wood. It's Southern yellow pine that's been heated to a very high temperature, making it rot-resistant (see "Thermally Modified Wood," page 49). The process also gives the wood a beautiful chocolate color, inside and out, which nicely complements our home's cedar shakes and the artificial stone below it (see Sources, p. 48). The boards are amazingly flat and stable. I had to try it!

My friend builds decks for a living. He had a bunch of thermally modified wood left over from a job—enough to build this table. I gladly offered to buy it and had a great time working with it, although I did have to alter my plans a bit. The wood I used is thinner and narrower than standard material. (It's 1-1/4" thick and 5" wide; standard boards are usually 1-3/8" thick and 5-1/4" wide.)

You'll need about 24 pieces of 8' long 2x6s to build this table. The cutting list will work fine if you're using standard lumber, but your top will be nine boards wide, rather than ten. Let's get going!

Build the cross stretchers

Begin by making the crisscross stretchers (A). Saw

Cutting List

Overall Dimensions: 6'7" Sq. x 31" H; Top is 49" dia.

Part	Name	Qty.	Th x W x L
A	Cross stretcher	4	1-1/4" x 5" x 76-3/4"
B	End spacer	4	1-1/4" x 2" x 13-1/2"
C	Middle spacer	4	1-1/4" x 5" x 4-1/2"
D	Leg	4	1-1/4" x 5" x 33-7/8"
E	Long brace	2	1-1/4" x 2" x 47-1/4"
F	Short brace	2	1-1/4" x 2" x 27"
G	Top board	6 (a)	1-1/4" x 5" x 49-1/2"
H	Top board	2	1-1/4" x 5" x 45"
J	Top board	2	1-1/4" x 5" x 36"
K	Top cleat	2	1-1/4" x 5" x 45-1/4"
L	Outer seat board	8	1-1/4" x 5" x 40"
M	Middle seat board	4	1-1/4" x 3-1/2" x 40"
N	Seat cleat	8	1-1/4" x 2" x 12"
P	Seat leg	8	1-1/4" x 5" x 16-3/4"
Q	Leg stretcher	4	1-1/4" x 5" x 24"

Notes:

a) If you are using 5-1/4" wide material, only 5 boards are needed.



1

Cut the four crisscross stretchers of the base to the same length. Miter their ends at 22-1/2°. All miter saws have a detent for this commonly used angle.



2

Glue and screw the stretchers together. Note the dados in the middle of each stretcher. These cutouts are needed to create a square hole large enough for an umbrella pole.



3

Cut half-lap notches in the center of each stretcher assembly. It's best to use a crosscut sled, as shown here, to prevent this large piece from wobbling.



4

Add two legs to each stretcher assembly. Use spacing pieces to make sure the legs are set at the correct angle and position. Use a long level to make sure the tops of the legs are even.



5

Fit the stretcher assemblies together. Use handscrews or blocks to hold one assembly upright while you drop the second assembly in place.



6

Add braces to the legs for attaching the top. The long braces have dadoes cut in them to accommodate the umbrella pole.

them to length, cutting angles on their ends (**Photo 1**). Cut dadoes in the middle of each piece using a router or a tablesaw (Fig. B).

Make the pieces that go between the stretchers: the end spacers (B) and middle spacers (C). Using an exterior yellow glue, glue and screw these pieces to two of the stretchers. Sand all the mating surfaces first, so the glue will adhere better. (Note that the middle spacers are aligned with the sides of the dadoes you just cut.) Glue and screw a second stretcher on top of the spacers (**Photo 2**). You should now have two identical stretcher assemblies.

These assemblies will nest together with large half-lap joints. Draw these joints in the center of each assembly. When you lay out the joints, be sure that one notch will be on the top of the assembly and the other notch on the bottom. The angled ends are your guide as to which side is top and which is bottom. Cut the notches on the tablesaw (**Photo 3**). You can use a standard blade or a dado blade. (If you use a dado blade, don't take off too much in one bite.)

Make the legs (D, Fig. C). Notch the top of each leg as shown. Round over the bottom ends of the legs with a router. To help assemble the legs, make a pair of spacing pieces that are the same width and length as the portion of the leg that extends below the cross stretchers. You can use offcuts from the legs or pieces of plywood to make these pieces. Clamp the spacers to the bottom of the legs and insert the legs through the stretcher assembly (**Photo 4**).

Fine-tune the position of the legs by lining up their ends with a long level or straightedge. Once the legs are aligned, clamp them in place. Run two lag screws through the stretchers and the legs (Fig. A).

Finish the base

Join the two stretcher assemblies together (**Photo 5**). For maximum strength, use glue and screws. If you intend to take the table apart for moving or storage (or just to get it out of the shop!), skip the glue and screws.

Make the long braces (E) and short braces (F). Cut dadoes in the center of the long braces (Fig. A). These dadoes are oversized so you don't have to be extremely fussy when positioning the braces. Glue and screw all four braces to the legs (**Photo 6**).

Add the top

Cut the top boards (G, H and J) to length. Assemble them in a symmetrical pattern (Fig. D), using 8d nails or 1/8" spacers between the pieces.

Note: If you're using standard-width lumber to build this table, make the top from nine pieces, not ten pieces as shown.

Clamp the top pieces together (**Photo 7**). Make the top cleats (K) and glue and screw them to the top boards. Remove the clamps and place the base on the top. Fasten the base to the top (**Photo 8**). Get some help and turn the table over onto the floor.

You can use a jigsaw to cut the top into a circle,

but a plunge router equipped with a long 1/2" dia. straight bit will create a smoother surface (see Sources). To guide the router, make a plywood trammel (Fig. E). Mark the center of the top and nail the loose square piece to the table. Remove the subbase from your router and fasten the router to the trammel. Place the trammel on the square piece nailed to the table.

Set the router to make a plunge cut all the way through the top. To prevent the edges of the boards from splintering as you rout around the circle, make a series of plunge cuts on both sides of each board (Photo 9). Then reset the router to cut one-third of the way through the top and rout a full circle. Reset the router to make deeper cuts and keep routing until you've cut all the way through. Use a 1/8" dia. roundover bit to ease the top's edge.

Fig. D Top Layout

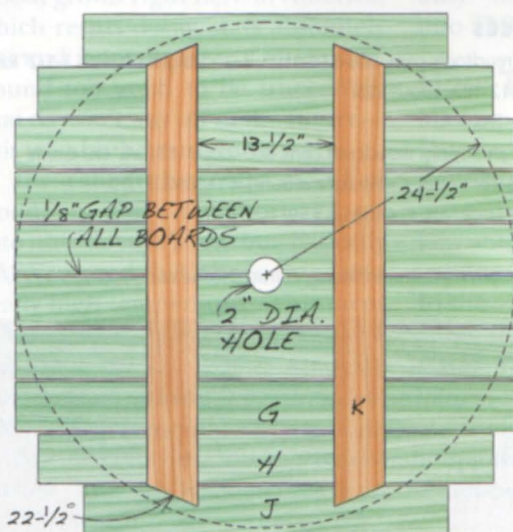
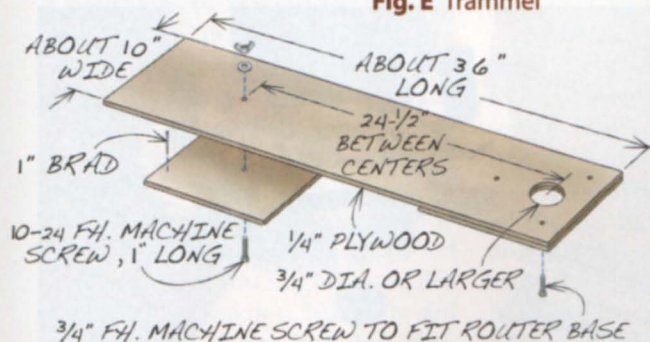


Fig. E Trammel



Add the seats

Make the seat boards (L and M) and seat cleats (N). Glue and screw the cleats to the boards (Fig. F). Make sure the cleats are parallel to each other—a plywood spacer would help here.

Make a 1/4" plywood template for shaping the seats. Nail the template to a seat assembly (Photo 10). Use a plunge router equipped with a 5/8" o.d. guide



Assemble the top. Place 8d nails between the boards to create equal gaps. Clamp the boards to keep them from shifting, then fasten cleats across the boards.

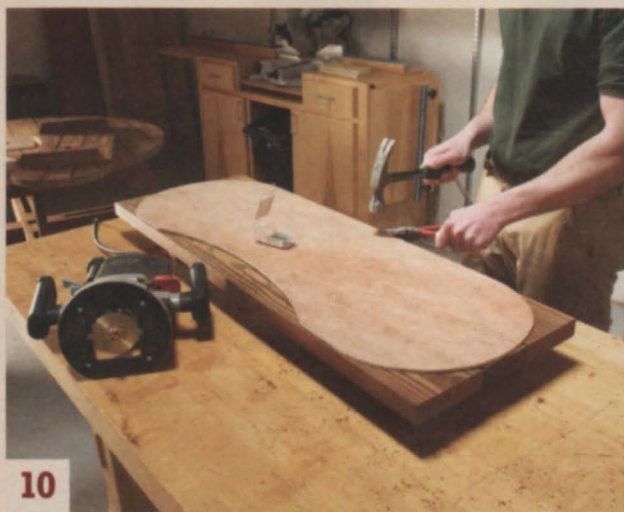


Fasten the base to the top. It's easiest to do this on a bench, with the base upside down. Before you begin, though, make sure you can get the table out through your shop's door—it's big!



Rout the top into a circle, using a plunge router mounted on a plywood trammel. First, plunge holes on both sides of each board to prevent splintering (see inset). Then rout the full circle.





10

Make the seats. Fasten three seat boards together with cleats, like the top. Then nail a plywood template to the top of each seat and rout around the template, using a guide bushing in your router.



11

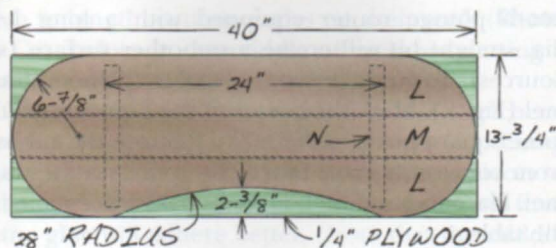
Fasten the seats to the base. This operation is much easier if the table is upside down, but you'll definitely need help turning it over!



12

Add the legs and a stretcher. Now the seats will support plenty of weight—and even a few rambunctious kids jumping on them.

Fig. F Seat Pattern



bushing and a 1/2" straight bit to rout around the template. Round over the seats' edges.

Fasten the seats to the base (**Photo 11**). Make the seat legs (P) and fasten them to the cleats. Make the leg stretchers (Q) and fasten them between the legs (**Photo 12**).

Drill or rout a hole in the tabletop for the umbrella pole (**Photo 13**). If you use a router, make a template with a 2-1/8" dia. hole and nail it to the top. Use the same guide bushing and bit as you used for the seat.

SOURCES

Freud, freudtools.com, 800-334-4107, 1/2" straight bit with 1-1/2" long flutes, #12-122, about \$25.

Woodcraft Supply, woodcraft.com, 800-225-1153, 5/8" OD Guide Bushing (for Porter-Cable style mount), #144692, \$7.19; Bushing Lock Nut, #144696, \$3.59.

Owens Corning Cultured Stone, culturedstone.com, 800-255-1727.

Chad Stanton

is a self-employed carpenter and furnituremaker. He hosts the web show *Wood Choppin' Time!* woodchoppintime.com, a mix of serious woodworking and light comedy.



13

Rout a hole in the center of the table for an umbrella pole. Make a template with a hole in it to guide your router. Add the umbrella and pour the lemonade!

Thermally Modified Wood



A remarkable drying process gives wood a new character.

by Chad Stanton

SOME DAY, YOU'LL BE able to build an outdoor project with a new kind of wood, grown right here in America, which resists decay, stays absolutely flat and is totally free of chemicals. Sound too good to be true? Well, that day isn't way off in the future—this wood is here, right now.

It's called thermally modified wood, or TMW for short. I'll go into the details later, but basically TMW is wood that's been dried at a really high temperature. This turns it brown all the way through—like a chocolate cookie. But it's a cookie that mold and fungus can't digest. TMW won't rot.

Any species of wood can be turned into TMW—hardwood or softwood.

Origins of TMW

Credit goes to Finland for figuring out how to make TMW. Actually, TMW's rot resistance was an accidental discovery. Back in the early '90s, Finnish scientists were experimenting with a drying process that would make wood more dimensionally stable—that is, free from cupping, bowing and twisting. Good luck with that, you might think. But they hit the jackpot. Not only did they achieve their goal, but they found that the process made the wood rot-resistant, too.

Of course, baking the wood in a super-hot kiln changes it in other ways, too, not all of which are desirable. More on that below.

For a few years, TMW was an exclusively Scandinavian product.

Today, a few American companies have licensed the process and are busy converting domestic woods into TMW.

How TMW is made

Making TMW is a complicated, four-step process. To start off, the untreated lumber is dimensioned at the sawmill. Then it's brought to the kiln and the first step begins: slowly heating the wood to 212 degrees. In the second step, the wood is preconditioned by drying it to nearly 0% MC (moisture content).

This wood resists decay, but it's totally free of chemicals

Now it's ready for the crucial third step, where the temperature of the wood is raised to 374-482 degrees for several hours. At this high temperature the natural sugars in the wood are converted into substances that all the agents of rot—insects, mold and fungus—cannot eat. In the final step, the wood is cooled and some moisture is restored, bringing it up to around 6% to 7% MC.

Properties of TMW

I first heard about TMW from a friend who's in the deck-building business. He buys thermally modified Southern yellow pine from PureWood, a company based in North Carolina (for more informa-

tion, visit purewoodproducts.com). Their 2x6 lumber costs about \$2.50 per lineal foot. I used some of that wood to build a large picnic table (see "Crisscross Picnic Table", page 43). Here's what I've learned.

- **Color and smell.** The TMW process darkens the wood all the way through to a cocoa-brown color. If left unfinished outdoors and exposed to sunlight, it will turn gray. TMW has a pleasant smell when you cut it—like toasted marshmallows.

- **Stability.** TMW planks are exceptionally straight and flat. I resawed some wood into thinner pieces and they didn't warp one bit. That's a rare experience with any wood—and a welcome one.

- **Strength.** The drying process seems to make the wood more brittle. It splits and splinters more easily than wood of the same species that's been kiln-dried. TMW is not recommended for use as joists and posts.

- **Dust.** Sawing and routing TMW creates very fine dust, like working MDF. It's a good idea to wear a mask.

- **Planing and jointing.** No problem. Freshly machined surfaces take glue well, too. Old surfaces should be sanded or milled before gluing.

- **Dimensions.** The TMW I used was slightly thinner and narrower than standard dimensional lumber. Check before you buy.

The bottom line

Like any wood, TMW has its pros and cons. But it's amazing stuff, and I hope it catches on. 

Planter Bench

by Tom Caspar



SMELL THE FLOWERS. Touch the leaves. It's easy to enjoy plants when they're placed at a convenient height—and easier still when you can sit right next to them. Sitting on a planter bench brings nature close to hand.

While you can make this project

with red cedar boards just as they come from the lumberyard, your planter bench will last longer and look better if you mill the wood first (see "Working with Red Cedar," below). The joints will definitely be stronger because mating surfaces will be flat.

To build this project, you'll need about 17 1x6 deck boards 12' long and about four 2x4s 8' long. You'll also need some No. 8 deck screws (one box of 1-1/4" screws and one box of 1-5/8" screws) plus a bottle of water resistant glue suitable for outdoor projects.

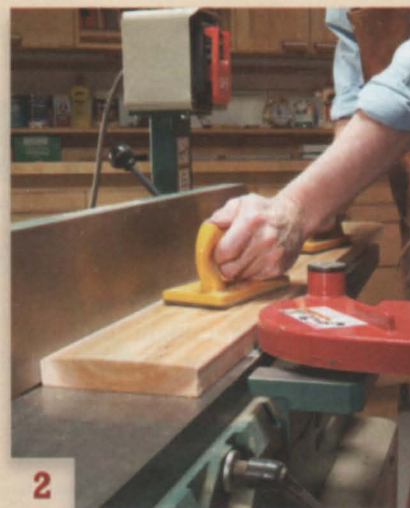
Working with Red Cedar

If you've ever built with red cedar, you probably know that most boards are cupped, bowed and twisted. That's not necessarily a problem for projects that are nailed or screwed together, such as fences and decks. But when it comes to making outdoor furniture with glued joints, warped boards won't do. You're better off treating those boards—smooth as they may be—as if they were rough lumber.

Before you start milling the wood, check its moisture content. It should be no more than 12%-14%. At that point, the wood has reached equilibrium with average outdoor humidity and has stopped cupping, bowing and twisting. (Although it will continue to move if it



1 Rip warped boards on the bandsaw. This is much safer than cutting them on the tablesaw—there's no danger of kickback. To prevent a cupped board from rocking, put the concave side down.



2 Flatten each board on the jointer, then run it through the planer. Building a piece of outdoor furniture is much easier when you're working with flat stock.

The planters and bench are separate parts—arrange them as you wish.



By cutting the lumberyard boards to rough size first (**Photos 1 and 2**), you should be able to mill the deck boards to 7/8" thick and the 2x4s to 1-1/4" thick. The exact thickness isn't really important, though.

Build the planters first. Start by

making the corners (A and B). Cut the individual pieces to exact size, then glue them together. Mill the long panels (C) and short panels (D). Leave the short panels 1/4" extra-long. Glue and screw the long panels to the corners (**Photo 3**). Drill the pilot holes with a combi-

nation bit, counterboring the holes deep enough so the screws will penetrate at least 1/2" into the panels.

Measure the total length of one of the side assemblies, then trim the short panels to a length that makes the planter exactly square. Complete the box structure by add-



3

Pre-drill holes for screws. Once red cedar is dry, it's very easy to split—particularly near the end of a board—if you don't pre-drill first.



4

Biscuit joints work well. These are the leg joints for the bench in this project. Once your pieces are flat and square, these joints can be made quite easily.

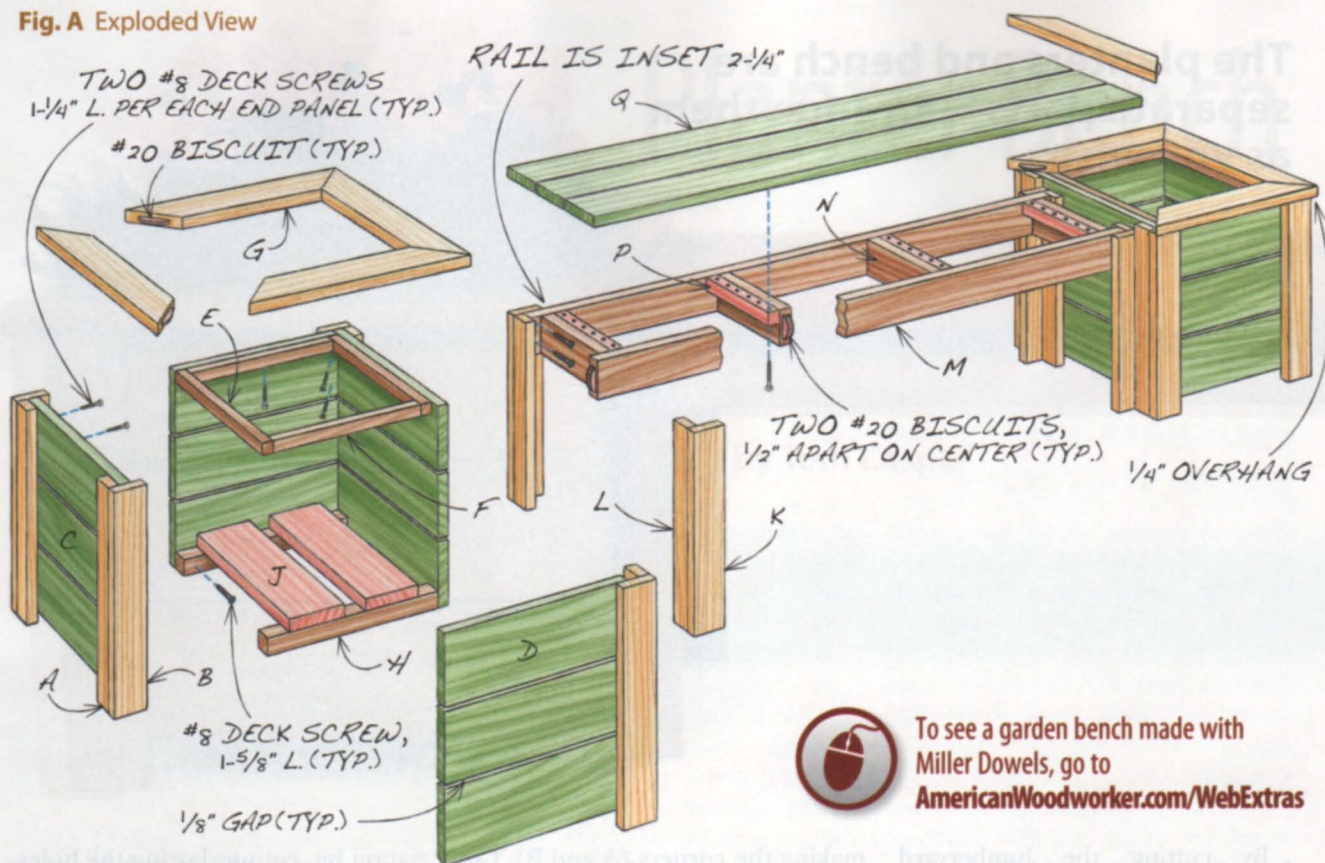
dries further.)

The first step in milling the wood is to cut your pieces to rough length. Group them in twos or threes—for example, to make two 12" pieces, cut a piece 25" long. Rip the pieces to rough width (**Photo 1**). Look at the growth rings at the end of a board and make the cut nearest the center of the tree. This creates pieces that have the best chance of staying flat.

Flatten the pieces on a jointer (**Photo 2**) and run them through the planer. Joint one edge and rip them to exact width. Finally, crosscut to length.

Reinforce glued face joints with screws (**Photo 3**). Screws won't hold well in end grain, though. Make these joints with biscuits (**Photo 4**).

Fig. A Exploded View



ing the short panels. Run the short-panel screws at an angle, like toenailing a board.

Make the ledger strips (E and F) and glue them to the panels. Mill the top pieces (G). Miter them 1/2" longer than the total length of the box's sides, to create a 1/4" overhang all around. Cut the biscuit joints and glue the pieces with a band clamp.

Sand the planter base and top with 120 grit paper to make the joints flush. Screw the top to the base. Glue and screw the floor supports (H) to the base and make the floor boards (J).

Build the bench by starting with the legs (K and L). Glue the pieces together. Mill the long and short rails (M and N). Cut double biscuit slots in the ends of the long rails and in the legs (Photo 4). Use a 1/2" thick board under the plate joiner to space the slots. Cut more double biscuit slots in the ends of the short rails and inside the long rails, again using the 1/2" spacer.

Glue the legs to the long rails.

Reinforce these joints with screws (Fig. A). Complete the base by gluing the short rails between the long rails. Add the ledger pieces (P) and counterbore holes in them for fastening the seat. Mill the seat boards (Q) and install them.

To see a garden bench made with Miller Dowels, go to AmericanWoodworker.com/WebExtras

Cutting List

Approx. Overall Dimensions: 18" H x 20" D x 8' L

Section	Part	Name	Qty.	Th x W x L
Planter	A	Narrow corner	8	7/8" x 2" x 17-1/4"
	B	Wide corner	8	7/8" x 3" x 17-1/4"
	C	Long panel	12	7/8" x 5-1/8" x 18"
	D	Short panel	12	7/8" x 5-1/8" x 16-1/4"
	E	Ledger	4	7/8" x 7/8" x 16-1/4"
	F	Ledger	4	7/8" x 7/8" x 14-3/8"
	G	Top	8	7/8" x 3" x 20-3/16"
	H	Floor support	4	1-1/4" x 1-1/4" x 16-1/4"
Bench	J	Floor board	4	7/8" x 5-1/8" x 16-3/16"
	K	Wide leg	4	7/8" x 3" x 16-1/4"
	L	Narrow leg	4	7/8" x 2" x 16-1/4"
	M	Long rail	2	1-1/4" x 3-1/4" x 56-1/4"
	N	Short rail	4	1-1/4" x 3-1/4" x 8-1/4"
	P	Ledger	4	1-1/4" x 1-1/4" x 8-1/4"
	Q	Seat	3	7/8" x 4-1/4" x 58"

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Lickety-Split Storage Boxes



by Mike Burton

Cut completed boxes from a simple glue-up.

IF YOUR SHOP IS LIKE MINE, every horizontal surface collects stuff—the necessary minutiae of woodworking. It's all good stuff, to be sure, but it can also create a real mess. Small storage boxes are the answer, but making them individually is a pain, because each box requires cutting, fitting and assembling five pieces. That's 45 pieces to make the nine 2-3/8" x 5" x 8" boxes shown here. Here's how I made them using only 13 pieces.

Make a 'box roll'

The trick is to glue up one long assembly and then cut the completed boxes from it, as if you were cutting slices from a jelly roll. I use 1/4" MDF for the sides and bottom of the assembly and suitably dry 2x4 stock milled to 1-3/8" thick for the

dividers—they'll eventually become the box fronts and backs. The dividers determine the size of the boxes: Their width determines the height, their length determines the width and their spacing determines the depth. The length of the "box roll"

Cut these boxes as if you were cutting slices from a jelly roll

assembly depends on the number of boxes and their depth. The nine boxes shown here came from a 78" long assembly.

Start by cutting the dividers to width and length. To determine their width, subtract the thickness of the MDF bottom from the box

height you've chosen; to determine the length, subtract the combined thickness of the MDF sides from your chosen box width. To make boxes like the ones shown here, cut 10 dividers to 2-1/8" x 4-1/2". Make sure the ends are square.

Rip the 1/4" x 78" long MDF bottom 4-1/2" wide, so it matches the length of the dividers. Then use a square to mark lines across it spaced 8-1/8" (the chosen box depth plus the width of the saw kerf). Apply glue and position a divider flush with each line (and always on the same side). Make sure both ends of each divider are flush with the bottom and then clamp each divider (**Photo 1**). Here's a tip: Wait five minutes before applying the clamps. This allows the glue to set, so the pieces won't slide out of

position when clamping pressure is applied. Leave the clamps on for at least 30 minutes.

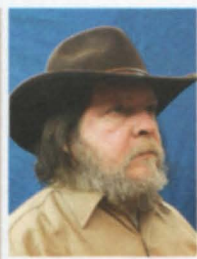
Rip a pair of 1/4" x 78" long MDF sides 2-3/8" wide so they match the height of the assembly you've just glued together. Glue on the sides one at a time so you can make sure they're flush from end to end with the bottom and the dividers (**Photo 2**).

Cut out the boxes

Mark a line down the center of each divider. Then move to the tablesaw. Attach a long, stout fence to the miter gauge and use the centerlines on the dividers to cut the box roll assembly into individual boxes (**Photo 3**). Stand the boxes on end to check their depth—some variation is likely. If you want to make the depths consistent, choose the shortest box and use it to position a stop block on the miter gauge fence. Then cut all the other boxes to match.

Box your storage boxes

The 9-box storage cabinet shown at left is made of 1/2" birch plywood. Its sides are rabbeted for the top and dadoed for the shelves. A 1/2" x 1/2" plywood strip fills the gap below the bottom shelf. The inside width of the assembled box measures 1/16" more than the combined width of three storage boxes. The shelves are spaced 2-7/16" apart. The back of the box is rabbeted for the 1/4" back. 



Mike Burton

is a professional woodworker and author from Ogden, UT. See Mike's work at

burtonswoodartworks.com.



See how to build a benchtop toolbox at
AmericanWoodworker.com/WebExtras

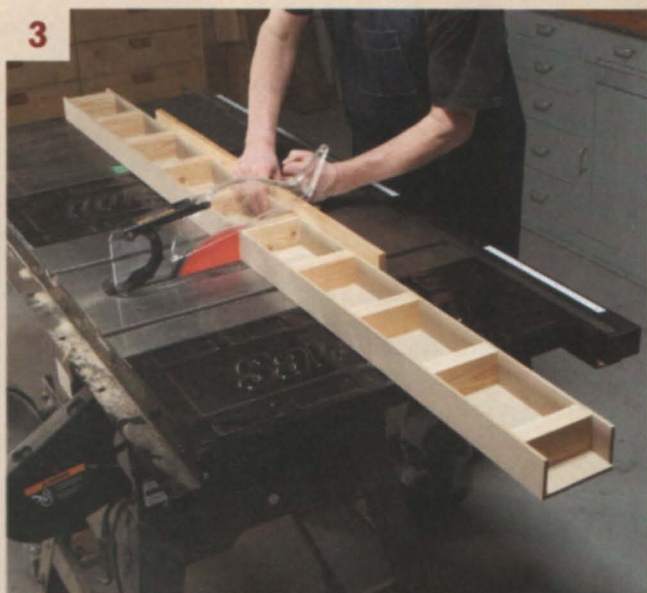
Glue evenly spaced dividers onto a length of 1/4" MDF. Make sure their ends are flush with the MDF. Clamping to a flat surface distributes the pressure evenly across the joints.



Glue additional lengths of MDF onto both sides of the assembly. Make sure the edges are flush.



Cut through the centerline of each divider to create the boxes. The blade's vertical cutting capacity determines the maximum box height.



Finish an Exterior Door

How to choose and apply a long-lasting clear finish.

by Kevin Southwick

WHAT DO FANCY wooden boats and beautiful wooden front doors have in common? They both need a clear finish that can really stand up to the elements. Sunlight, water, extreme temperature changes and abrasions are bound to occur in both situations. Most clear coatings just can't take that type of abuse and will fail in a year or two, allowing discoloration and damage to the wood.



Clear exterior varnishes

Spar varnishes are formulated to be resilient under outdoor conditions. They're more elastic than regular varnish, so they're less likely to crack as the wood continuously expands and contracts with changing outdoor conditions. Some spar varnishes also contain very effective UV inhibitors. The finishes with the best track record for exterior use come from the marine industry, where spar varnish originated.

Spar varnishes are usually glossy. A glossy sheen looks good on a wooden boat and also tells the owner when it's time to apply a fresh coat of finish. A loss of sheen indicates that the finish is beginning to degrade and it's time for recoating. Some brands offer a

Properly preparing the raw wood surface is imperative for good results

lower sheen option, usually recommended for application as the top-coat over several coats of high gloss for the best results.

Most of the spar varnishes at hardware and paint stores will work well on an exterior door that's tucked under a front porch, where the sun and rain are kept at a distance. But for a door that will be fully exposed year round in a harsh climate, a high quality oil-based marine-grade spar varnish will provide both good looks and a long service life before it requires maintenance.

Tung oil and phenolic resin are the key ingredients in many marine-grade spar varnishes. The most technically advanced marine spar varnish formulations also contain ultra violet light (UV) inhibitors. UV inhibitors reduce the effect of the sun's rays by changing

Saturate the raw surface with distilled water to eliminate a possible catastrophe. Moisture (from rain or wet fingerprints, for example) that inadvertently gets on the surface leaves invisible marks that show up as ugly splotches when stain is applied.



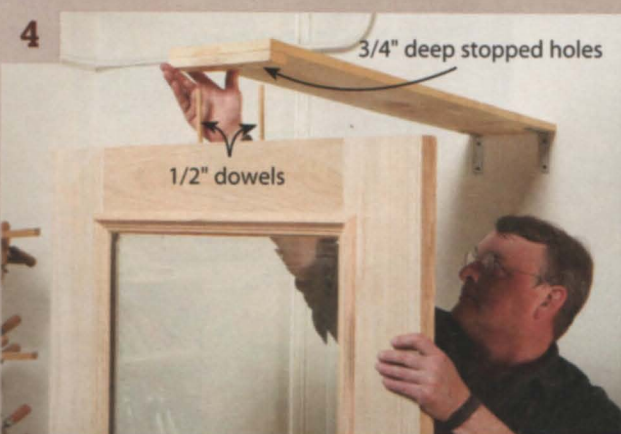
Remove factory sanding marks by carefully and thoroughly sanding with the grain by hand, using 120 grit paper. These factory sanding marks are especially problematic on the rails, where the scratches run across the grain.



Install hardwood dowels to create temporary legs for standing the door for finishing. Fill the holes with epoxy putty after the finishing process has been completed.



Stabilize the standing door with additional dowels and a wall-mounted bracket, so both faces and all the edges can be finished at once. Coating every surface is important for protection and is required by the manufacturers' warranties.





5

Apply stain, starting at the bottom, including the bottom edge. Work up one side and adjacent edge, across the top and down the other side and edge. Then move to the other side and repeat the process.



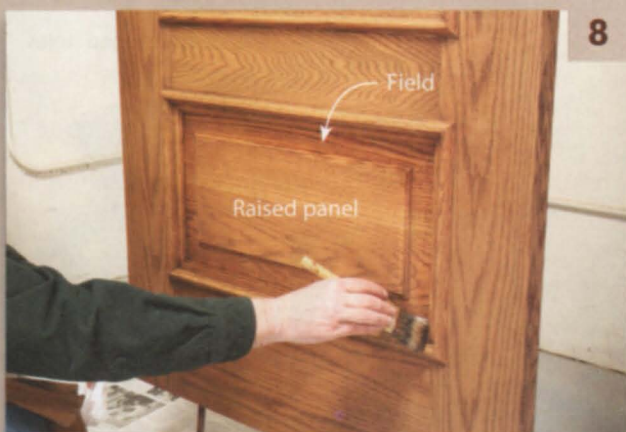
6

Marine spar varnish developed and tested for use on boats provides the best looking, longest lasting clear exterior finish. You'll pay a premium price to buy it, but it's worth every penny.



7

Load the brush with varnish and dab off any excess on a clean lint-free cloth to help avoid drips and runs. I prefer a 2" brush with natural china bristles.



8

Brush the panels first, working from the bottom of the door to the top. This door has only one panel, at the bottom. Start by dabbing finish into the corners and brushing the field that surrounds the raised panel. Then brush the raised panel.

UV light energy to heat, which can then dissipate without harming the finish or the wood beneath it. These are expensive ingredients and are reflected in the cost. A quart of the good stuff can cost \$40 or more, but this is a small price to pay compared to a finish that fails after a year or two.

Unfortunately, it's almost always impossible to identify the ingredients by reading the label (or even the Material Safety Data Sheet), because they're rarely listed. Some brands do list ingredients on their websites or other literature. Be aware that labels can carry misleading claims, such as "maximum UV protection" or "UV stabilized," even though the product doesn't contain any significant UV inhibitors. That's why the spar varnishes that I trust the most are specifically

Brush the panels first and then the rails; brush the stiles last

designed for and tested over time in the most extreme conditions. These premium spar varnishes are also formulated to level well (reducing brush marks) and to allow ample working time. Finding such spar varnishes usually requires shopping at a marine supply store or in the advertising pages or websites of boating magazines.

Applying spar varnish

I'll start by preparing this new entry door for finishing by wetting it to eliminate hidden marks (**Photo 1**), sanding it to remove unsightly factory sanding marks (**Photo 2**) and standing it, so both sides and all the edges can be finished at the same time (**Photos 3 and 4**).

Next, I'll apply a dark brown oil-based pigmented stain (**Photo 5** and Sources). Pigmented stain adds more than color—the pigments provide some UV protection for the wood as well. When the

stain is thoroughly dry, I'll apply three coats of Epifanes clear high gloss varnish—my favorite premium marine spar varnish (**Photo 6**). To give the door a hand-rubbed appearance, I'll switch to Epifanes wood finish matte for the final coat. This finish—five layers all told—will provide many years of protection before requiring maintenance.

I'll use a 2" natural bristle varnish brush and small round sash brushes to apply the varnish (see Sources, below). The 2" brush will do the bulk of the surface (**Photos 7–10**); the sash brushes provide better control on the moldings around the raised panels (**Photo 11**). They're also the best tools for removing drips (**Photo 12**). Avoid multiple cleanings by submerging the brushes' bristles in paint thinner between coats. 🛠️

SOURCES

Epifanes, epifanes.com, 800-269-0961, Epifanes Clear Varnish, 1000 ml (1 qt.), \$45.62; Epifanes Woodfinish Matte, 1000 ml (1 qt.), \$58.90.

Rockler, rockler.com, 800-279-4441, Genreal Finishes Antique Walnut Gel Stain, #34865, \$22.49 per qt.; 2" Natural Badger-Style China Bristle Brush, #23466, \$23.49.

Wet Paint, wetpaintart.com, 651-698-6431, Escoda Olive Shape Bristle Round #2 Sash Brush, #7643.2, \$14.92; Escoda Olive Shape Bristle Round #3/0 Sash Brush, #7643.3.0, \$12.11.



Kevin Southwick

is a wood-finishing specialist and furniture restorer/conservator in Minneapolis MN.



Learn how to build a wooden storm door at AmericanWoodworker.com/WebExtras

Move on to the rails. Again, start at the bottom of the door (including the bottom edge) and work to the top (including the top edge). Brush the varnish a couple inches beyond the joints with the stiles.



Brush the stiles and edges from bottom to top. Be careful not to brush onto the rails; stop at the joint lines. Check for drips and then move to the other side of the door and repeat the brushing process.



A round sash brush closely follows the molding's shapes and makes it easier to neatly seal the glass to the wood, as recommended by door manufacturers.



Check for drips using a light held at a low angle and remove them by stippling with a small, dry sash brush. Most drips result from varnish scraping off the brush on moldings or raised panels, or from puddling in panel corners.



Kubb

An outdoor game that's part bowling, part horseshoes, part chess—and totally fun for all ages.

by Tom Caspar



IF YOU ENJOY PICNICS by playing a relaxing lawn game with the family, you're going to love Kubb. What, you've never heard of it? Legend has it that the Vikings played it, but whether that's true or not, Kubb is certainly the hottest outdoor game since the invention of Frisbee golf—Kubb tournaments are now played all over the world.

All you need to play Kubb (pronounced Koob) is an open, flat area about 15' by 25', two people (although teams are more fun), and a set of Kubb pieces.

While the rules aren't very complicated, I'm going to pass on explaining the details here and direct you to a website, below left. Basically, the idea is to knock over small squat blocks (called kubbs) by throwing sticks at them—underhand. (The sticks are called batons.) The kubbs are lined up on opposite sides of the playing field, which is defined by four stakes.

Each team stands on opposite sides of the field. The first side to knock over all of their kubbs must then knock over the King, which stands in the center of the field. There's definitely a strategy involved, which is why the game is sometimes called "Viking Chess."



The wood

You can use just about any kind of wood to make a set of Kubb pieces. Usually, all of the pieces are made from the same species of wood and are the same color. I made this set from two different species—one for each team—just for fun.

The King is 3-1/2" square, so some folks make their set from 4x4 construction lumber. While that avoids having to glue up thinner stock, this wood is prone to splintering when it gets knocked about, so it's not ideal. Commercial sets are usually made from yellow poplar. It's relatively inexpensive and won't splinter, but it's bland in appearance.

I made this set from 8/4 (2" thick) walnut and ash. That's just the right thickness to make the batons, which are 1-3/4" dia. The King and kubbs are composed of two pieces glued together.



Watch a video on how to play Kubb at AmericanWoodworker.com/WebExtras



A really nice set of Kubb pieces is very easy to build, and makes a memorable gift. They'll last for years!

Making the set

The kubb pieces are just simple blocks (see the Cutting List, page 62). Mill four pieces 1-5/16" thick, 3" wide and 32" long. Glue them together to make two blanks, then mill the blanks on all sides, making them 2-3/4" square. Cut the blanks into five kubbs apiece. Soften all of the kubbs' edges with a router, using a 1/8" roundover bit.

Turn the batons on the lathe. If you don't have a lathe, make them octagonal. (See the link for a video about this on the next page) The stakes can be round or octagonal. I also made an optional mallet for pounding in the stakes.

The King could simply be a plain block, like the kubbs, but here's how I made a two-part King with a crown. Mill two pieces of walnut and two pieces of ash 1-13/16" thick, 3-3/4" wide and 10" long. Glue them together and mill them into 3-1/2" square blocks. Cut the blocks to final length (the

ash block is extra-long so it's safe to joint and plane.) Bevel one end of both blocks (**Photo 1** and Fig. A, page 62). Stand the ash block on the walnut block and decide which faces should be on the same side. Mark two mating faces "I" and "II".

Join the two blocks with 3/8" or 1/2" dowels, using a jig for drilling the holes (**Photo 2**). This jig is reversible: drilling from opposite sides of the jig ensures that the holes in both blocks will be aligned. The main part of the jig should be at least 1" thick. You could cut this piece from the left-over ash block or make a new one; in any case, it must be exactly the same size as the walnut and ash blocks. Drill four holes through the piece using a drill press to ensure that the holes are perpendicular. Nail or glue four small pieces of wood around the jig.

Before drilling the holes, mark the jig. Place the jig on the walnut block, then place the ash block in the jig. Mark "I" and "II" on one of the outer pieces of the jig, corresponding to the marks on the blocks, as shown in the photo. Remove the ash block. Clamp the jig to the walnut block and drill four holes. Remove the jig, turn it over and clamp it to the ash block. Drill the mating holes.

Glue dowels in the holes and glue the blocks together (**Photo 3**).

To make the King's crown, lay out the V cuts on just one of the King's faces (Fig. A). The sawing process is very easy, but you have to be careful (**Photo 4**). Basically, you just need to make two cuts (Cut 1 and Cut 2) rotating the block four times for each cut. However, to avoid kick-back, you can't make any small off-cuts that will get trapped under the King. Instead of cutting right on the





1

Begin making the King by beveling the end of a large walnut block. Make the same cuts on a shorter block of ash.



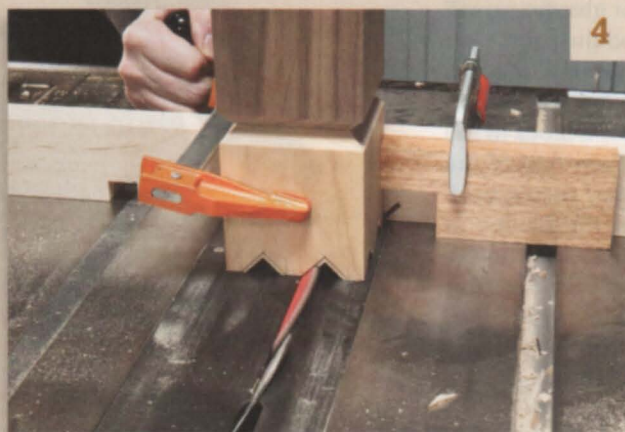
2

Use a jig, made on a drill press, to drill dowel holes in the end of the walnut block. Turn over the jig to drill mating holes in the ash block.



3

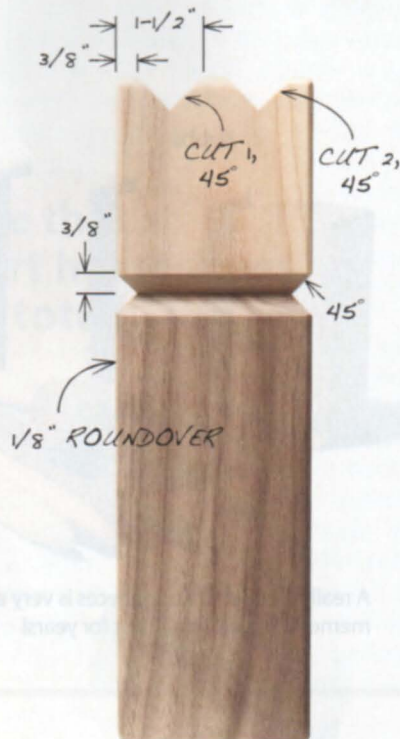
Glue the pieces together. The numbers marked on the blocks correspond to similar numbers on the drilling jig. These marks ensure that the holes will align.



4

Saw V-shaped notches to make the King's crown. Rotate the King after each cut. Make these cuts in small stages to avoid trapping offcuts and cutting too deep.

Fig. A The King



line, start each cut $1/8$ " off the center of the V and raise the saw blade up only $3/16$ ". Rotate the King and make 3 more of the same cuts. Then adjust the King's position so the saw cuts $1/8$ " closer to the V line. Raise the blade about $3/8$ " high and saw again. Move the King one more time and adjust the blade's height until you're cutting exactly on the line. Don't cut right to the bottom of the V, though—clean this waste out later with a chisel. When you're done, ease all the edges with the roundover bit, including the top of the crown.

Toss all the pieces in a small duffel bag, pack the picnic basket and go have fun! 🐾

Cutting List

Part	Qty.	Th x W x L
King	1	3-1/2" x 3-1/2" x 11-3/4" (a)
Kubb	10	2-3/4" x 2-3/4" x 6"
Baton	6	1-3/4" dia. x 11-3/4"
Stake	4	1" dia. x 11-3/4"

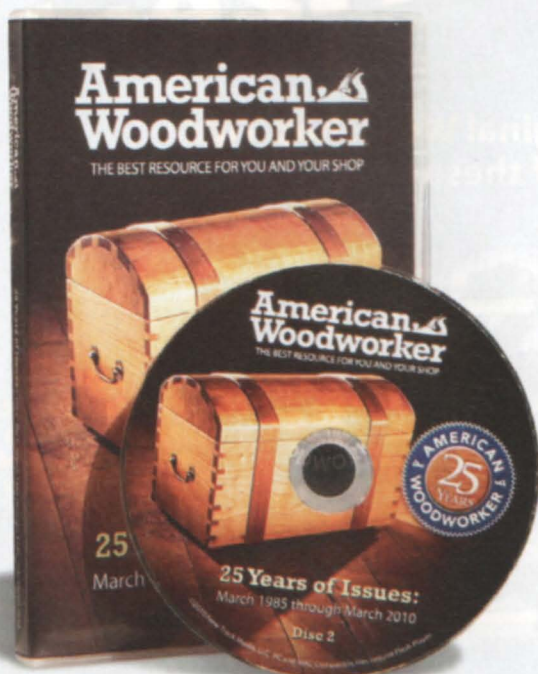
Notes:

a) For a two-part King, the top is 3-3/4" long; the bottom is 8" long.



See a quick tip for setting up a saw to cut octagonal stock at AmericanWoodworker.com/WebExtras

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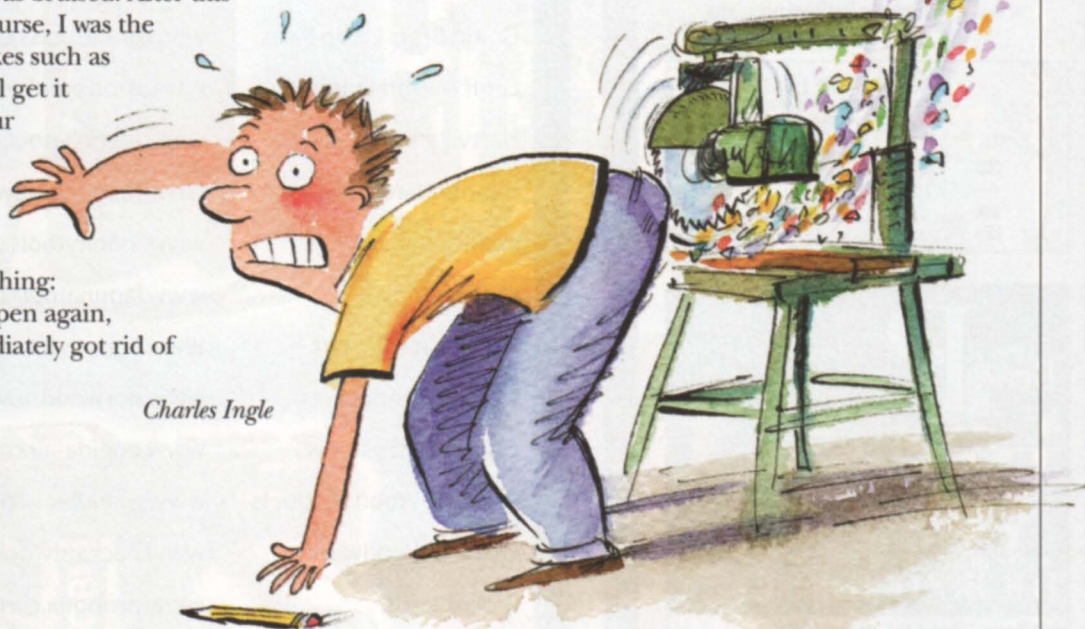
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Rear Ended

AFTER CUTTING A PIECE OF WOOD with my ancient radial arm saw, I turned to retrieve the pencil that I'd used to mark the cut—the saw's vibration had caused it to roll off the table and onto the floor. When I bent over to pick it up, though, I felt something funny, because I'd forgotten to return the business end of the saw—and now the spinning blade was introducing itself to my derriere!

Fortunately, the 14 plastic cards in my billfold saved me from harm, so only my ego was bruised. After this happened, of course, I was the butt (ha!) of jokes such as "eventually you'll get it in the end," "your credit has been cut," "you're a walking dis-ass-ter," etc. I'll tell you one thing: It will never happen again, because I immediately got rid of that saw!

Charles Ingle



The Long and the Short of It

I WAS ASSEMBLING A CABINET at the small woodworking shop where I work while my boss unpacked a shipment from one of our suppliers. "That darn Fryburg," he complained. "Some of these parts are 8" too long and others are 8" too short."

"Well," I replied, "at least they average out." We tossed back and forth a few more disparaging remarks about the offending supplier before I noticed that the bottom for the cabinet was too long. "Ha," I smirked. "You should wait until your own

ducks are all in a row before you criticize Fryburg. You cut this cabinet bottom 2" too long."

As I went over to the tablesaw to re-cut the bottom, Aden remarked, "You'd better make sure your own measurements are correct." I knew he was only half-serious but I checked again—and did a double take. If not for his warning, I would have cut the bottom an inch too short!

Emery Yoder



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