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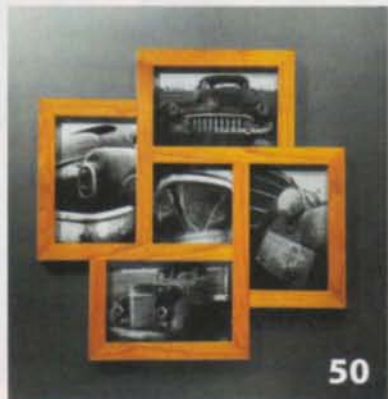
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Issue #153. American Woodworker®, ISSN 1074-9152, USPS 738-710. Published bimonthly by Woodworking Media, LLC, 90 Sherman St., Cambridge, MA 02140. Periodicals postage paid at Boston, MA and additional mailing offices. POSTMASTER: Send change of address notice to American Woodworker®, P.O. Box 420235, Palm Coast, FL 32142-0235. Subscription rates: U.S. one-year, \$24.98. Single-copy, \$5.99. Canada one-year, \$29.98. Single-copy \$6.99 (U.S. Funds). GST # R122988611. Foreign surface one-year, \$29.98 (U.S. Funds). U.S. newsstand distribution by Curtis Circulation Company, LLC, New Milford, NJ 07646. Canada Post Publications Mail Agreement Number 41525524. Canada Postmaster: Send address changes to: American Woodworker, PO Box 456, Niagara Falls, ON L2E 6V2. Send returns and address changes to American Woodworker®, P.O. Box 420235, Palm Coast, FL 32142-0235. Printed in USA. © 2010 New Track Media LLC. All rights reserved.

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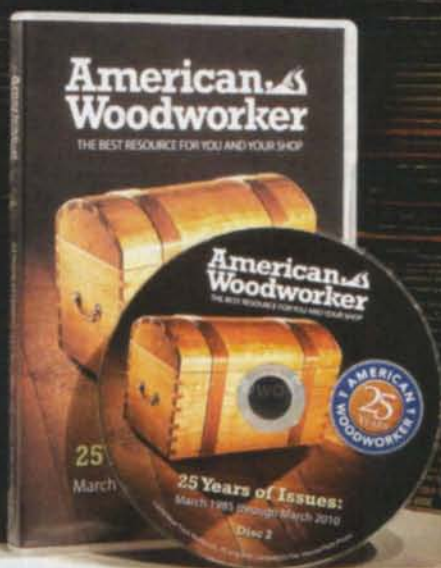
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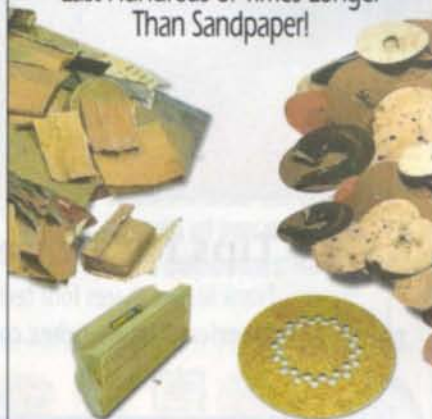
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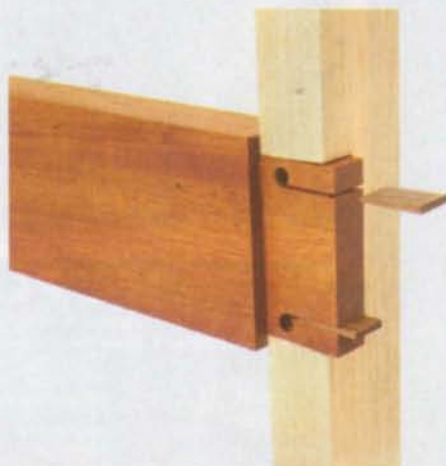
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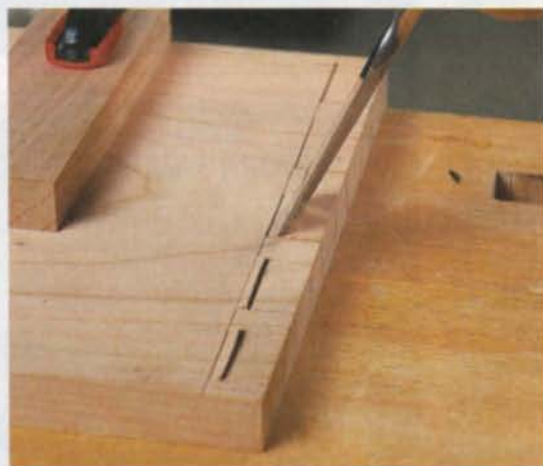
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**Terrific Tip!**

Ripping Thin Pieces

WHILE MAKING SHAKER BOXES, I built a jig to accurately rip 1/16" thick strips without getting my hands too close to the blade. In fact, I can leave the guard on the saw.

The jig has two parts. First, there's a track that mounts on the saw, next to the fence. Two rare-earth magnets recessed into the bottom of the track keep it from sliding. The track is positioned 1/16" away from the blade, or at whatever thickness of strip I want to rip.

The second part of the jig is a push block. (I call it a shoe.) It slides in a groove on the track. The shoe has a 1/8" thick sacrificial cleat that hooks over the back end of the board I'm ripping. The cleat has slots in it, so I can move it up or down to accommodate

boards of different thicknesses.

To cut a strip, I put a magnetic featherboard on the left side of the board I'm ripping to keep the board tight against the track. Then I feed the board into the saw by hand, just like any other rip cut.

When the end of the board is even with the track, I put the shoe on the track and push the board the rest of the way through the cut. The front edges of the shoe and cleat are rounded to allow the blade guard to ride up and over the jig.

Joe Schavle



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The Sandpaper Files

THIS SANDPAPER STORAGE SYSTEM is about as simple as it gets. It's just a stack of folded envelopes bound with a big rubber band. Each envelope is marked with a grit number. A thin piece of wood on the bottom of the pile keeps the envelopes flat.

Standard letter-size envelopes work well. Fold and tape them to fit your sandpaper. My pieces are 1/6 of a sheet, a perfect size for a sanding block. To make them, I tear a sheet in half lengthwise, then divide each half into three pieces.

Tom Caspar



Sawing with Sticky Notes

WHEN USING MY MITER SAW, I've found that the easiest way to sneak up on a line is to use a stack of sticky notes.

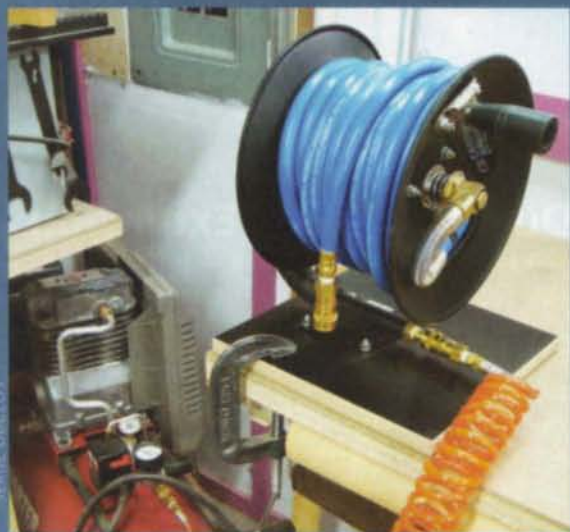
First, set a stop block to cut your part slightly oversize (1/16" is plenty). Attach a thin pile of sticky notes to the stop block, make a cut, and then add individual notes until you're right on the money. They'll all stay in place for cutting more parts at the same length. Put the sticky notes back on the pad when you're done.

Brad Holden

Portable Hose Reel

INSTEAD OF MOUNTING my compressor's hose reel to the wall, I mounted it to a board. This way I can take the reel wherever I'm working and clamp it in place.

Serge Duclos



Goof-Proof Center Finder

TO MARK THE EXACT CENTER of a board, I measure an equal distance from both ends and make two marks. This distance is just an approximation—it doesn't matter if it's longer or shorter than exactly half the length of the board, as long as the marks are reasonably close together. Then I just split the difference by eye.

John English



Shallow groove

Benchtop Ruler

I WISH I HAD THREE HANDS sometimes, when I'm measuring and marking. After dropping a tape measure I don't know how many times one day, I decided to make my bench hold the tape for me. Using a guide, I routed a 1/64" deep x 1/2" wide groove in my benchtop and installed a metal adhesive-backed flexible rule in it.

Stephen Goad

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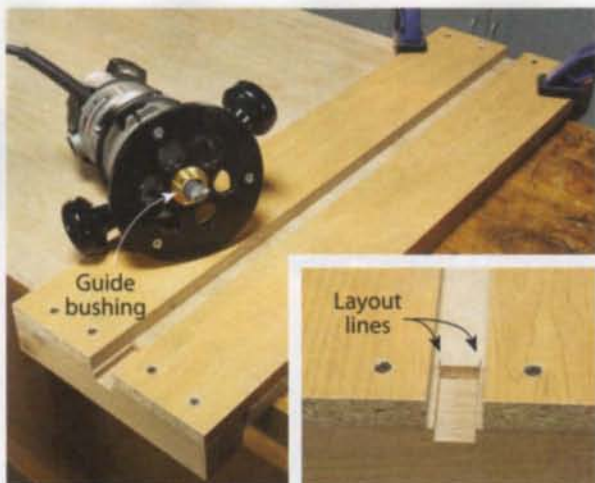
Tablesaw Assembly Clamp

MY TABLESAW'S TOP often does double duty as an assembly table. It's a guaranteed-flat surface. When I glue or screw together a project, it won't come out twisted.

Sometimes I use the saw's fence as a clamp to hold parts in place for fastening. The "fixed" end of the clamp is a stick that fits tight in the saw's miter slot.

If I'm gluing, I'll cover the saw with newspaper or red builder's paper. Before I used paper, I found that I could pop off dried glue blobs from the cast-iron top using a putty knife, but the glue discolored the surface.

Alan Wesley



Guide bushing

Layout lines

Router Dado Jig

STRAIGHT AND ACCURATE DADOES are easy to make using this simple jig. It's composed of two pieces of melamine shelving, cut 4" wide, and a couple of crossbars screwed underneath. The space between the melamine pieces is 1"—exactly fitting the 1" o.d. guide bushing in my router. The router can't wobble as I cut the dado.

To prepare the jig, I precut a dado in one of the crossbars. I line up this dado with a pair of layout marks on the workpiece, clamp the jig in place, and have at it.

Robert Brosbe



Dust port

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V-Carving in 10 easy steps.

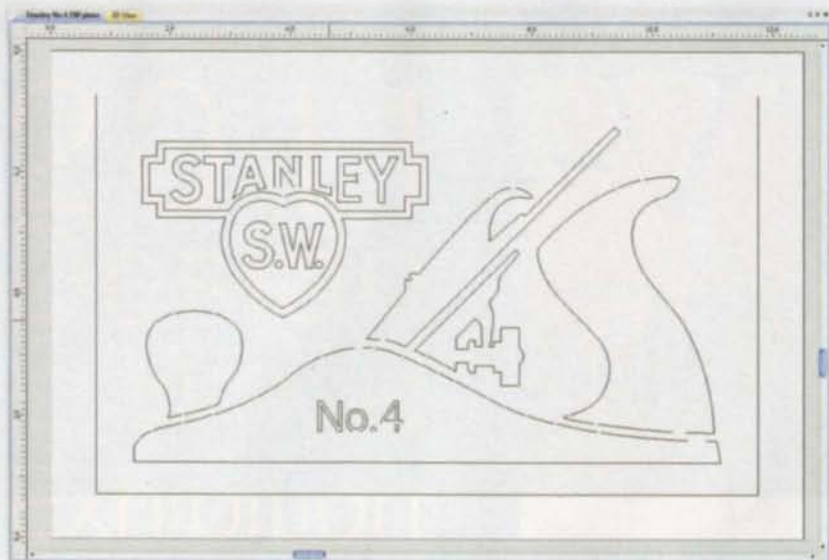
V-CARVING IS ONE OF THE SIMPLEST WAYS to create attractive carvings on a CNC router. With special software and a little practice, it's possible to transform almost any lettering style or 2D design into a carving that requires only minimal cleanup before finishing. I use V-Carve Pro software from Vectric, but the steps are similar with other v-carving pro-

grams. The software tells the machine to raise the bit at the inside corners; the machine then uses the tip of the v-bit to create corners that are clean and crisp—as opposed to the rounded corners made by a handheld router guided by a template. For more examples of v-carving visit AmericanWoodworker.com/CNC.



Step 1

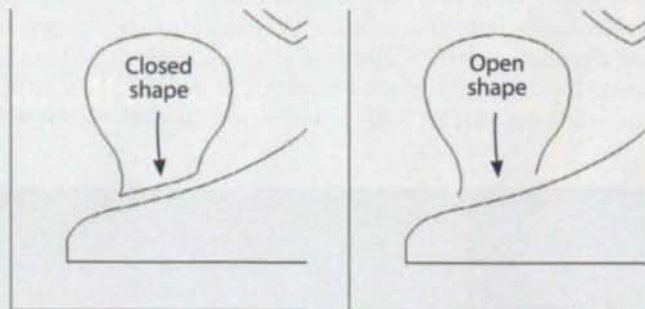
Layout your design. All it takes is a simple hand sketch or photograph. This can be imported directly into the program and then outlined using the drawing tools in the v-carve design program. Since both letters and shapes can be carved, there are not many limits to the kinds of designs you can v-carve. You also have the choice of carving on the inside or outside of letters or shapes.



Step 2

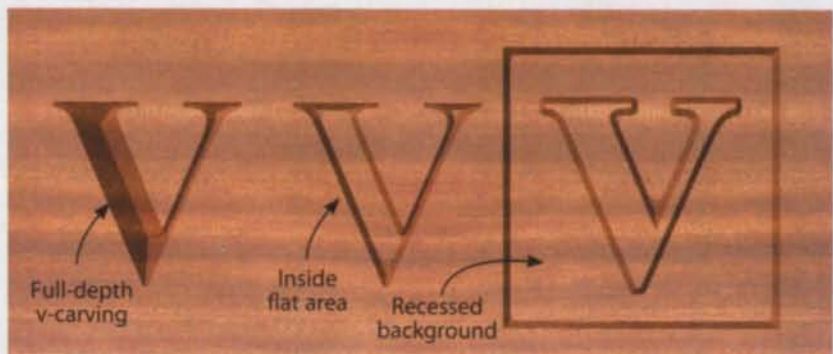
Make sure all shapes are closed.

This is one of the cardinal rules of v-carving design. A circle, square or the outline of an object qualifies, but a single line or parallel lines with open ends will not work. The v-carve programs need a continuous outline to follow. Some outlines may look continuous, but even a little break in the line will cause problems. Fortunately, v-carve programs are able to recognize shapes that have small openings and will automatically close them for you.



Step 3

Set the cutting depth for the background of your carving and the inside of the letters (as needed). This cutting depth is mainly a design decision, and of course it cannot exceed the thickness of your board. The cutting preview (example at right) will show you how your chosen cutting depth looks.

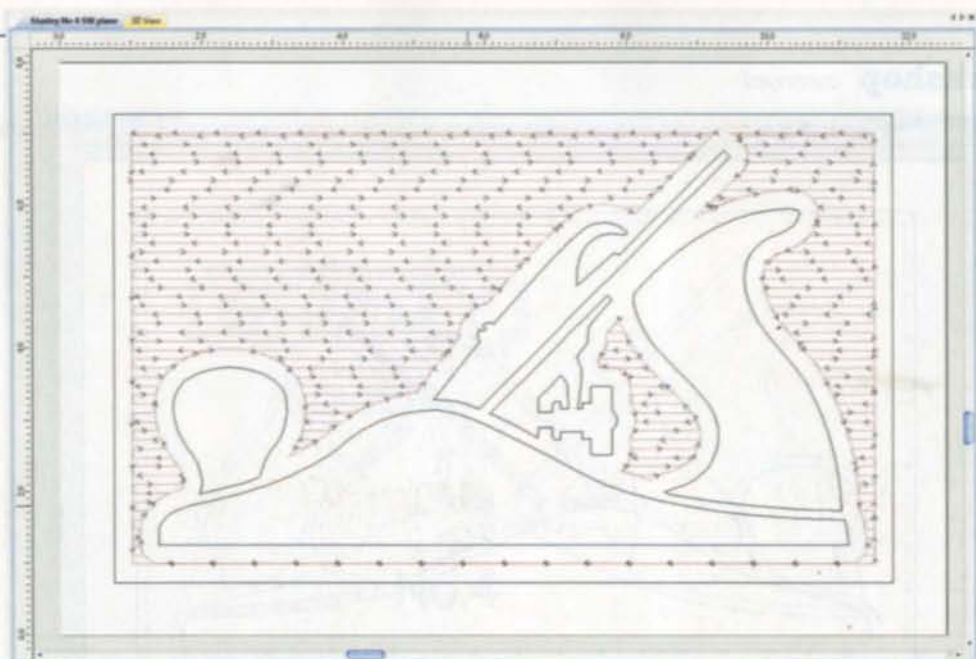


Step 4

Select your router bits. Use a straight bit first to rout flat areas. The diameter of this bit determines how much cleanup the v-bit will need to do inside a corner. A large diameter straight bit removes material faster but leaves more for the v-bit to cleanup. A small diameter straight bit leaves less material inside a corner but takes longer to clear the flat areas. I typically use a 1/4" diameter end mill for drawer front or cabinet door carvings.

The three most common v-bit angles are 60°, 90° and 120°. I prefer using a 90° and 120° v-bit for wide or large letters and a 60° v-bit for small or fine letters. If possible, I also prefer to use a v-bit with a cutting radius that's slightly wider than the width of the final bevel. This allows me to make one final cleanup pass (if needed) to remove any step marks left by the initial passes.





Step 5

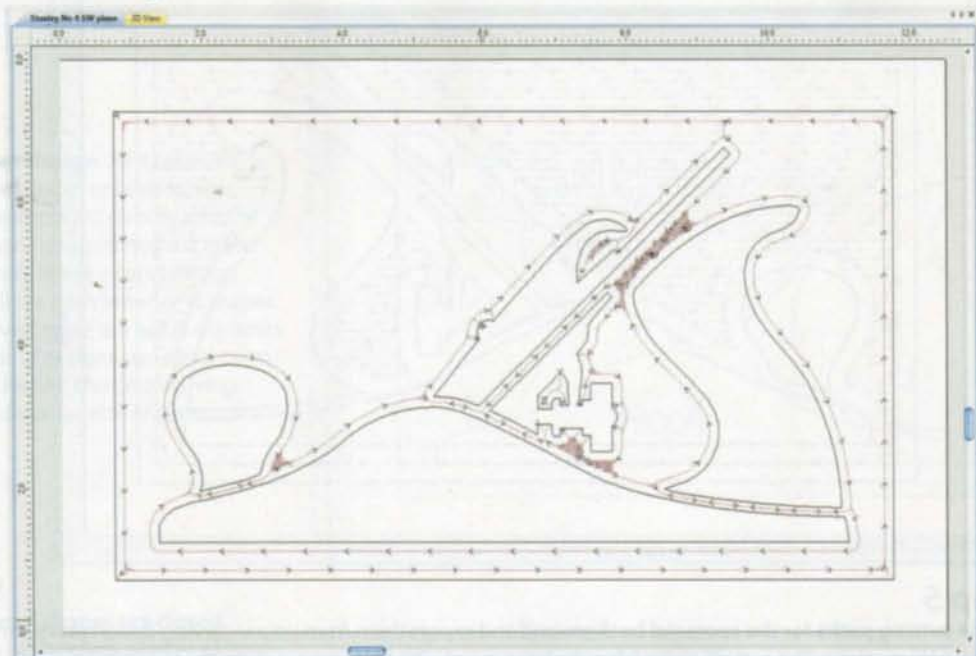
Create cutting paths for the recessed background and export them from your v-carving design program to your CNC machine. The cutting paths (shown above in red with tiny arrows) show the areas that will be routed. Here I'm using a 1/4" end mill bit to rout the flat background area. I'm accomplishing this with 1/8" wide passes (shown by the distance between the red lines). This dimension is referred to as the "stepover" measurement. The cutting depth per pass can also be programmed, as can the feed (travel) rate of the router, expressed in inches per minute.



Step 6

Rout the recessed background area. To ensure a smooth background on this plaque, I used a couple techniques. First, I routed the background area in two .06" (about 1/16") deep passes, plus a light .01" pass to reach the final depth of .013". Three passes take more time than one, but create a surface that requires only light sanding. Second, I programmed the router to cut with the grain (see Step 5). This reduces sanding, too. Milling the background for this plaque took about 20 minutes.





Step 7

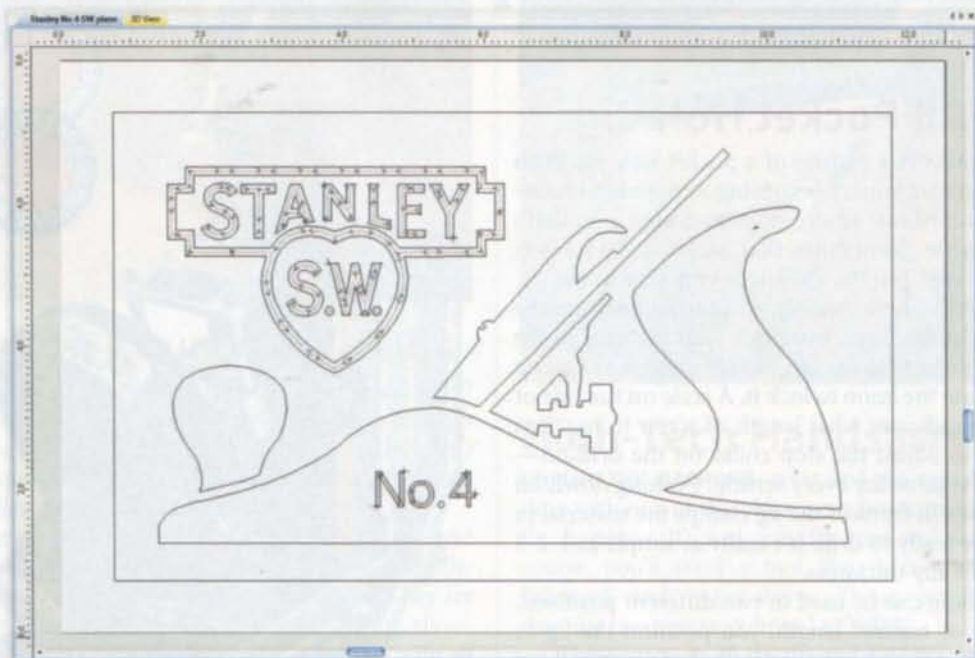
Create cutting paths for the bevels around the shapes (the hand plane and perimeter rectangle in this case) and export them to your CNC machine. For this design, I will be using a 90° v-bit, which produces a 45° bevel. The shaded areas above the handle and below the depth-adjustment knob are closely-spaced tool paths where the v-bit needs to make many close passes to mill the background flat. These areas are too narrow for the 1/4" end mill bit to get into.



Step 8

Rout the bevels around the shapes. This requires removing the straight bit and installing the appropriate v-bit. I used a 1/2" diameter 90° v-bit. It has a 1/4" tall bevel—more than enough for the carved bevel, which will be only 1/8" tall. This step took about 20 minutes to rout. Except for some light hand sanding and a little touch-up with a carving chisel, this part of the carving is now complete.





Step 9

Create tool paths for the lettering. This requires a separate step because I'm changing to a 60° v-bit. I prefer a 60° bit for small letters such as these because it creates a deeper, more distinctive v-groove than a 90° bit. The tool paths above show how v-carving requires two lines to carve between. The two lines are parallel in these letters, but they can be any shape or spacing. For example, the outline of the hand plane and outer rectangle represents the pair of lines that were used to create the hand plane carving.



Step 10

Rout the lettering. Notice that "No. 4" is routed into the surface of the plane whereas the logo is carved into the background. I programmed the difference in cutting depth into the cutting paths while designing the plaque. This final carving step took about 8 minutes. To view a video on how I designed and machined this plaque from start to finish, visit AmericanWoodworker.com/CNC.



Do-It-All Pocket Hole Jig

YES, THIS REALLY IS a picture of a pocket hole jig. With screwed-together joinery becoming so popular, Porter-Cable has pulled out all the stops to design a jig that's fully adjustable. Sometimes that makes a device way too complicated, but the Quikjig is very easy to use.

To adjust the hole spacing, you turn a knob on the left side of the jig. Then you place your material in the jig and push down on the large knob in front as far as it will go. Rotate the knob to lock it. A scale on the side of the jig then indicates what length of screw to use. You don't have to adjust the stop collar on the drill bit—that stays the same for every setting. Pushing down on the large lever in front of the jig clamps the material in place. You're ready to drill. It's really as simple as 1-2-3 for a piece of any thickness.

The Quikjig can be used in two different positions. For a piece of normal length, you position the jig as shown and put the piece in vertically. For an extra-long piece, you turn the jig 90°. The back of the jig becomes the base and the piece slides in horizontally.

All in all, the major benefit of this jig is that it greatly expands the range of furniture parts that you can assemble with pocket hole screws. After all, they're not just for face frames anymore.

The Quikjig will handle material from 1/2" to 1-1/2" thick. You can space the holes anywhere from 3/4" to 1-1/2" apart. The drill bit and stop collar are included.



SOURCE

Porter-Cable, www.deltaportercable.com, (800) 223-7278, QuikJig Pocket Hole Joinery System, Model 560, \$230.

Improved Digital Planer Gauge

IF YOU'VE BEEN LOOKING for a thickness gauge for your planer that's easier to read, there's really only one game in town: the Wixey Digital Readout. Wixey first introduced their gauge about 10 years ago, and while it

certainly was accurate, it could have been more user-friendly. Wixey has now addressed these shortcomings and redesigned the gauge. It's a little taste of woodworking heaven.

The new WR510 has an angled display that's easy to read without bending over. (The older model had a vertical display, like the stock gauges on most planers.) The new gauge also has an auto shutoff to prolong the battery's life. (If you forgot to press the Off button on the old model—which we often did—the gauge would stay on indefinitely.) The WR510 also has improved mounting hardware, and is designed to easily fit many brands of planers.

As for the readout, you could hardly ask for more. It reads in decimal inches, millimeters and—best of all—in fractions. Depending on the mode you select, you can either tell exactly how thick the board is coming out the back end of the planer or how much more you have to take off to reach a pre-determined thickness.

SOURCE

Wixey, www.wixey.com, Planer Digital Readout, WR510, \$60.





Premium Countersink Bits

EVEN THE HUMBLE countersink bit can be improved, right? A new set of these bits from Woodworker's Supply takes up where generic sets leave off. The new bits make absolutely smooth holes, defy clogging and come with a set of stop collars unlike any you've seen before.

The set contains four bits matched for #6, #8, #10 and #12 screws. The countersink bodies are 3/8" dia. for the #6, #8 and #10 bits, and 1/2" dia. for the #12 bit. They are hardened to Rc64 for a long life and are 1-1/4" long, allowing you to drill a deep, accurate counterbore. As with all countersink bits, you can vary the drill bit's length by loosening a set screw. However, these bits have two set screws, an arrangement that further prevents the bit from slipping.

Two stop collars are included: one for the #6, #8 and #10 bits, and one for the #12 bit. A white nylon ring spins freely on the end of each stop collar to prevent the collar from marring the wood. The stop collars also have "windows" above the ring to allow chips to eject, a convenient feature most stop collars don't have. The set is packaged in a handsome burl-finish box, worthy of the fine tools inside.

SOURCE

Woodworker's Supply, www.woodworker.com, (800) 645-9292, Four-bit Straight Countersink Set with 3/8" RTS-2000 Plug Cutter, #964-370, \$73.

Sharpen Spade Bits and More

THE FIRST AND ONLY spade-bit sharpener on the market, the Drill Doctor DDSB, might make you take another look at these bits for serious woodworking. They're a heck of a lot cheaper than Forstner bits.

Most spade bits—even new ones, right out of the package—leave a ragged surface inside a hole. But given a really sharp edge, which this machine can deliver, they're capable of doing much better.

Grinding a spade bit on the Drill Doctor DDSB guarantees that both cutting edges will be in the same plane and that the point will remain centered—a geometry that's very hard to achieve if you sharpen spade bits by hand. Both factors help make a spade bit run true.

The DDSB is a further refinement of the Drill Doctor line. Drill Doctors are well-known, reliable machines



High-Tech Handsaws

UNPLUG THE MACHINES, relax and get ready for a good time with one of the oldest woodworking tools around: the handsaw. It's just you, the saw and the wood. Of course, you'll want a tool that is comfortable, well-balanced and super-sharp. Those qualities exactly describe two new saws from Lee Valley.

These saws—a 12 tpi rip and a 14 tpi crosscut—are designed for general joinery work. We like them best for cutting tenons. You use the rip saw for cutting the cheeks, as shown above, and the crosscut for cutting the shoulders.

Both saws have high-tech composite spines, pistol-grip handles and 11" long blades. The set is only 0.003" on each side. With the kerf hardly wider than the blade, it's easy to stay on track. In trying out these saws, we were surprised to see how our skills improved just by using such high-quality tools. We're sure that yours will, too.

SOURCE

Lee Valley, www.leevalley.com, (800) 871-8158, Veritas Rip Carcass Saw, 05T07.05, \$69; Veritas Crosscut Carcass Saw, 05T07.01, \$69.



for sharpening twist bits. Using the same technology, the DDSB can sharpen twist bits as well, from 3/32" to 1/2".

SOURCE

Darex, www.drilldoctor.com, (800) 597-6170, Drill Doctor Model DDSB, \$130.

Small Size, Big Features

CRAMPED FOR SPACE? If so, this new compact scroll saw from General International may be just the answer. The Excalibur EX-16 will easily store on a shelf—it's only 15" wide, 27" deep and 17" high. Full-size Excalibur scroll saws are well-known for their excellent performance; the new EX-16 meets the same standards.

Like its larger cousins, the EX-16's head tilts, not the table. That's a real advantage. Your workpiece stays level, giving you better control for intricate cuts. The EX-16 also utilizes a parallel-link arm to minimize vibration. The larger Excaliburs have the same type of arm.

This saw has a 16" throat capacity and a maximum cutting depth of 2". Its table is 12" wide by 18-1/2" deep. The blade tilts up to 45° in either direction. The motor has a variable speed control, going from 400 to 1400 strokes per minute.

Blade changes are toolless, and speed and tension controls are conveniently located. An onboard dust blower



keeps the blade clean and the work surface clear of dust, so you see precisely where you're cutting.

SOURCE

General International, www.general.ca, (888) 949-1161, 16" Scroll Saw, Model EX-16, \$575.

Redesigned Planer

DELTA HAS JUST INTRODUCED a new 13" planer, the 22-590. It replaces the 22-580, a model that received top marks in our planer tool test back in 2003. In the years since, few other small planers have met the very high standard set by the 22-580. Is the new model a step forward?

The answer is a mixed bag. We won't be able to make a final judgment until we've used the 22-590 for a year or so (we've had a 22-580 in our shop since '03), but here's a comparison of three important features.

The new model introduces a three-knife cutterhead. Running at 26 feet per minute—a good clip—it produces 96 cuts per inch (cpi). The higher the number of cuts per inch, the smoother the surface you'll get. Few other planers can match 96 cpi, so the new model does quite well in this regard.



The old model, the 22-580, had a two-knife cutterhead. It was capable of producing 90 cpi, but this required you to switch the feed rate to a much slower speed. At the normal feed rate, you would get 60 cpi, which is OK for anything other than a final pass. A lower cpi has the benefit of putting less wear on the blades.

In sum, the older model gave you the option of two surface qualities, medium and fine, while the new model only produces a fine surface. Delta has compensated for the additional wear on the 22-590's blades by upgrading their steel.

A second major difference between the models is the thickness scale—the indicator that tells you how thick your planed board will be. These scales are notoriously hard to read. The older model broke new ground by introducing a scale with an easy-to-read cursor, conveniently positioned on top of the machine. The new model abandons this approach, reverting to a commonly used type of scale that's frankly awkward to read.

A third difference between the models is the depth stop. The new model allows you to dial in a thickness anywhere from 1/8" to 1-1/4". However, it's not a very positive stop—when cranking the depth-of-cut handle, it's hard to tell when you've exactly arrived at your pre-set thickness. The old model allowed you to dial in virtually any thickness from 1/8" to 6". This stop was very definite—you knew when you hit it.

Overall, if surface quality is the most important aspect of a planer's performance, the 22-590 continues an excellent tradition. But we wish it were more user-friendly.

SOURCE

Delta Tools, www.deltaportercable.com, (800) 223-7278, 13" Portable Thickness Planer, 22-590, \$500.



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Bits for Impact Drivers

THE BEST TOOL for tough screwing jobs is an impact driver. It has much more torque than the average cordless drill/driver. The next time you want to run screws into a piece of hardwood without drilling pilot holes, as when fastening a turning blank to a faceplate, reach for an impact driver.

But don't grab the bit from your cordless drill. The tip will get rounded over or chip pretty fast because it's not designed to take the constant pounding of an impact driver. Instead, you should reach for a special type of bit that can withstand these brutal conditions. Dedicated impact-driver bits are currently offered by Bosch, Craftsman, DeWalt, Makita and Milwaukee. All have 1/4" hex

SOURCES

Bosch Tools, www.boschtools.com, (877) 267-2499; Craftsman, www.craftsman.com, (800) 549-4505; DeWalt, www.dewalt.com, (800) 433-9258; Makita, www.makita.com, (800) 462-5482; Milwaukee, www.milwaukee.com, (800) 638-9582.

New Glue, Old Favorite

WHITE GLUE DESERVES more respect—at least, this one should get it. It's Elmer's Glue-All, first introduced in 1948 and recently reformulated to make a stronger bond. Many folks confuse this product with Elmer's School Glue, but that's a different white glue best suited for craft and paper projects. Glue-All is for woodworkers, even though it's generally thought of simply as a home-repair remedy.

Glue-All has one simple property that most yellow glues don't have: It's slippery when wet. Two pieces coated with Glue-All will slip past each other more easily than if they were coated with most yellow glues. And when would that be important? Hmmm ... let's see. How about a nice, tight-fitting tenon sliding into a mortise? A long dowel going into a hole? A series of well-made dovetails?

Well, you get the point. For some joinery work, Elmer's Glue-All is perfect. Sure, there are many situations in which a tackier glue would be preferable. But we woodworkers are picky, right? We want the right glue for the right job. Here's one more to add to your kit.

SOURCE

Elmer's, www.elmers.com, (888) 435-6377, Glue-All, 8 oz., \$8.



Revamped Jigsaws

CUTTING HARDWOOD with a jigsaw is a brutal test of the machine's quality. Many saws don't score high marks because their blade deflects, producing cuts that are out of square. That makes it hard to accurately follow a line. Years ago, Bosch led the way in producing a jigsaw that passed the hardwood test with flying colors. They've recently updated their line with two new models.

Inside, the saws are very similar. Both have similar 7-amp variable-speed motors. As with many state-of-the-art woodworking machines today, this motor's feedback circuitry maintains a steady speed as the load increases. In practical terms, that means less bogging down when you push faster.

Both jigsaws have a toolless blade-change system and four orbital-action settings (smooth to very aggressive). They also have an integrated, adjustable dust blower to keep the cutting line clear and a steel insert in the foot to reduce wear.

On the outside, Bosch has made two saws that look and feel very different. One model has a barrel-grip handle, while the other has an enclosed handle. A barrel-grip handle puts your hand closer to your workpiece. That's best for intricate work, such as cutting small radius curves. With a low center of gravity, there's less chance of



inadvertently putting side pressure on the blade and making a non-perpendicular cut. An enclosed handle, on the other hand, is easier to grip when making vertical cuts.

SOURCE

Bosch Tools, www.boschtools.com, (877) 267-2499, 7-Amp Top-Handle Jigsaw, JS470E, \$160; 7-Amp Barrel-Grip Jigsaw, JS470EB, \$160.

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freud
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Brad Greenwood

Blending craftsmanship, whimsy, California hardwoods and Rube Goldberg.

by Spike Carlsen

SOME FURNITURE MAKERS excel in rustic construction, others in elegant design; some accent their pieces with wood carvings, others with whimsical details. But few craftsmen bring all of these skills to bear in their craft—and no one blends them as seamlessly into a single piece of furniture as Brad Greenwood.

His unique, eclectic style may reflect his unique eclectic upbringing. He became enamored with wood while tinkering in his father's workshop as his father carved decoys. And his gift for design and style was influenced by his mother—a former runway model with a flair for interior design.

After taking design and furniture building classes at De Anza Community College in Cupertino California, Brad began to forge his way in the world of professional woodworking. To help pay the bills while establishing his business, he worked in auto mechanics and body repair. "It taught me how to use

my hands and also how material reacts to different forces," he explains. It also gave Brad the skills he now uses to fashion the clever mechanisms—some similar to those of a car door handle—used to operate secret drawers and compartments in his pieces (see "Open Sesame," page 31.)

Brad's initial foray into professional woodworking met with muted success. He tried his hand at making landing nets for fly fishermen, but found the work highly competitive and highly boring. So he turned to rustic furniture. "The first few pieces were twig furniture and I wound up throwing them away," Brad recalls. "But then I began having luck selling pieces through the Design Center in San Francisco." By the mid-1980s he was earning enough to make a living, and soon began adding more refined elements to his pieces.



Stick 'em Up! gun cabinet



Stick 'em Up! cornice carving



Buffalo Hunter shooting game

Inspiration and whimsy

Brad's work is inspired, in part, by Arts and Crafts furniture, as well as the Black Forest furniture of Germany—a style characterized by its rustic feel and use of carved elements that often portray wildlife. Most of Brad's carvings are based on photographs he's found or taken himself in Yellowstone and other national parks. He strives for realism. When he couldn't find the right photograph for the suspended birds in his *Stick 'em Up!* gun cabinet (see photos, above), he opted for the real thing. He went to a local quail dealer, got his own models and hung them exactly how he wanted them.

Brad's furniture pieces are also often adorned with whimsical elements. *Great Plains Buffet* (see photo, page 30) has miniature fence posts strung across the top and pistols wedging the through tenons at the bottom. *Boy's Cupboard* features mini bunk beds for

shelves and mini ladders for dividers. Brad's mechanical shooting games, such as *Buffalo Hunter* (above) are based on coin-operated games he encountered on visits to the local drugstore as a kid.

Brad's pieces have a sense of humor. "A warped sense of humor," he adds. "I like surprising people. It draws them in—and I think it's one of the things that makes me successful." A client who recently purchased a poker table asked if Brad could integrate a hidden mechanism for popping up a surprise card.

Although it functions as a dry bar with a pull-out prep surface, *Outlaw Cabinet* (see photo, page 30) blends fine woodworking with high-tech "animatronics." Drop in a quarter and you get your money's worth: The robotic cowboy blinks, moves, sings and taunts the sheriff (who's seated in the outhouse). Lights come on and objects move—all this made possible by servo-mechanisms similar to those used at Disneyland and

A Great American Woodworker

a computer chip programmed by Brad's wife, Lorraine.

"I love to reuse and recycle things," he says. "Visiting a junkyard can give me lots of ideas." Referring to the 125-year-old ranch (previously owned by an antiques dealer) where he now lives with his wife and four sons, Brad muses, "There's lots of inspiration laying around here."

Talking woods

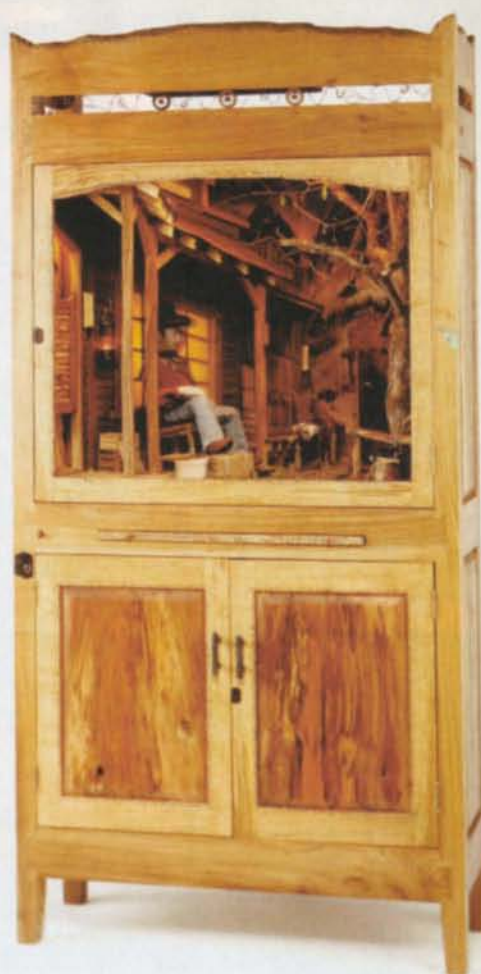
Brad uses hardwoods harvested in California and loves working with walnut, mulberry, elm and eucalyptus. Most of his wood comes from trees downed from natural causes and headed for the chipper. The walnut often comes from nut orchards where older, less productive trees are being removed and replaced with younger, more productive ones.

Brad has a tremendous stash of wood. Some slabs have such character they talk to him. "Some pieces say, 'Yep, I'm an end table.' And that's what they become."

About half of Brad's work is commissioned. While he enjoys building specific pieces for clients, he feels it can limit his imagination. "If you show a sketch to the client, the finished piece had better look like the sketch," Brad explains. "But non-commissioned pieces can evolve."

Some of Brad's elaborate desks and mechanical games can cost as much as \$18,000; a simple (ha!) barstool brings \$1,200. Brad spends up to 400 hours designing and building his more intricate pieces. "Sometimes I don't keep track of the hours because I'd realize I'm not making much," he reflects. The prospect of low hourly wages doesn't deter this craftsman, whose personal motto is "Love what you do. It shows." 

continued



Outlaw Cabinet with animatronic display



Great Plains Buffet—A Tribute to the American Spirit



See the animatronic display in action at AmericanWoodworker.com/WebExtras

See more of Brad's amazing work at www.bradgreenwood.com.

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.

Open Sesame

A trademark of Brad's furniture, particularly his desks and buffets, are hidden drawers and secret compartments. "I've always had an interest in mechanical things," he says mischievously. "And I like to have fun." Brad's hidden-compartment pieces are often requested by repeat clients who know about his special affinity. His advice for first-time hidden-compartment builders? "Plan ahead. Keep it simple. Have fun."

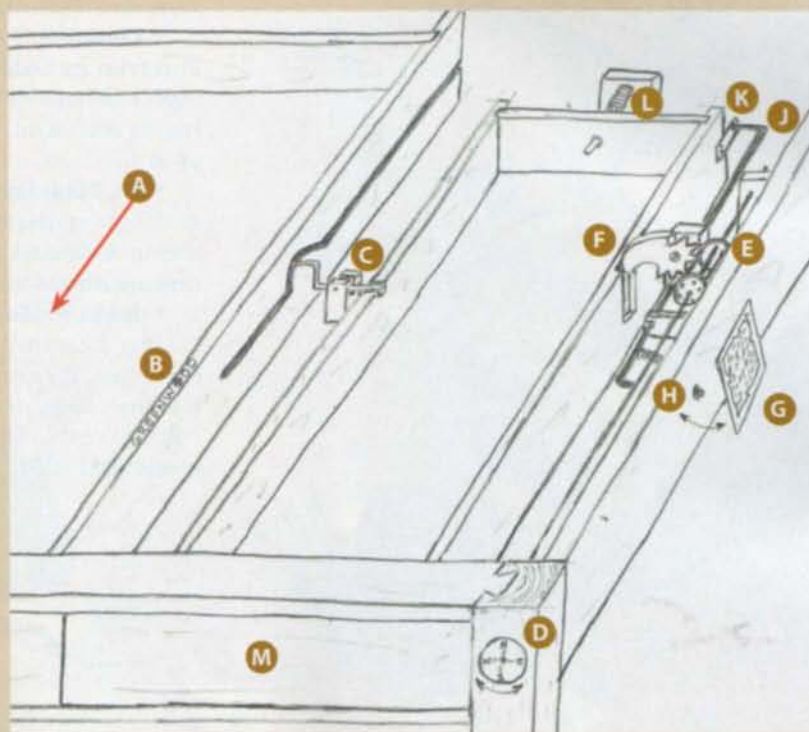
Brad's mechanisms are typically a combination of metal and wood. Some hidden compartments are simply drawers or panels that blend in with the surrounding wood. But others are more complex—much more complex. For example, unlocking the hidden drawer on Brad's *Northwoods Desk* (right) requires:

Opening the main drawer (A) to a specific position that's located by looking through a small open knothole in the desktop's front edging and lining up crosshairs (B) which ... causes the teeter-totter (C) to rise out of notch in the secret drawer, after which you ... rotate the compass on the front leg (D) to the south position, which ... causes the shaft to rotate the spool gear (E) that turns the cog gear (F), which rotates the catch out of the side of the drawer. After which you ... swing the decorative diamond shape on the side apron (G) downward to reveal the release button (H) which ... causes the linkage with the spring (J) to pull away from the metal catch (K), which activates the spring on the back of drawer (L) which ... automatically thrusts out the secret drawer/apron front (M).



Northwoods Desk

Hidden drawer mechanism



10 Everyday Tools

Here's what one pro always keeps in his toolbox.

by Chad Stanton



MY FAVORITE TOOLS are the ones that I use every day—around the house, in the shop or at a jobsite. They've become old friends. They're not complicated, gimmicky or gold-plated. Seven of them cost less than \$20 apiece.

My everyday kit also includes a few obvious tools not shown here, such as a hammer, tape measure, screwdriver, carpenter's pencil and a utility knife. The ten tools I've arranged on my bench round out that set. Let me introduce you to my pals:

- **Cordless drill.** This tool is a must for drilling holes of any size. I also use it for driving small screws. After adjusting its clutch to a very light torque setting, I'll set the drill to its low speed and use the variable-speed trigger to turn the screw very slowly. For large screws, I use an impact driver.

- **Lufkin 6' folding rule.** I really like this rule's extension slide for measuring inside something.

- **Compass.** I use this mainly for scribing cabinets and trim in order to get a good fit against an uneven wall. I also use it for bisecting angles, along with a sliding bevel. And, oh yeah, I use it for drawing circles as well.

- **No. 3 Stanley plane.** This plane is shorter, narrower and lighter than a No. 4, but that makes it easier to use in awkward situations. I can even hold it upside down without too much effort.

- **Irwin ProTouch 15" handsaw.** With a good saw, cutting by hand is just as fast and accurate as using a machine. It's certainly a lot more enjoyable. This saw has fine 12-pt. teeth up front for accurately starting a cut; the rest of the saw has coarse 9-pt. teeth. Look for model 2011201. I love it!

• **1-1/2" Stanley No. 60**

butt chisel. Once in a while, I beat the snot out of this thing—and it can take it. A butt chisel is shorter than a standard chisel, which makes it easier to store in my tool belt. I use it for splitting 2x4s, letting in a butt hinge, paring a miter and everything in between.

• **Sliding bevel.** Corners are never truly square, are they? This is an essential tool for measuring the angle of a corner when laying out miters on house trim, especially baseboards.

• **Small pry bar.** It's for removing trim, of course, but I also place it under the claw end of a hammer when I'm removing a nail, to protect the wood.

• **Impact driver.** This tool is for driving screws, not drilling holes. An impact driver has much more torque than a cordless drill. I like its small size, especially when I'm standing in an awkward position while hanging a cabinet.

• **Swanson 6" combination square.** Nope, not a 12"—a 6" has better balance and comfortably stores in my tool belt. I use it as a square, a depth gauge, a height gauge and a marking gauge. 



Troubleshoot a hand plane at
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Chad's StepBox

Learn how to make compound-angle dovetails building this handy stool and portable tool box.

by Chad Stanton



FOR MY JOB as a trim carpenter and furniture-maker, I've always needed a sturdy stool to stand on. I've also wanted to make a nice box for carrying my tools and a small workbench for cutting molding. While perched on an overturned bucket one day, I thought, "Why not combine all three?" The StepBox was born.

The StepBox has splayed sides for stability, ample room for my tools (see "10 Everyday Tools," page 32), and grooves and notches in the top for holding pieces of molding and drilling holes.

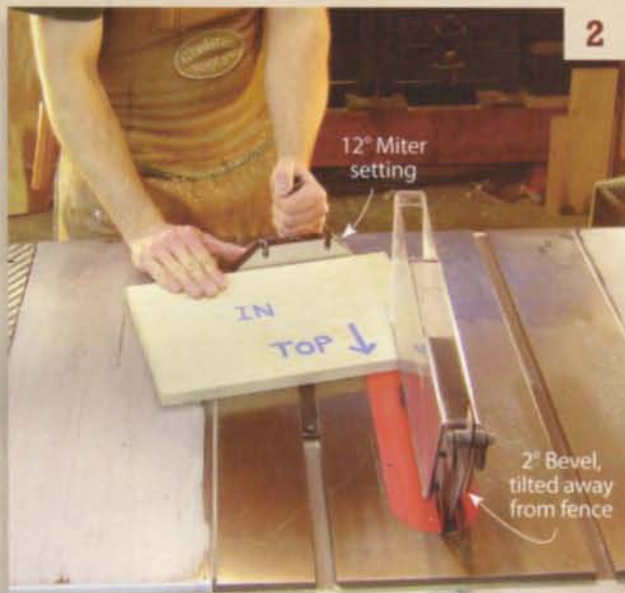
Building the StepBox gave me an opportunity to learn how to make a challenging joint: the compound-angle dovetail. While I could have merely screwed the parts together, I wanted a stronger joint. Dovetails are definitely the way to go. When I stand on the stool, the joints actually tighten. This project is built to last!





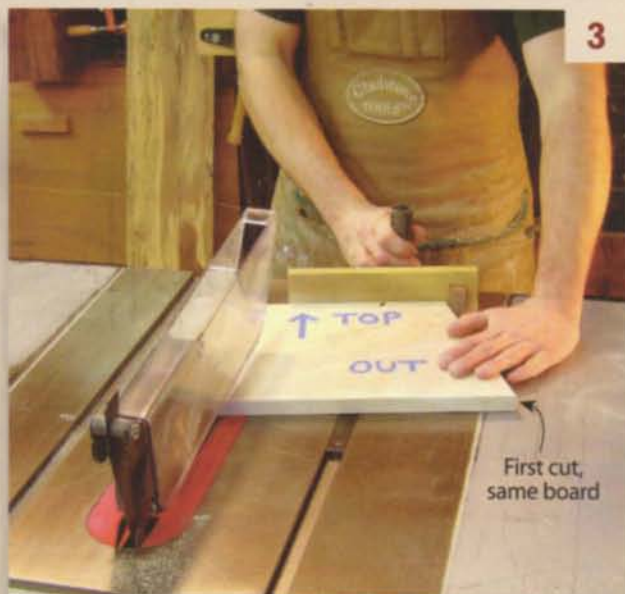
1

Rip 12° bevels on the long edges of the side and end pieces. Note that both edges are beveled, and that the bevels lean the same way.



2

Saw an angled end on each piece. This is a compound cut: The miter gauge is set at 12°; the blade is tilted to 2°. (See "Compound-Angle Butt Joints", next page.) The inside surface of the board must be facing up.



3

Make the second cut on the other side of the blade. Leave the miter gauge and blade at the same settings, but flip over the workpiece, so the outside surface is facing up.

Materials

I made the base and handle of my StepBox from 3/4" hard maple. As you know, this wood is very strong. It can easily take my weight and more when I stand on the stool. Maple is also a good choice for dovetailing. Pencil lines are easy to see, and it cuts and pares cleanly, without splintering. But because it's so hard, I have to keep my saw and chisels extra-sharp (see "Wicked Sharp!", page 60).

I made the top from a 1" thick stair tread. It's Southern yellow pine—a tough wood, like maple, but not as heavy. The top must withstand a lot of wear and tear (I may even drill into it occasionally), so I used a piece of wood that would be easy and inexpensive to replace.

The challenge

The StepBox's base splays 12° in both directions. It won't tip over, even when I stand with my feet right on the edge. The splay also makes it easier to fish out tools from the box and drop them back inside.

Creating this splay is quite interesting: You must cut the ends of all four base pieces at a compound angle. You might think that merely mitering the pieces at 12° would do the trick. It doesn't. In order for all four pieces to butt together, you must bevel their ends at 2° as well.

These compound angles can make your head spin. But you won't go wrong if you follow my technique. Even so, I strongly suggest that you make a complete base from scrap wood first, to familiarize yourself with each step, before cutting into your expensive maple.

Cut the compound angles

Joint and plane the sides (B) and ends (C) to final thickness. Cross-cut them about 1" extra-long and rip them about 1/4" extra-wide. Tilt the blade of your tablesaw to 12° and rip one long edge of each piece. Flip each piece over and rip it to final width (**Photo 1**). I clamped a board to my fence so the bevel didn't get trapped under the fence.

Mark your pieces well. Stand each board on edge, long side

Compound-Angle Butt Joints: The Setup Block

MOST BUTT JOINTS are easy to make. A box with four square sides only requires 90° cuts, right? But if the sides slope, like a pyramid, these pieces have to be cut at a *compound angle*.

Take my StepBox, for example. All four pieces of the base splay outward at the same angle—12°. Their ends are cut with a 12° miter and a 2° bevel.

Let's say you wanted to make a box with a 20° splay. Obviously, the bevel angle would be different—but how would you figure out what it is?

Well, you don't have to consult a chart. For a 20° splay, you just have to make a 20° setup block. And for a 12° splay, you'd make a 12° block. Following the steps below, you can make a setup block to give you the correct bevel for any compound-angle butt joint.

Make the block from a squared-up 2x4, or from any piece of wood that's at least 1-1/2" thick and about 12" long. I make my setup block by gluing up three pieces of 3/4" plywood. With plywood, I don't have to joint or plane the block, and I create a lip that helps orient the block through the cutting process.



Watch Chad cut these joints at AmericanWoodworker.com/WebExtras

To make the block, cut one piece of plywood 3" x 12". Cut two pieces 2 - 1/2" x 12". Glue them together in a stack. The sides and ends of the three pieces don't have to be perfectly aligned; close is good enough.

The next steps depend on whether your saw's blade tilts left (away from the fence) or right (toward the fence). In the photos, I'm using a left-tilt saw.

- **For a left-tilt saw:** Tilt your tablesaw blade to the splay angle of your project. Rip the block, running its lip against the fence (**Step 1**). Next, crosscut the block (**Step 2**). Finally, turn your miter gauge counter-clockwise to the splay angle. Rotate the block 90° and butt its end up to the blade (**Step 3**). Tilt the blade to match the angle of the block. This will be the bevel angle for the compound cut.

- **For a right-tilt saw:** Tilt your tablesaw blade to the splay angle of your project. Place the saw's fence on the left side of the blade. Rip the block, as in Step 1 above, running the lip against the fence. Next, place the miter gauge in the left miter slot. With the lip in front, as in Step 2 above, crosscut the block. Finally, turn your miter gauge clockwise to the splay angle. As in Step 3 above, rotate the setup block 90°, so the lip is up, and butt the end of the block to the blade. Tilt the blade to match the angle of the block.

Step 1



Rip the setup block at the angle that the sides of the box will splay. In this step and the ones that follow, note which way the block's lip faces.

Step 2



Crosscut one end of the block. Leave the blade tilted at the same angle as Step 1. The miter gauge is set at 90°. Once the block is cut, you're ready to set up your saw for cutting compound-angle butt joints.

Step 3



Set the miter gauge to the splay angle. Rotate the setup block 90° and place the freshly-cut end of the block against the blade. Tilt the blade until it matches the block's angle—this is the bevel angle of the compound cut.

Fig. A Exploded View

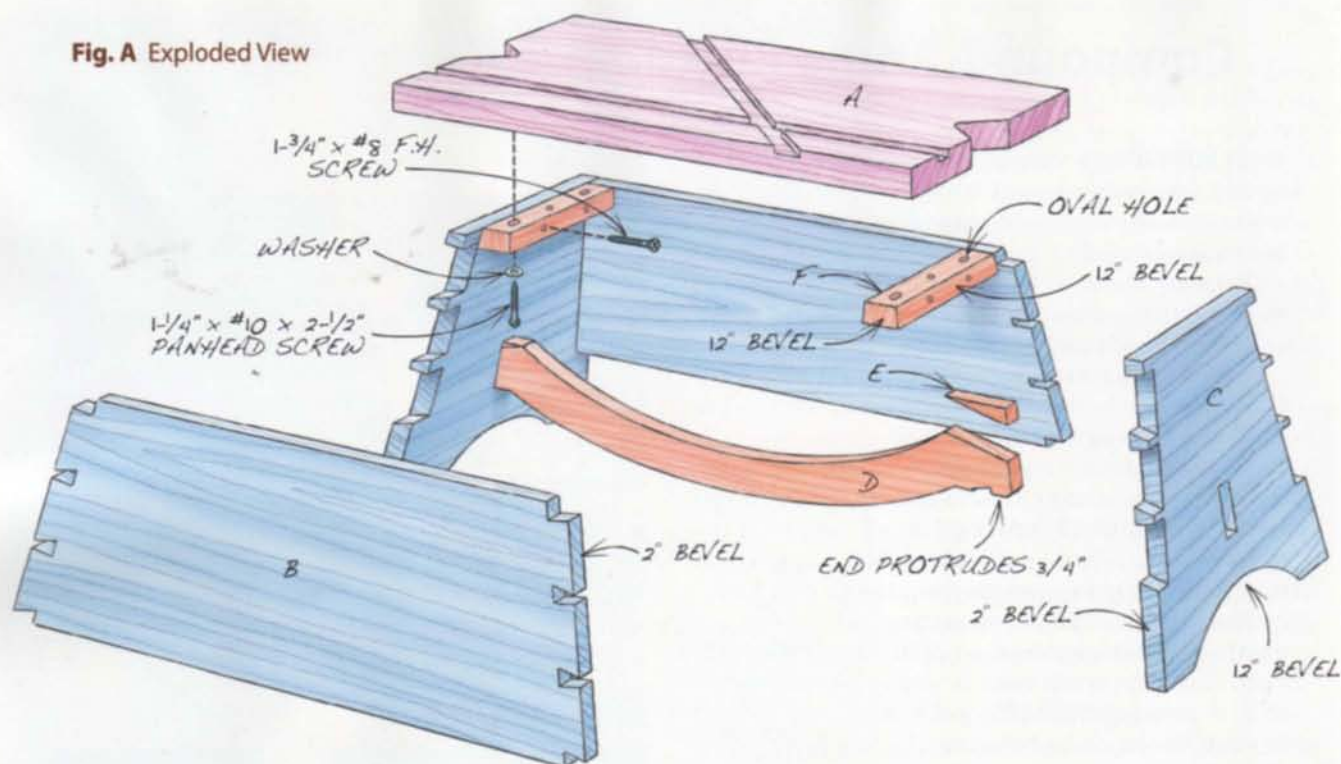


Fig. B Pin Layout

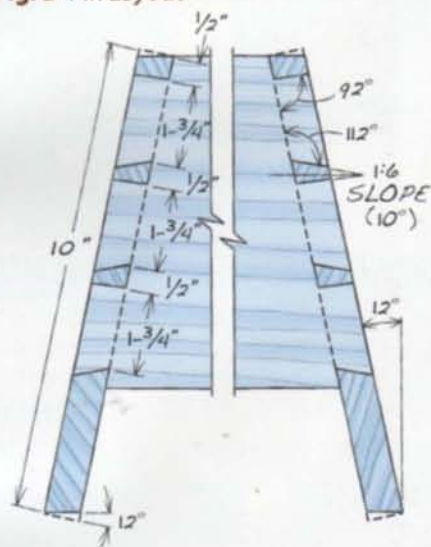


Fig. C End View

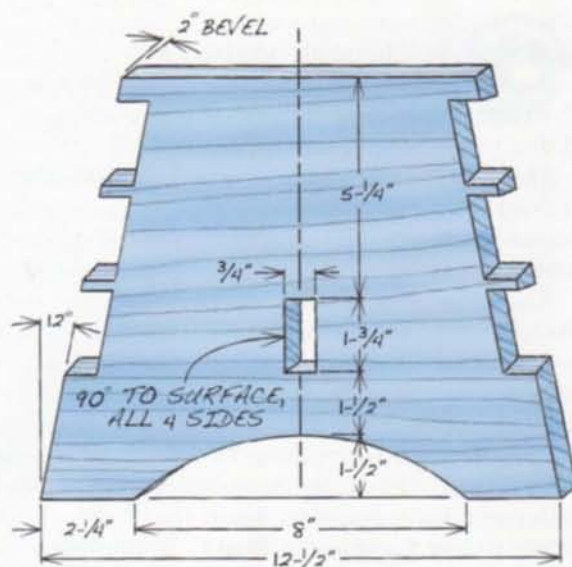
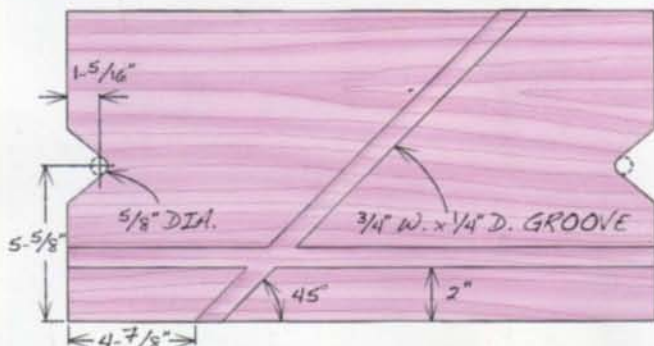


Fig. D Top



Cutting List

Overall Dimensions: 10-1/2" H x 22" L x 12-1/2" D

Part	Name	Qty.	Material	Th x W x L
A	Top	1	5/4 Pine	1" x 11-1/2" x 22"
B	Side	2	Maple	3/4" x 7-1/4" x 20-3/4"
C	End	2	Maple	3/4" x 10" x 12-1/2"
D	Handle	1	Maple	3/4" x 3-1/4" x 22-3/4" (a)
E	Wedge	2	Maple	3/4" x 3/4" x 2-3/4" (a)
F	Cleat	2	Maple	3/4" x 1-1/4" x 7-1/2"

Note: a) Cut piece at least 1" extra-long, fit, then trim to final length.

down, so you can clearly see which way it leans. Think of the board as one face of a pyramid with its top cut off, as shown in Fig. A (page 38). Using a carpenter's pencil, write Top—In and Top—Out in big, bold letters on both sides of each piece.

Get ready to make the first cut on the end of each board. The procedure to follow depends on which way your sawblade tilts:

- **For a left-tilt saw:** Place your miter gauge in the right-hand slot. Rotate its head counterclockwise to make a 12° cut (Photo 2). (Depending on how your gauge is marked, the reading will be 12° or 78° .) Tilt the blade to 2° . Place each board so the In side faces up and the Top edge faces away from you. Cut the end. Repeat this process for each board. To cut the opposite ends, move the miter gauge to the other side of the blade (Photo 3). Fasten a fence to the miter gauge, so you can screw or clamp a stop block to it. (You'll need the stop block to ensure that matching pieces are cut the same length.) Flip over each board so the Out side faces up and the Top edge butts against the miter gauge. Make the cuts.

- **For a right-tilt saw:** Place your miter gauge in the right-hand slot. Rotate its head clockwise to make a 12° cut (the opposite direction from the one shown in Photo 2). Tilt the blade 2° . Place each board so the Out side faces up and the Top edge butts against the miter gauge. Make the cut. For the second cut, move the miter gauge to the left-hand slot. Flip each board so the In side faces up, and Top edge faces away from you.

Cut the dovetails

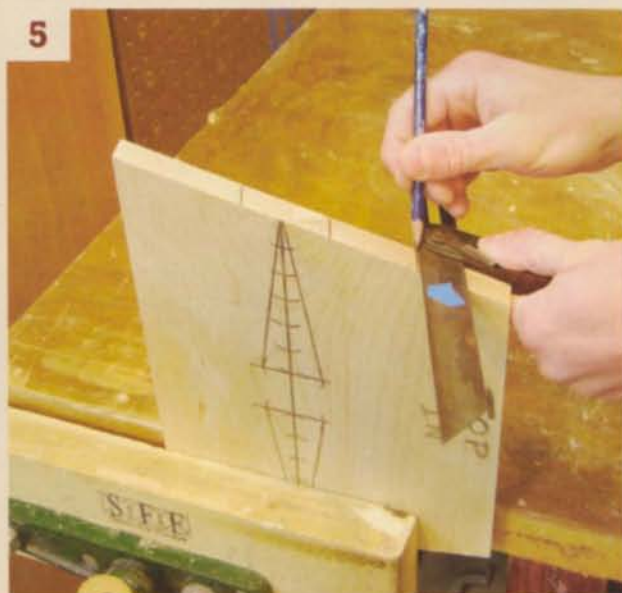
If you thought the angles are tricky so far, just wait! Laying out these dovetails can make your eyes go crossed—the angles just don't look right when you first draw them. Fortunately, I used a foolproof system for drawing the dovetails (see "Compound-Angle Dovetails—The Layout", page 54). Let me quickly show you how it works, and then we'll move on.

Lay out the pins first (Fig. B).

Lay out the dovetails. Start with the pins. First, draw a large triangle on the board that indicates the pitch of the dovetails. Set your sliding bevel directly from the triangle. (See "Compound-Angle Dovetails: The Layout", page 54).

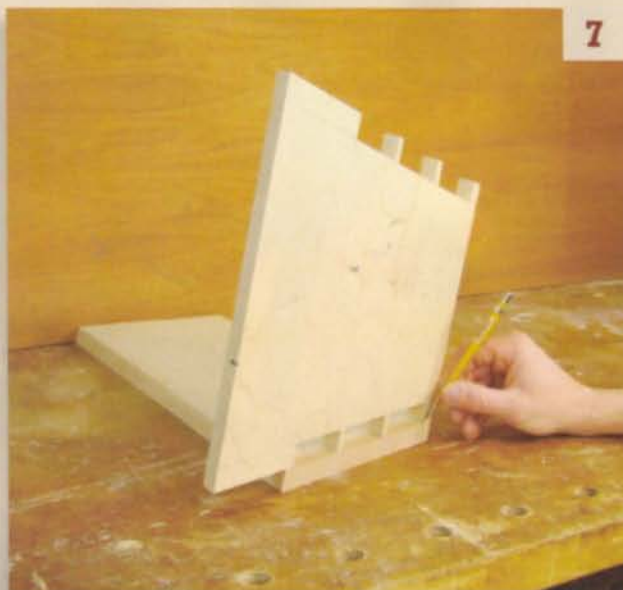


Transfer this angle to the end of the board. The right side of the triangle shows the correct angle for the right sides of the pins.



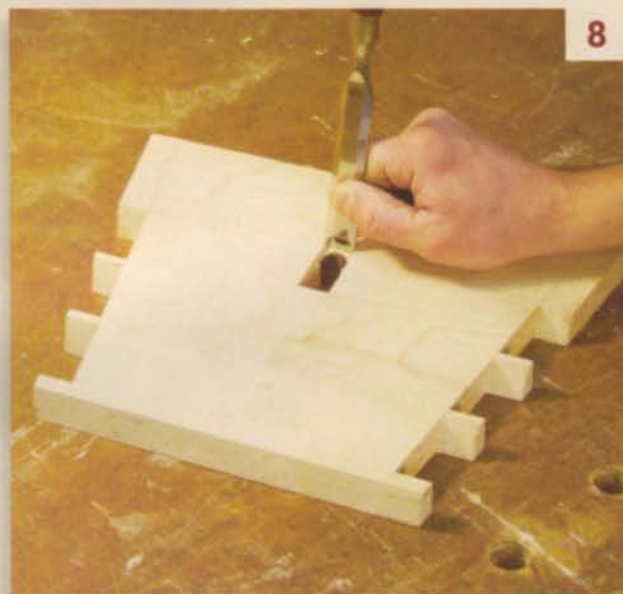
Saw the pins. This is a bit trickier than sawing standard dovetails. Every cut is a compound angle—it leans two ways. I use an auxiliary support to raise the workpiece and to keep it from chattering.





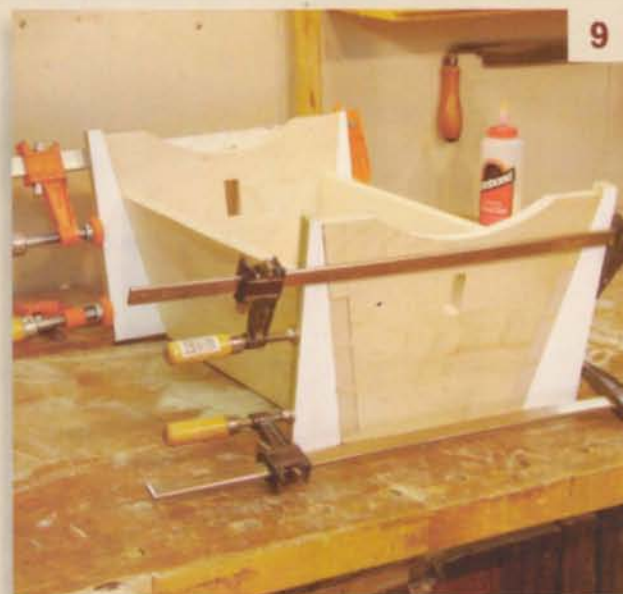
7

Draw around the pins to mark the tails. Sawing and chopping out the tails is no different than making standard tails, but once again, these will all be compound angles.



8

Drill and chop mortises for the handle. There are no compound angles here—all sides of the mortise are square to the surface.



9

Glue the base. Use triangular blocks to prevent the clamps from slipping or digging into the wood.

Draw a pair of large triangles on the inside face of each end board. The long sides of the triangle represent the pitch of the dovetails (in this case, the familiar 1:6 ratio). Place a sliding bevel on the face of the board and set it to match the right side of the triangle (**Photo 4**). Place the square on the end of the board and draw the right side of each pin (**Photo 5**). Reset the sliding bevel to the left side of the triangle to draw the left side of each pin. That's the gist of it.

If you've made through dovetails before, the rest is pretty standard. I won't claim it's easy—just familiar. You saw and chop the pins (**Photo 6**), then lay out, saw and chop the tails (**Photo 7**). Accurate layout is the key to the whole process.

Mortises and arches

Before assembling the base, drill and chop mortises for the handle (D, Fig. C). Although the base has a 12° splay, the top and bottom walls of the mortises don't lean at 12°—they're square to the faces of the end pieces. Use a pencil to lay out the mortises on both sides of each piece. Outline the perimeter of the mortise with a knife or chisel.

Using a wide chisel, pare to these scribed lines to establish a shallow shoulder all the way around the mortise. Do this on both the front and back sides of the workpiece. Use a 5/8" Forstner bit in a drill press to remove most of the waste, then finish the mortise by hand (**Photo 8**).

There's one more task before assembly: Cut arches on the bottom side of both ends. The arches form four feet. They give the stool more stability on an uneven surface than if the ends were left straight. Draw the arches on the Out face of each end piece. Tilt your bandsaw table 12° and cut the arches. Sand them smooth. These surfaces should look good, since they'll face up when you tote the StepBox around.

Glue the base

Make four gluing blocks, tapered at 12° (**Photo 9**). It may be tempting to use the offcuts from the base

Make the blocks from a soft wood, such as pine, with the grain going the long way. Why use a soft wood? If the pins stick out a bit, they'll crush into the wood, allowing the block to continue pushing against the tails—where you want the pressure.

Glue a thick piece of paper onto the face of each block. The paper will absorb the glue squeeze-out and prevent the blocks from adhering to the base.

Glue and clamp the base. Plane, scrape or sand the dovetails so they're flush.

Saw out the handle (D, Fig. E), leaving it 1" or so extra-long on both ends. (Note that the drawing shows it cut to final length.) Don't saw out the notches on each end of the handle yet—you'll mark their locations directly from the base.

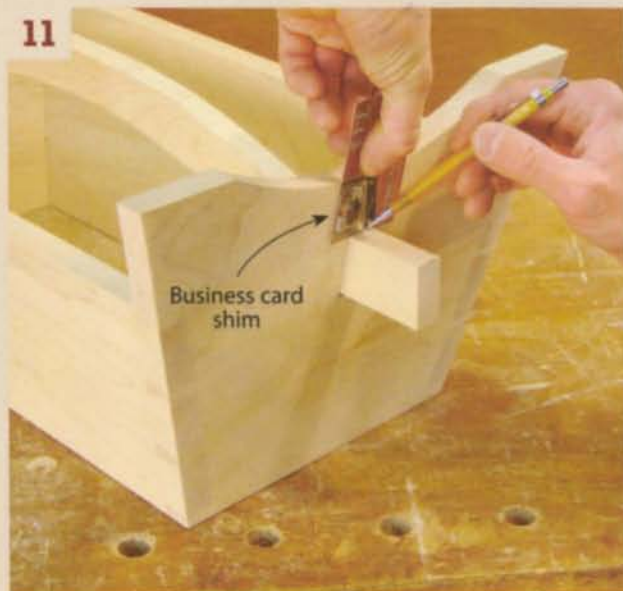
Slide the handle into the base (**Photo 10**). Draw a line across the top side of each end, using a business card as a shim (**Photo 11**). This shim deserves some explanation. Let's say you just drew the line for each notch flush up against the base. After cutting the notches, you'd find that the distance between them would be too short. You have to allow the extra distance caused by the splay of the base, and that's where the shim comes in.

Withdraw the handle and saw and chop the notches (**Photo 12**). Stick the handle back in the base and test the fit of the joints. Adjust as necessary. When all is well, remove the handle and round over the section between the notches with a spokeshave. Test how it feels

10

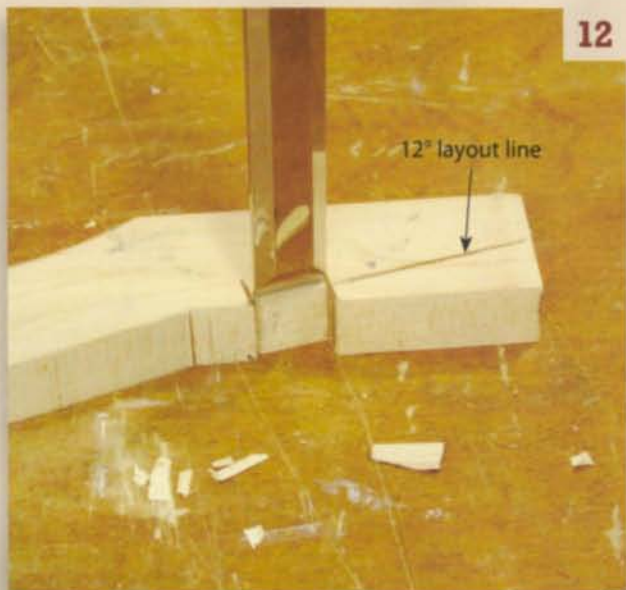


11



Technical drawing of a curved wooden piece, likely a part of a boat hull or a decorative element. The drawing is on a blue grid background. The piece is light brown with a wood grain texture. Dimensions are given in inches:

- Overall height on the left: $3\frac{1}{4}"$
- Height of the top flat section: $2\frac{1}{4}"$
- Height of the bottom flat section: $1\frac{1}{2}"$
- Height of the top flat section (from the bottom flat section): $\frac{1}{4}"$
- Angle of the top flat section: 12°
- Height of the curved section: $1\frac{1}{2}"$
- Height of the curved section (from the bottom flat section): $1\frac{1}{4}"$
- Angle of the curved section: $< 1^\circ$
- Overall width: $11\frac{3}{8}"$
- Width of the top flat section: $2\frac{3}{4}"$



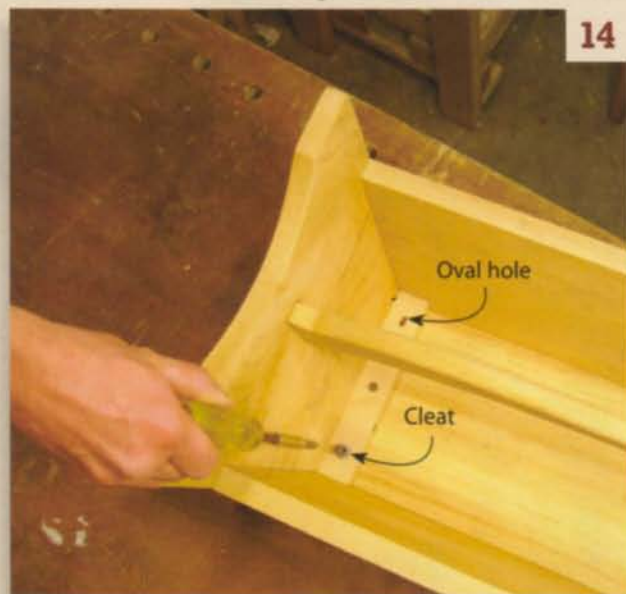
12

Saw and pare the notches. Slide the handle back through the mortises and see if the notches fit the ends. If all is well, remove the handle and round its faces with a spokeshave.



13

Glue the handle to the base. Slide in a large 12° wedge to lock the handle in place. After the glue is dry, saw the end of the handle and the wedge to final length.



14

Attach the top. It's fastened through cleats that are glued to the base. The outside holes in the cleats are oval, to allow the top to move without cracking.

in your hands, and make it rounder or slimmer to suit.

Prepare two 12° wedges (E) for locking in the handle. Make them extra-long, so they'll be easier to make and install.



Learn how to make a wedged-tenon joint at AmericanWoodworker.com/WebExtras

Brush glue on the handle's notches and slide the handle in place. Apply glue to the wedges and lightly tap them in place (**Photo 13**). After the glue is dry, cut the handle and wedges so they protrude 3/4" beyond the end pieces. Soften their edges with a file and sandpaper.

Add the top

Cut the top (A) to final size. Cut both grooves in the top using a dado set in your tablesaw (**Fig. D**). Use a miter gauge and fence for making the 45° groove. To make the notches, first drill a hole for each one, then cut the notches on the bandsaw.

Make the cleats (F) that will be used to fasten the top. Note that the outer holes in the cleats are oval (**Fig. A**). This allows the top to shrink and swell without cracking. Glue the cleats to the base.

Apply finish to the base and top, then fasten the top to the base (**Photo 14**). 



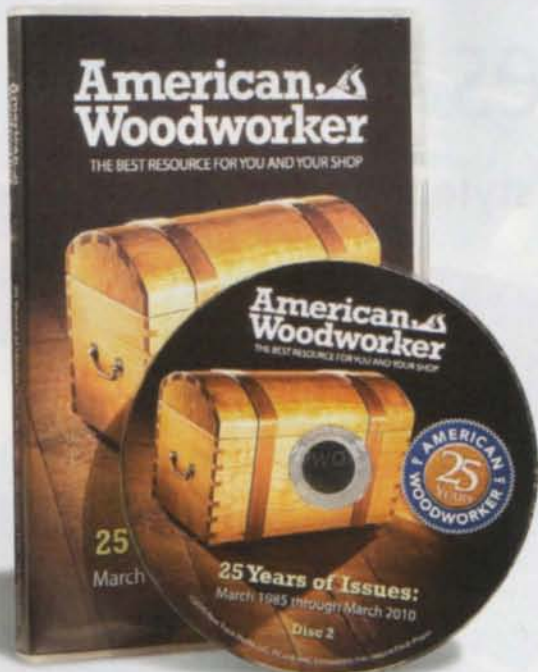
Chad Stanton

is a self-employed carpenter and furnituremaker.

He hosts the

web show *Wood Choppin' Time!* www.woodchoppintime.com, a mix of serious woodworking and light comedy.

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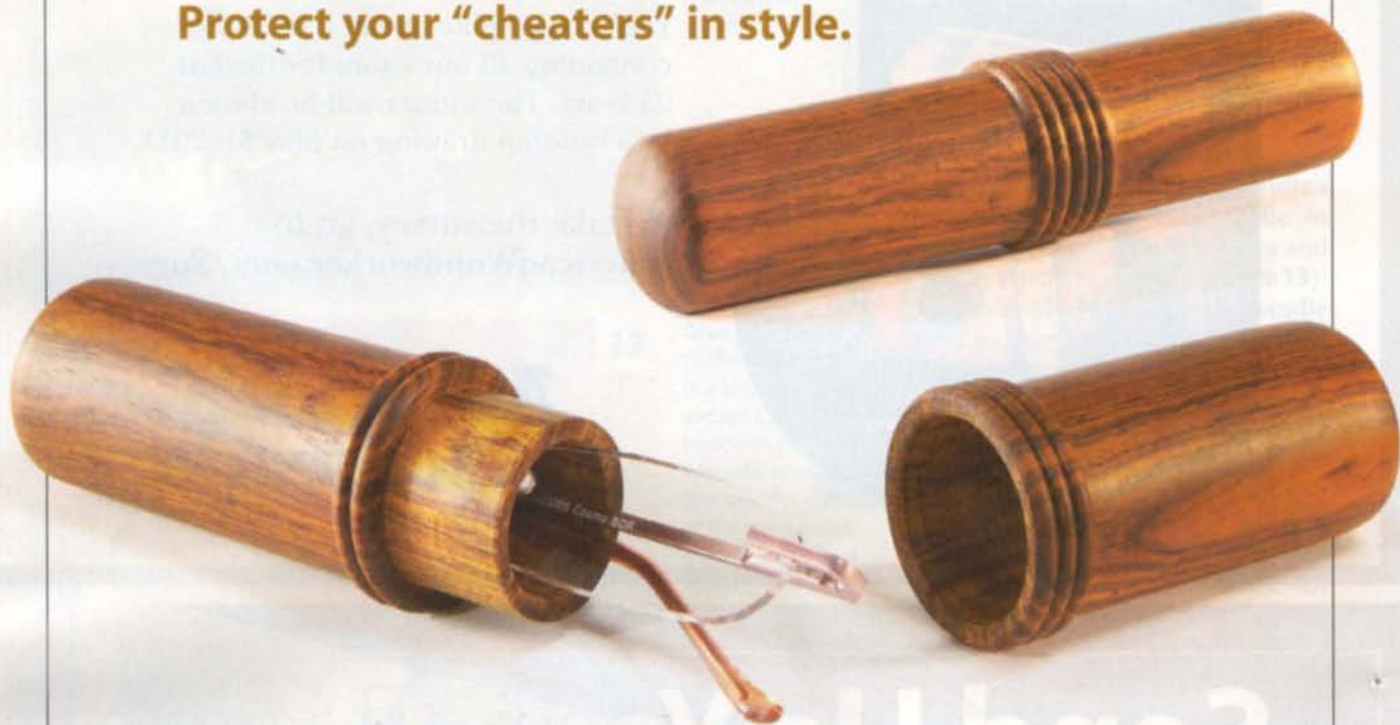
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Reading Glasses Case

Protect your "cheaters" in style.

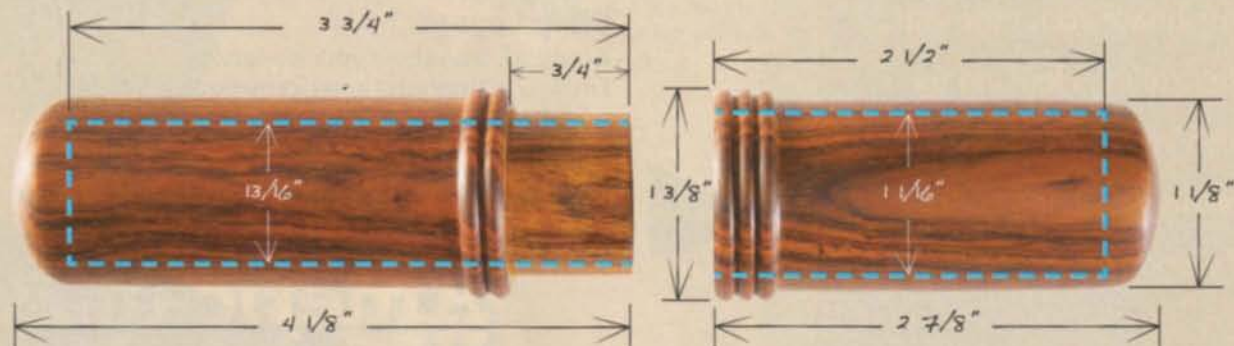


SOONER OR LATER everyone's eyes need a little help—especially for reading or close work. One popular solution is to buy a pair of "cheaters," those stylish reading glasses that are available in bookstores and practically everywhere else. How to protect these delicate, inexpensive glasses—especially the compact versions—is always an issue.

A turned wooden case with a friction-fit cap is a

perfect solution. It's a unique gift that fits in pockets, purses and briefcases. It can also hold more than glasses. It would make an outstanding one-cigar humidor, for example, if you used the appropriate wood. In either case, this project provides an opportunity to develop skills in end-grain drilling, turning delicate details and creating just the right fit between the base and the cap.

Fig. A Dimensions

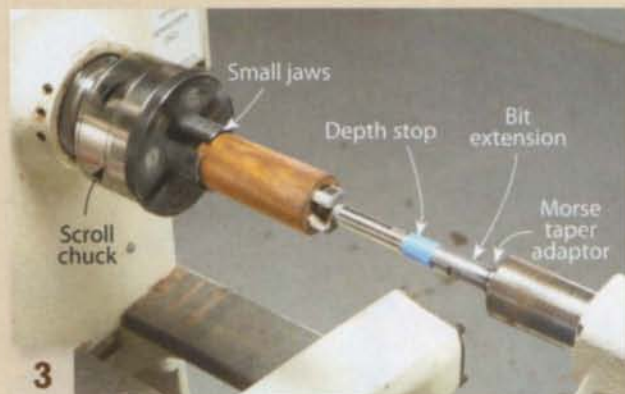




1 Skew chisel →
Start by cutting tenons on both ends of the blank. These tenons will be used later, when the cap and base pieces are drilled out.



2 Base Cap
 Thin-kerf parting tool
Separate the cap from the base by cutting in with a parting tool. Stop just before cutting through. Then twist the blank to break the pieces apart.



3 Small jaws Depth stop Bit extension Morse taper adaptor Scroll chuck
Drill out the cap with a Forstner bit attached to an extension for deep drilling and an adaptor for mounting in the tailstock. Slowly advance the tailstock to move the bit into the spinning blank.



4 Depth of hole
Face off the cap's rim by scraping with the skew chisel. The rim must be flat or taper slightly to the inside. Mark the depth of the drilled hole on the blank.

Materials and tools

A 1-1/2" square by 9" to 10" long block of wood should be more than adequate, although the glasses' size is the ultimate determinant (the glasses shown here measure 11/16" x 3/4" x 5-3/8"). Almost any wood will work, but stronger woods such as maple, cherry, cocobolo, purpleheart, gonzalo alves and boxwood will allow creating thinner walls. Make sure the wood is at the drier end of the spectrum.

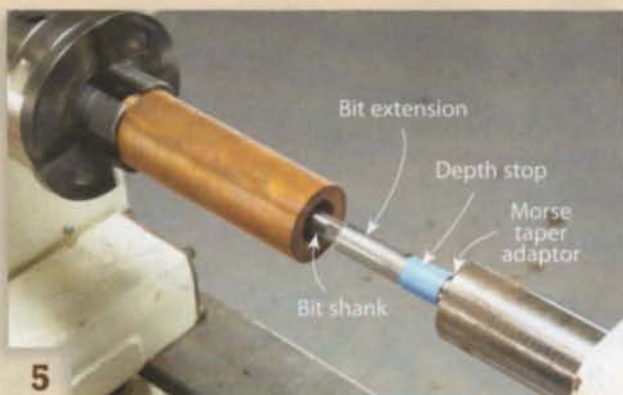
A spindle roughing gouge, a spindle/detail gouge, a parting tool, a thin-kerf parting tool and a skew chisel will suffice for turning. You'll need a scroll chuck equipped with a small set of jaws to hold the wood for drilling (see Sources, page 47). You'll also need two high-speed steel or carbide Forstner-style drill bits. An extension to allow drilling deep holes and an adaptor/holder with a #2 Morse taper end, designed to mount in the tailstock quill, can be purchased with the bits (see Sources). The glasses and the wall thickness of the case determine the bit sizes. For the glasses shown here, I used a 1-1/16" dia. bit to drill out the case's slip-on cap and a 13/16" dia. bit to drill out its base (Fig. A, at left).

Determine the proportions

Mount the blank between centers and knock down the corners using the spindle roughing gouge. Then turn tenons at both ends (**Photo 1**). These tenons will be used later, to mount the cap and base blanks in the scroll chuck. The tenons should be about 3/4" long and about 1" in diameter, and their shoulders should be slightly concave.

Lay out the base and cap on the blank. Their overall lengths depend on the depth of the holes drilled in them. Use your glasses and the overlap of the friction-fit joint to calculate the depth of these holes. I normally allow 3/4" for the joint on both parts (the tenon is on the base; the mortise is in the cap), and I drill into the base far enough to house the glasses by about two-thirds their length, so they won't easily fall out when the cap is removed. For the glasses shown here, I drilled a 3-3/4" deep hole in the base and a 2-1/2" deep hole in the cap.

The overall lengths of each part must be longer than the drilled holes, of course—by at least 1/4". Decide which end of the blank will be the cap and which will be the base. When you mark the dividing



5 Follow the same procedure to drill out the base. Use a smaller Forstner bit and drill the hole about two-thirds as deep as the glasses are long.



6 Turn a tenon on the base to fit the hole in the cap. Start oversize and reduce the diameter to create a very tight fit. A cone center supports the drilled-out end.



7 Mount the cap. Make sure that the assembled joint does not slip and that the ends of both drilled holes are marked. Bring up the cone center to support the end of the reassembled blank.



8 Turn the case to a cylinder after establishing the ends by cutting in with the parting tool about 1/4" beyond each end mark.

line on the blank, allow about 1/2" additional length on both parts for shaping their ends, finish sanding and parting off.

Use a parting tool to separate the cap and the base (Photo 2). Although not essential, a thin-kerf parting tool minimizes the wood loss, resulting in a slightly better grain match between these two parts on the completed case.

Drill the holes

It's much easier to fit the tenon on the base to the hole in the cap than vice versa, so start with the cap. Mount the cap blank in the small jaws of the scroll chuck. Then lightly face off the end with a parting tool or skew chisel—this makes it easier to center the drill bit. Drilling holes on the lathe is different than ordinary drilling because the workpiece rotates instead of the bit. Mount the large Forstner bit and its extension in the tailstock quill, using the Morse taper adaptor or a Jacobs-style chuck. Then drill into the cap by slowly advancing the bit (Photo 3).

The cap's rim must be perfectly flat or tapered to the inside, so scrape it lightly with the skew chisel

(Photo 4). Mark the hole depth on the outside of the cap blank. Then remove it from the chuck and mount the base blank. Lightly face off the end. Then install the small Forstner bit and its extension and drill into the base (Photo 5).

Turn the tenon

I install a cone-type live center in the tailstock to support the base blank while turning the tenon. Another solution is to fill the drilled hole with a piece of wood that's slightly tapered (like a bottle's cork), so you can use a standard live center.

I like the sure feel that a 3/4" long tenon gives the case's friction-fit joint. Use a parting tool and outside calipers to turn the tenon (Photo 6). Be sure to round the calipers' ends, so they don't catch and get launched at you by the spinning blank. Set the calipers about 1/16" oversize and then reduce the diameter in very small increments. Stop frequently and use the cap to check the fit. The goal is to create a very tight fit, so the joint won't slip—but not so tight that you can't remove the cap without breaking the wood.



9

Create tactile surfaces and disguise the joint by adding decorative details such as the beads shown here, using the skew.



10

Round the end of the cap by making rolling cuts with the spindle/detail gouge. Then finish-sand both the cap and the base.



11

Use the skew to part off the cap. Then remove the cap from the base and finish-sand its parted-off tip.



12

Tune the joint's fit by removing a tiny amount from the tenon with a peeling cut. Ideally, you'll hear a vacuum pop when you pull off the cap.

Shape the outside

Mount the fitted cap on the base and bring up the tailstock for support (**Photo 7**). Then establish the final outside lengths, which are based on the depths of the holes drilled in both pieces (**Photo 8**). Turn the case to a cylinder with the spindle roughing gouge and add details with the skew chisel or detail/spindle gouge at the same time (**Photo 9**). This time the goal is to leave just enough wood for strength in both length and diameter, so the case doesn't feel excessively heavy. Obviously, the hole in the cap ultimately determines the outside diameter.

Round the end of the cap and finish-sand the entire case (**Photo 10**). Part off the cap, remove it from the tenon, and hand-sand its parted-off tip (**Photo 11**).

Final details

Fine-tune the fit between the cap and the tenon by adjusting the tenon (**Photo 12**). Make a peeling cut (not a scraping action) to lightly remove a very small amount of wood. The goal is a piston-like fit. You should feel resistance between the parts; ideally, you'll hear

a vacuum pop when you pull them apart (the same sound you hear when pulling a cork from a bottle).

Round and finish-sand the end of the base using the same method used earlier on the cap. Then part off the base and hand-sand the tip. Apply the finish of your choice. I often use pure tung oil, especially for darker woods. For the cocobolo case shown here, I simply applied paste wax.

SOURCES

Choice Woods, www.choice-woods.com, (888) 895-7779, Maxi Cut HSS 13/16" Forstner Bit, #375120, \$29.50; Maxi Cut HSS 1-1/16" Forstner Bit, #375150, \$31.95 (other Maxi Cut HSS Forstner bit sizes are available); Rotastop 3-1/2" Extension, #375500, \$25.95; #2 MT Adapter, #375700, \$41.95; 13/16" Forstner Bit, \$29.50.

Oneway Manufacturing, www.oneway.ca, (800) 565-7288, Oneway Talon Chuck, #2985, \$232; Spigot (small) Jaws, #3016, \$40.95.

Alan Lacer is a woodturner, writer and instructor who lives near River Falls, WI. To see more of Alan's work visit www.alanlacer.com.



Rustic Shop

MY BOARD-ON-BOARD SHOP may look like an ancient rural farm building, but it's really only ten years old. I built it using Southern bald cypress, which is native to this part of Alabama, and just let the wood weather naturally. The inside is trimmed in cypress, too. Even after ten years, the sweet scent of cypress still permeates the shop.

Designed for large-scale woodworking, my 24' x 36' shop has 10' ceilings and plenty of storage upstairs. When the still summer heat hits, ceiling fans help to take off the edge. During the occasional cold winter blast, a pair of wall-hung catalytic heaters keep out the chill.

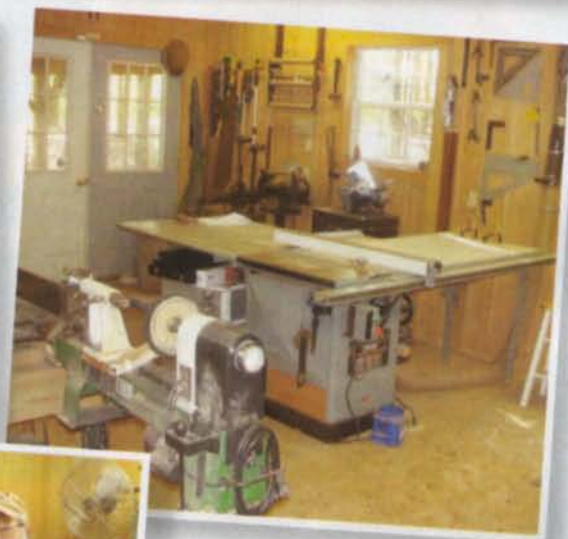
My stationary tools are located

centrally and along the walls. The high ceilings make it easy to maneuver long stock and allow overhead dust collection to each machine. Double doors and wide walkways between the tools facilitate moving large items. Mobile bases and flexible dust collection hoses allow moving things to provide additional elbow room when necessary. The tablesaw is positioned to take advantage of the double doors—I just open them to rip long boards. A mobile clamp rack and a mobile compressed air station allow assembling projects anywhere in the shop.

When I retired in 2004, I started a business building lawn furniture made from cypress. While some

aspects of the business were good, assembling the furniture and storing it between shows took quite a bit of shop space, and the constant loading, unloading and transporting quickly became tiresome. After a while, I decided to switch to another woodworking business—one that took up less space and was easier to transport. My interest in woodturning made pen making an easy choice.

I started turning pens as a hobby, using a small mini lathe. To expand my capabilities now that pen turning had become a business, I've purchased a much larger variable speed lathe. In addition to pens, I also turn wild game calls and wine



bottle stoppers, along with canes and walking sticks; I'm constantly thinking of new designs and unique challenges to keep things fresh and interesting. My mini lathe is still going strong—it's now permanently outfitted with a buffing wheel for polishing.

I mostly work with tropical hardwoods and acrylics, and since I live in rural Alabama, white-tail deer antlers are plentiful. (Antler turns nicely, but it smells bad—like having a tooth drilled; my wife won't visit the shop when I'm turning it.) Recently I was blessed to acquire some very old heart Southern yellow pine; its tight, contrasting growth rings make great-looking pens. A

hardwood forest near my shop provides an endless supply of uniquely-shaped material for my walking sticks and canes.

Had I designed a shop just for turning pens, it would have been a lot smaller, but I'm glad I've got the extra space. I'm ready for anything.



*Phil Freeman
Evergreen, AL*

Tell Us About Your Shop

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.

E-mail your entry to myshop@americanwoodworker.com with digital photos attached. Or mail your description with digital photos on a disc to My Shop, American Woodworker, 1285 Corporate Center Drive, Suite 180, Eagan, MN 55121. Please include your phone number. Submissions cannot be returned and become our property upon acceptance and payment. We may edit submissions and use them in all print and electronic media.

Five-Photo Frame

**If a picture is worth a thousand words,
this frame reads like a book!**



HERE'S A 5-FOR-1 DEAL that's hard to refuse. This neat little frame displays two 4" x 6" portrait images, two 4" x 6" landscape images and one 4" x 4" image in a 13-1/2" x 13-1/2" package. Made from a single 3/4" x 4" x 22" board, it assembles with half-flap joints

and miters that are reinforced with decorative splines. This frame contains only three parts, so it's easy to build—you simply make multiples of each part and assemble them. A couple of simple jigs make building multiple frames just as easy.

Cut the frame parts

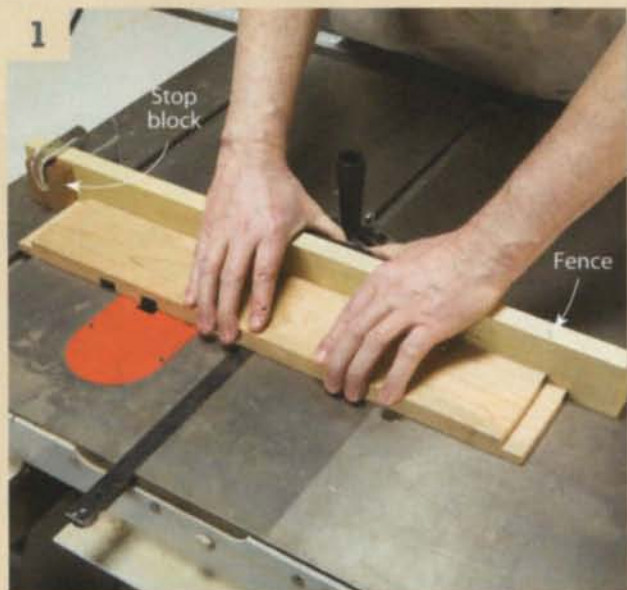
Install a dado set in your table saw and use the miter gauge and a fence with an clamped-on stop block to cut the $3/8" \times 3/4"$ rabbets and dados in the blank (**Photo 1** and Fig. A, page 52). These cuts must be precisely sized and located, so use a test piece to ensure accurate setups. Note that the rabbets are cut on one face of the blank and the dados on the other face. Cut the rabbets first. Then reposition the stop block (and flip over the blank) to cut each dado.

Rip the blank into four $3/4"$ wide pieces. Each one of these pieces contains the three different frame parts. Make test cuts on scrap stock first, to ensure that these four pieces snugly fit the dados. I follow an old-timer's advice for fitting joints: "A joint shouldn't go together without friction, nor need a hammer. It should be just tight enough to knock together with your hat."

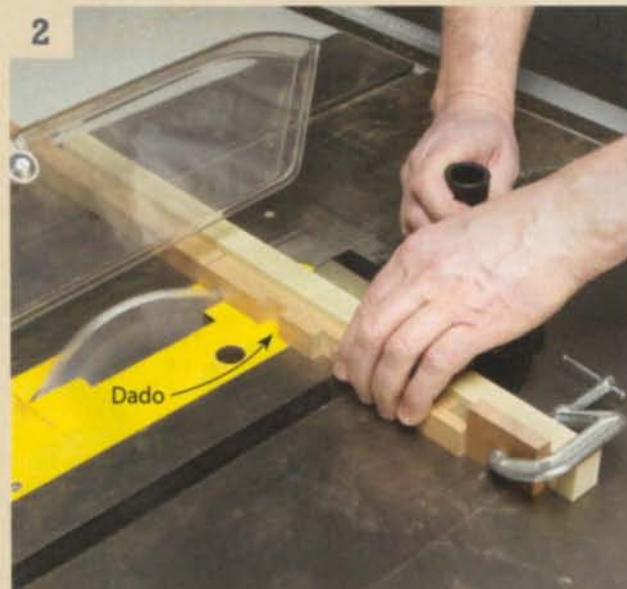
Install a new fence on the miter gauge to cut each long piece into the three frame parts. The first parts are rabbeted at one end and mitered at the other (A, Fig. A). Start by cutting a kerf through the fence with the blade tilted 45° . Orient the long piece with the dados facing the blade and mark it for cutting at $9-1/4"$. Align the mark with the kerf in the fence and clamp the stop block in position. Then miter each piece (**Photo 2**).

The second parts (B) are similar, except that their miters slope in the opposite direction. These parts share one critical $4-1/4"$ dimension with parts A (dimension "X," Fig. A). These dimensions must match for the frame's miter joints to fit properly. Mark the four offcuts from the previous step, orient each piece with its rabbeted end facing the blade and carefully align the mark with the kerf in the fence before you cut (**Photo 3**). The last parts (C) are mitered at both ends. They're made by shortening the mitered offcuts that remain from the previous step (**Photo 4**). Wait

Cut all the frame parts from one long blank. First, cut rabbets on both ends and two dados. Then rip the blank into four pieces sized to fit the dados.



Cut each long piece to create the different frame parts. To create the first part, miter the end that has the dados. Before you cut, make sure the dados face the blade.



Miter the opposite end of the offcut to create the second frame part. This time, make sure the rabbet faces the blade.





4

Miter the remaining offcut to create the third frame part.

until the other parts are glued together before cutting these parts to final size.

Glue-up

Assemble parts A and B without glue to test their fit (**Photo 5**). Make sure the rabbet shoulders butt flush, the joints are square and the critical "X" dimensions match. Glue parts A together first. Apply glue to the appropriate rabbets and dadoes and assemble the center pinwheel. Clamp each joint and let the glue dry. Then glue and clamp parts B. Remove the clamps and place the frame on a flat surface. Then cut, fit, glue and clamp each part C separately.

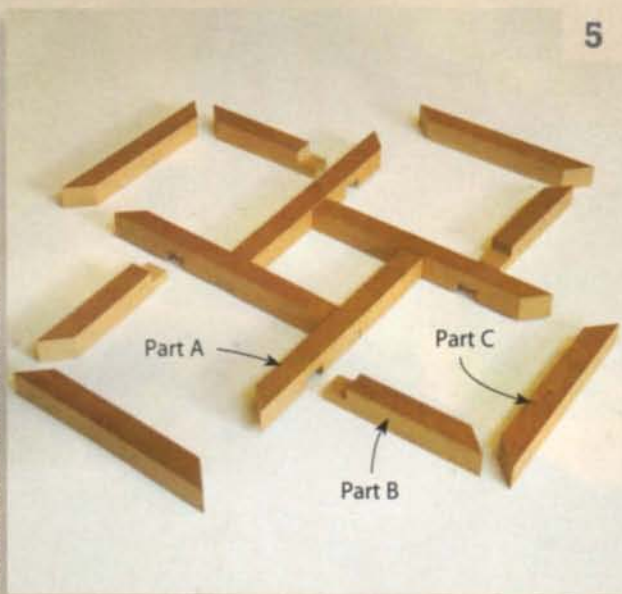
Install splines

Make a jig to cut slots for the spline in the frame's mitered corners (**Fig. B**). Center the frame on the bottom edge of a 12" x 12" piece of 3/4" MDF and transfer its jagged bottom profile (**Photo 6**). Label the three triangular sections as shown. Cut the blank into three 4" x 12" sections. Then cut out the three triangles and glue them to one of the two remaining MDF sections. Screw on the remaining MDF section and test-fit the frame. Widen the opening, if necessary, by adding playing card shims between the triangles and the outer piece of MDF.

Set the tablesaw fence so the blade will cut through the center of the jig. Set the blade's height at

5

Test-fit all the parts before gluing. Assemble the four parts A to form a pinwheel. Then install parts B. Cut parts C to fit after parts A and B are glued together.



COURTESY OF E. RICHARD CROCKETT

Fig. A Frame Parts

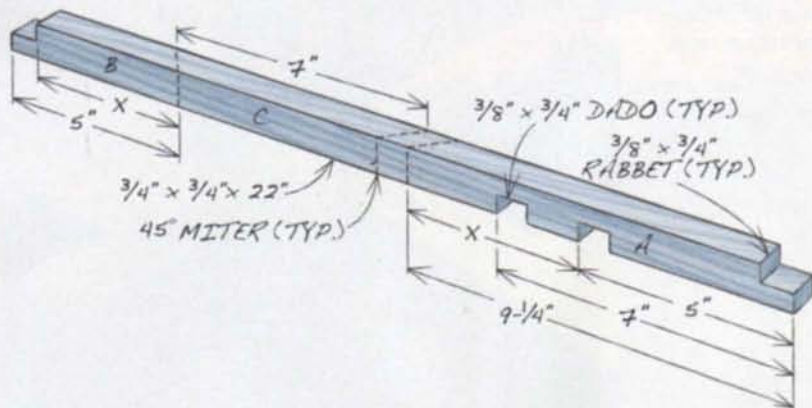
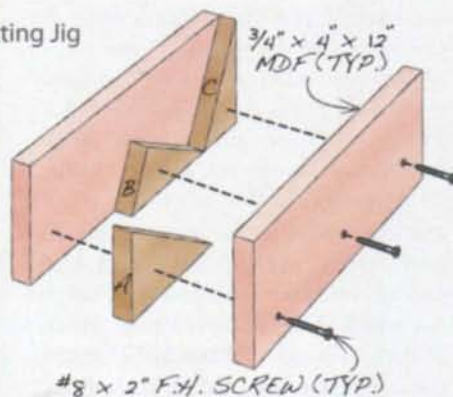


Fig. B Slotting Jig



1-1/2". Then install the frame in the jig and cut 1/8" wide slots in all the miters (**Photo 7**). Because of the frame's orientation in the jig, the slots will be longer on one face than the other.

Use the bandsaw to cut the spline stock. I compress each piece of spline in my bench vise. Glue makes the wood fibers rebound and swell to create tight joints (**Photo 8**). When the glue has dried, trim the splines with a saw and plane or sand them flush.

Final touches

Rout 1/4" wide x 3/8" deep rabbets on the back of the frame (**Photo 9**). (This depth hides the end grain from view in the half-lap joints.) Square the corners of all the rabbets—this is a pain in the neck to do by hand. To ease the job, I start by drilling out the corners with a 3/8" Forstner bit. This leaves visible scallops at each backside corner, but it makes removing the remaining waste much easier.

Apply your favorite finish. I used wipe-on polyurethane followed by a coat of paste wax. Install a saw-tooth picture hanger on the top horizontal frame part. To make sure the frame hangs level, center this hanger on the 4" x 4" middle frame. Cut glass and backing material (hardboard, foam core, etc.) for your photos and install them in the openings. Use turn buttons to hold everything in place.

Make a jig to cut slots for the spline. Mark the frame's profile on a 12" x 12" MDF blank. Then cut the blank into three equal pieces. Cut pieces A, B and C and sandwich them between the other two pieces.

6



COURTESY OF E. RICHARD CROCKETT

Cut saw-kerf slots for the spline in each miter joint. Rotate the frame 90° after each pass.

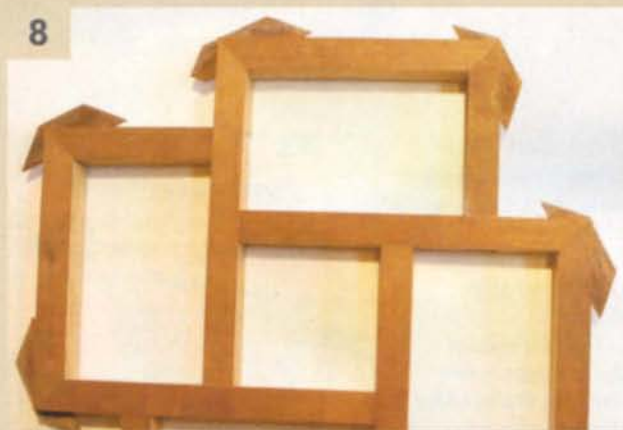
7



COURTESY OF E. RICHARD CROCKETT

Glue splines in the miters. Saw off the waste and smooth the edges by sanding.

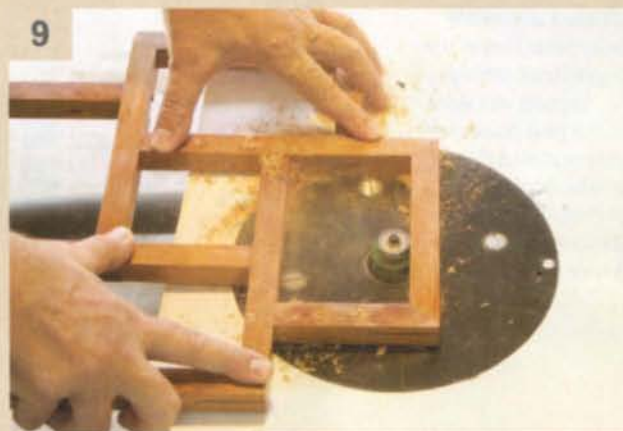
8



COURTESY OF E. RICHARD CROCKETT

Rout rabbets in the back of each frame and square all the corners. Apply the finish and then install the glass, photos and backing.

9



COURTESY OF E. RICHARD CROCKETT



E. Richard Crockett

is a third-generation woodworker in Houston, TX. His very understand-

ing wife Maria has never parked her car in their garage.



Learn how to make picture frames with intricate molded profiles at
AmericanWoodworker.com/WebExtras

Compound-Angle Dovetails: The Layout

A system as elegant
as the joint itself.

by Tom Caspar

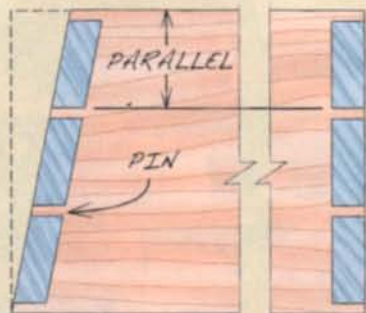
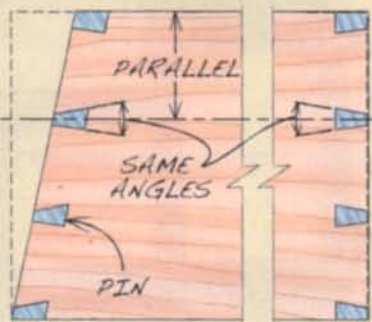


The Basics

When it comes right down to it, there are only two things you have to know about compound-angle dovetails.

First, the ends of the pins (upper left) slant just like standard through dovetails (upper right). It's the tapered side of the board that makes the angles look strange.

Second, the sides of the pins (lower left) are parallel to the top and bottom edges of the board, just like standard dovetails (lower right).

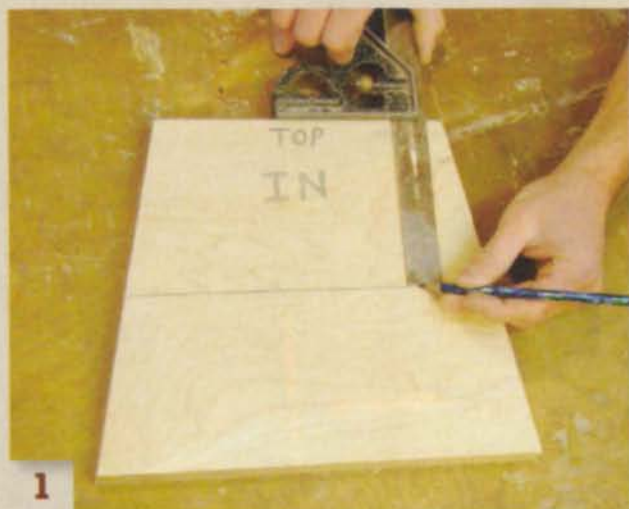


COMPOUND-ANGLE DOVETAILS are some of the most beguiling joints in all woodworking. But, as John Lennon once suggested, they can be as difficult to make as "fixing a hole in the ocean." Well, maybe not that hard—but it all begins with figuring out those odd angles.

I've developed a system that makes layout easy. It's based on very simple and familiar geometry (see "The Basics", at left). It's universal, too: This system works for a project with any amount of splay and for dovetails of any pitch.

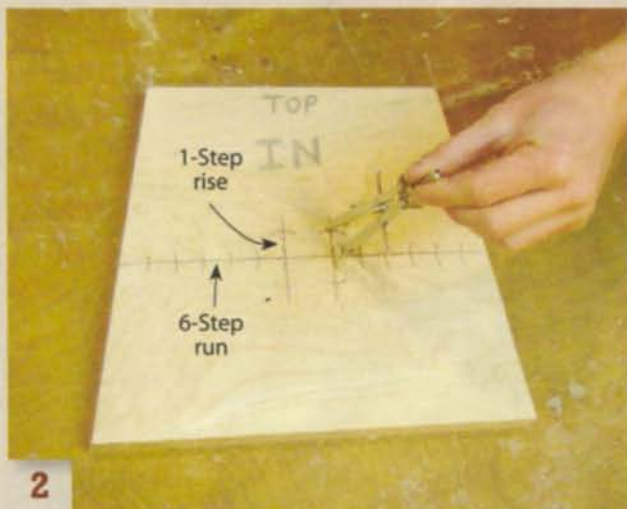
Before laying out the dovetails, your boards must be cut at the correct compound angle to form tight-fitting butt joints. (For the complete how-to, see "Chad's StepBox", page 35.)

We'll lay out the pins first, rather than the tails. As you follow the photos, there are a couple of small details that I'd like to emphasize. First, be sure to draw the dovetail triangles (Photo 3) on the *inside* face of the pin boards. (If you draw them on the outside face, the angles you transfer to the edge of the boards will come out backwards.) Second, always keep track of which side of your sliding bevel is facing up or out. I use a piece of tape to mark one side—just to be sure. Now, let's start.



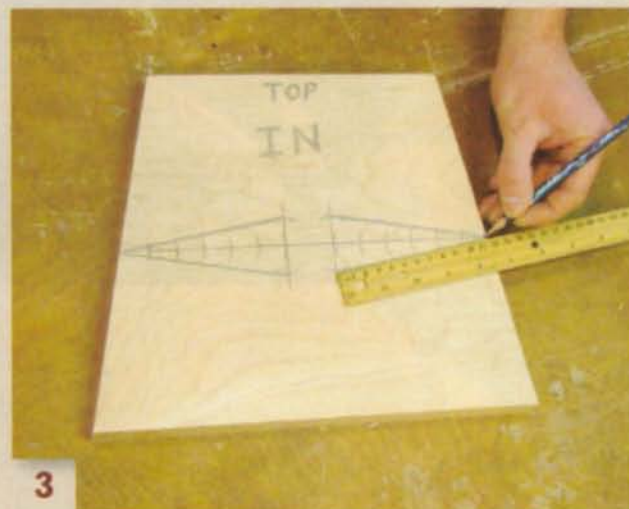
1

Draw a horizontal line across the inside face of one of the pin boards. The exact position of the line isn't important.



2

Mark the rise and run of the dovetails on the line. These dovetails have a pitch of 1:6, but you can use any pitch you wish.



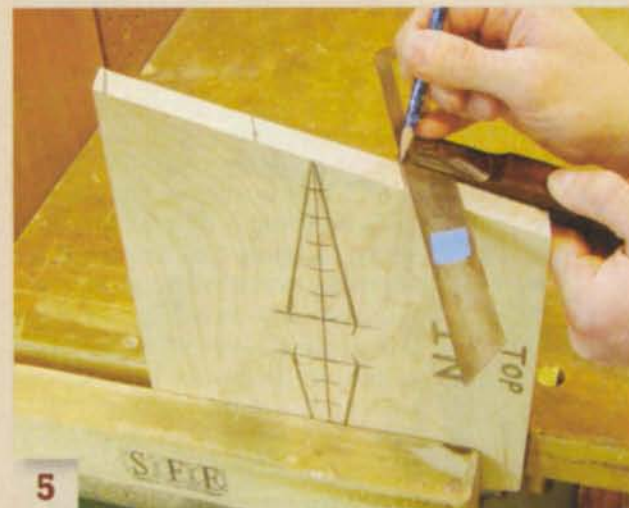
3

Draw two triangles. Think of these as representing the ends of really large pins.



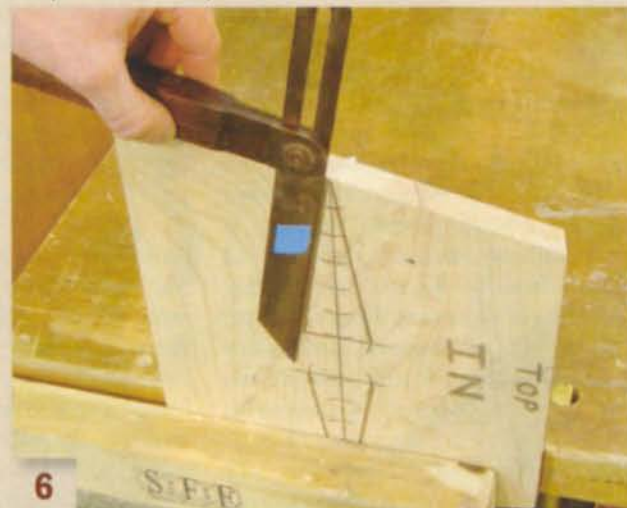
4

Adjust a sliding bevel to match the right side of a triangle. Put a piece of tape on your square—this side should always face out or up in the next steps.



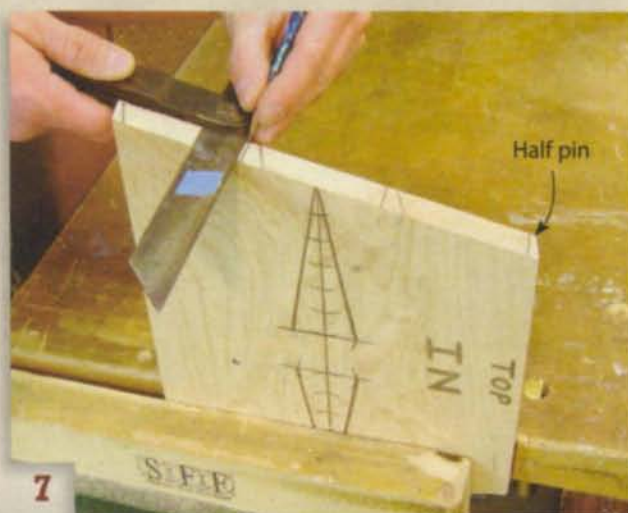
5

Mark the right sides of all the pins. If necessary, you can rotate the bevel to draw a line, but always keep its taped side facing up.



6

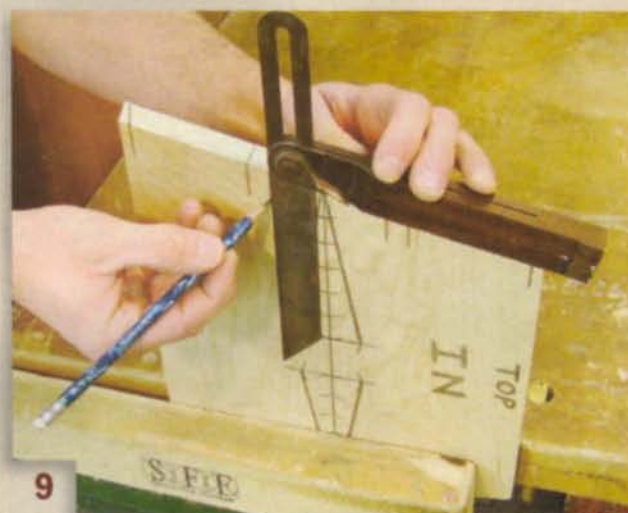
Reset the sliding bevel to the left side of the triangle.



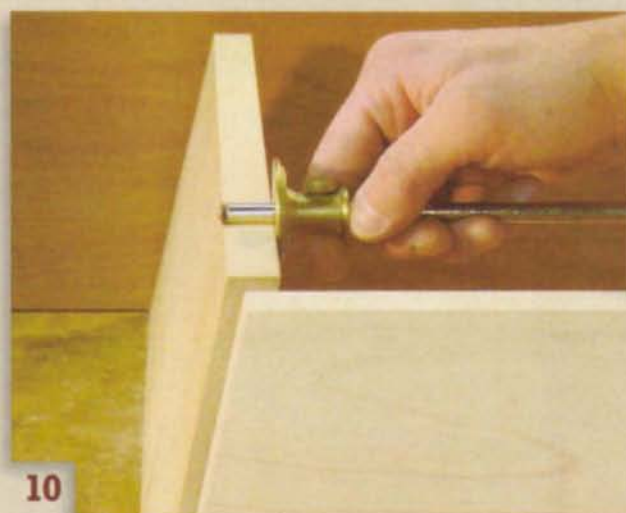
7 Draw the left sides of all of the pins. Note that the line on the far right is actually the left side of a half pin.



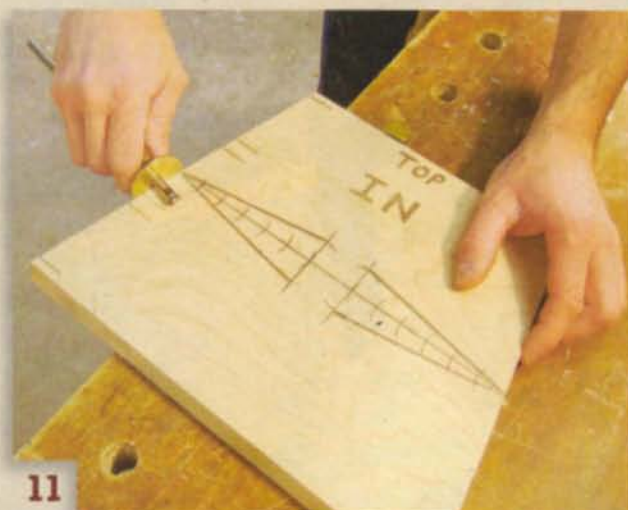
8 Reset the bevel to the splay angle of the board.



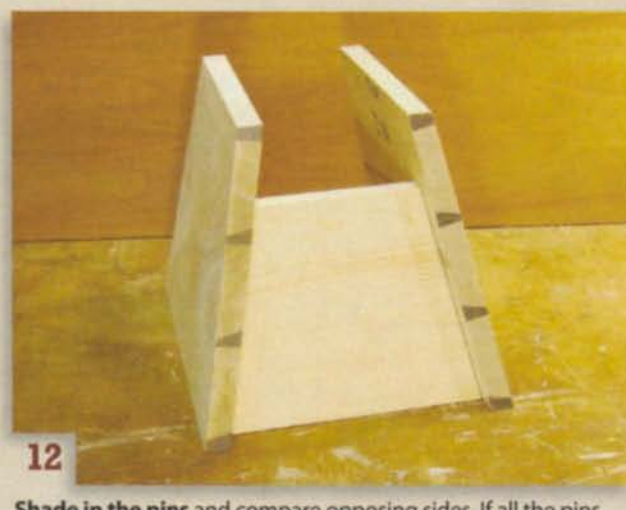
9 Draw the sides of the pins. Repeat the same process, starting with Photo 4, on the other end of the board.



10 Adjust a marking gauge to the width of one edge. Note that this is slightly longer than the thickness of the board.



11 Scribe the shoulders of the pins on both sides of the board.



12 Shade in the pins and compare opposing sides. If all the pins slant the correct way, start sawing! 



Wipe-On/Rub-Off Finishing

This two-step process guarantees flawless results.

by Kevin Southwick



NO BRUSH MARKS, drips, runs, bubbles, hairs, dust or orange peel—and beautiful results every time. For most furniture projects, it doesn't get easier than using a wipe-on/rub-off finishing process. This two-step method eliminates all the usual problems because rubbing off all of the finish that isn't absorbed by the wood leaves no wet film in which the problems can occur. The clear and important difference between this method and all others (including wiping on and leaving a film build) is the rubbing off. No attempt is made to build a film on the surface of the wood. Rubbing off the source of all the problems is the big trick.

The wipe-on/rub-off method

avoids time spent cleaning brushes and it dramatically reduces or eliminates sanding between coats. There are some limitations, though. This method can produce only a satin to semi-gloss finish and the finish itself won't be waterproof (see "One Drawback," page 59).

Finishes suitable or formulated for wiping on and rubbing off are widely available. They offer convenience, but you can also easily concoct your own wipe-on/rub-off finish. Thinning out an oil-based brushing varnish is one way. In fact, just about any finish can be wiped on and rubbed off, as long as it doesn't dry too fast. Shellac, lacquer and most waterborne finishes fall into

this category; they get sticky before you can rub them off.

Choosing the right material(s) for your wipe-on/rub-off finish can be confusing. Tung oil and linseed oil are natural vegetable oils that have been in use for ages. Paste wax is another classic wipe-on/rub-off finish. Then there are products like gel varnish, "Danish oil" and wiping varnish, as well as custom blends you can mix up yourself. So how do you choose the right formula? Here are three simple considerations.

- The type of resin (or solids). The materials that remain and harden to seal the wood after the solvents evaporate are important because they have varying degrees



1

Make your own high-quality wipe-on/rub-off finish by blending 100% pure tung oil, boiled linseed oil and polyurethane varnish.



2

Finish-sand to a finer grit than for a film-building finish. Wipe-on/rub-off finish shows scratches that a built-up finish hides.



3

Rub in the wet finish to create a silky-smooth surface.



4

Keep wiping until your last rag comes up clean.

of amber tone, working time and durability. For example, boiled linseed oil has more amber color than pure tung oil, while pure tung oil has a longer working time. Oil-based varnishes come in a variety of tones, will dry much faster and are more durable in every way than both tung oil and linseed oil.

- The thickness of the material. Thicker or more concentrated material is more effective at sealing the wood, but may be harder to apply and remove. For example, brushing varnish straight from the can is hard to rub off because it's thick and goopy. Rubbing off is much easier if the varnish is thinned out.

- Working time and drying

time. Faster drying time means less working time, so it's important to choose a material that has enough working time to allow you to get it all rubbed off before it gets sticky. You'll need a long working time if you plan to rub in the finish with wet/dry sandpaper. Products with a lot of oils have the longest working time—they require a day or longer to properly cure. Gel varnish, on the other hand, dries so fast you can apply two coats in one day.

One favorite wipe-on/rub-off finish is a combination of equal parts boiled linseed oil, 100% pure tung oil, and polyurethane varnish (**Photo 1**). This blend balances the color and drying time of the two oils and

is more durable due to the addition of the polyurethane. You can thin the blend to make it easier to smear around and remove. Use a gloss poly varnish to slightly increase the sheen. Master furniture maker Sam Maloof used this type of finish extensively. He even developed his own branded version (available at www.rockler.com). To make a "Danish oil" type material, simply thin any oil-based brushing varnish 50% or more with mineral spirits or paint thinner.

Tips for applying

- When you prep the bare wood for a wipe-on/rub-off finish, sand to a higher grit than you would for a film building finish (220-400 grit

One Drawback— It's Not Waterproof

It's virtually impossible to achieve a 100% waterproof seal with a wipe-on/rub-off finish alone. Fortunately, there's an easy fix: Just apply a thin coat of waterproof material on top. That's all it takes to build a consistent, durable film. In fact, if you want a waterproof coating that retains the low sheen and very "close to the wood" look of an oil finish, the wipe-on/rub-off method is an excellent and thorough way to prep the wood's surface.

After three rounds of wipe-on/rub-off finish on the entire piece, brush one coat of thinned-out (25-50%) oil-based brushing varnish on the top or any other horizontal surface that a glass or cup might find. Don't bother to brush vertical surfaces—there's really no need to make

*Fortunately, there's
a simple solution.*

them waterproof.

If brushing creates a dust or brush-mark problem, you don't have to

wait until the next day to deal with it. Simply wash off the messed-up varnish film with paint thinner or mineral spirits and try again. Most oil-based products can be removed this way for at least an hour or more.

vs. 150 grit, **Photo 2**). The quality of the sheen of a wipe-on/rub-off finish is determined by the smoothness or texture of the wood surface itself. The 150 grit scratches that would be filled by the layers of a film-building finish will leave the wipe-on/rub-off surface looking dull and lifeless.

- If you choose a finishing material that has enough working time you can create a surface that looks spectacular and feels super-smooth by rubbing in the first application of finish (**Photo 3**). Use a soft block and fine wet/dry sandpaper (600-1000 grit) to create a slurry that helps to seal the wood. You can feel the difference immediately by running your finger across the still-wet wood. This step needs to be done only once, unless you miss a spot.

Following this application, two more wipe-on/rub-off coats are usually enough to create a nice finish; more coats will slightly increase the sheen.

- The best way to determine if you've removed all of the finish that hasn't been absorbed by the wood is to continue rubbing with clean rags until they remain completely dry, showing no signs of excess finish (**Photo 4**). Good rags for this process are soft and absorbent; knit cotton and Scott shop towels are good choices. Note: The finish-soaked rags are likely to spontaneously combust, so dispose of them immediately and properly.

- Only two problems commonly occur with wipe-on/rub-off finishes and they're both easily avoided. The first occurs when wet finish

that isn't absorbed by the wood is left on the surface to create streaks, rag marks, and sticky or shiny spots. The second occurs as slower-drying oils or excess solvents bleed back out of the pores of the wood and leave little rings. If they're still wet, these rings can be removed by rubbing. But if they're allowed to harden on the surface, they must be sanded off. 



Kevin Southwick

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

Minneapolis MN.

Wicked Sharp!

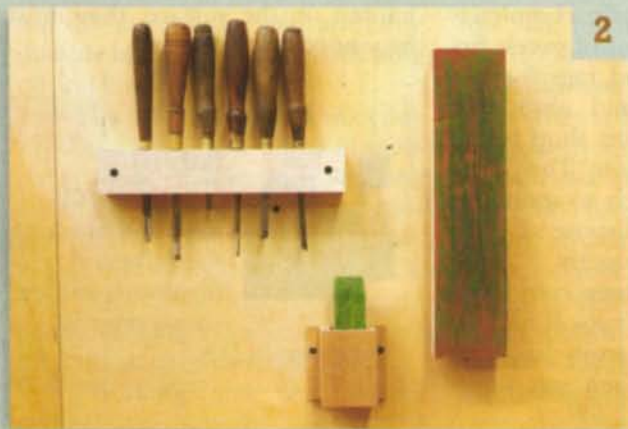
For the ultimate edge, use a leather strop.

by Alan Turner



1

Paring end grain requires an extremely sharp edge. When my chisel feels a bit dull, I go right to the strop to restore its edge.



2

My strop lives on the wall next to my bench, always ready to go. Stropping a chisel takes less than a minute.

I HAVE A SPECIAL SET of chisels that I only use for paring. To do a good job, they have to be wicked sharp—and stay that way. My secret weapon isn't a fabulously expensive honing stone. It's a cheap, homemade strop.

I use these chisels a lot when I'm cutting dovetails (**Photo 1**). Whenever a chisel feels the least bit dull, I renew its edge on the strop. This only takes a moment, but the results are dramatic. When I pare end grain, for example, I routinely get tissue-thin shavings, not dust. I use the strop quite often, so I store it right next to my chisels (**Photo 2**).

A strop is a very simple device. It's just a thick piece of firm leather, about 2-3" wide, glued to a block (see Sources, next page). The leather is charged with a thin layer of 0.5 micron honing compound (see Sources). A strop will serve you for many years: The leather won't wear out, and one stick of compound is probably all you'll ever need to buy.

Here's how to make one. Cut the leather about 10-12" long, then cut a board slightly wider and longer than the leather. Spread a thin layer of yellow glue onto the board and place the leather on the board (**Photo 3**). Clamp a second board on top of the leather to keep it flat. After the glue dries, use your table-saw to trim the block flush with the leather. Next, apply a thin coat of mineral oil to the leather (**Photo 4**) and rub on some honing compound (**Photo 5**). Your strop is ready to go.

Before I explain how to use the strop and describe what it does to an edge, let's return to my set of paring chisels. They're made of high-quality steel, so they can hold a thin edge. (A chisel with a low-angled bevel requires less effort to push when paring than one with a steep-angled bevel.) I grind these chisels at 20°, then hone on 500, 2000 and 8000 grit Shapton water-stones. I don't use a guide. Instead, I rock the chisel on the stone until I feel both the bevel's heel and toe contact the surface. Then I start honing, maintaining that angle, until I feel a wire edge on the back of the chisel. I remove the wire edge on the 8000 stone.

Next, I go to the strop. Again, I rock the chisel to find the bevel, press hard, then pull the chisel backwards down the strop. I repeat this process three or four times, making sure I maintain the bevel's original angle. I also strop the chisel's back (**Photo 6**).

What does the strop do? It polishes the edge—making it sharper; and slightly rounds over the edge—making it stronger. I'm convinced that a stropped edge lasts longer than an edge that's only been honed. It's amazing! 

SOURCES

Tandy Leather Factory,
www.tandy Leatherfactory.com, (817)
872-3200, Natural Cowhide Leather Strap,
2-1/2" W x 50" L, #4575-00, \$14.99.

Lee Valley, www.leevalley.com,
(800) 871-8158, Veritas Honing
Compound, #05M08.01, \$11.50.

To make a strop, glue a thick, stiff piece of leather to a block. MDF makes an ideal block—it's very flat and stable.



Prepare the strop by applying a light coat of mineral oil. Work it into the leather—you only have to do this once.



Rub honing compound onto the strop. The compound lasts a long time—I only recharge the strop every 3 months or so.



Strop the back of your chisel, as well as the bevel. Hold the chisel flat on the strop, so you don't round the edge, and pull it back.



\$20 Leg Vise

**Hardware-store parts
do the trick.**

by Allen Finch

THIS SIMPLE LEG VISE is based on a traditional design still favored by many woodworkers. My version is built with inexpensive parts you can buy from any hardware store or home center.

Every bench should have a good vise. Why use a leg vise, rather than a commercial face vise? Aside from its low cost, this leg vise has three major benefits:

- **Huge capacity.** Many commercial vises don't open very far, but a leg vise can extend up to 2' or more. To keep the jaws roughly parallel, you change the position of the bolt in the adjustment arm.

- **Deep reach.** Inexpensive commercial vises are very shallow, offering only a small amount of surface area. When you tighten a vise, you want a lot of surface area to contact the workpiece, to prevent the piece from moving. You can make the faces of this vise as deep and wide as you wish.

- **Convenient height.** Commercial vises are mounted flush with the top of a bench. For some work, it's better to elevate the vise. A tall vise helps prevent chatter when sawing, for example. A leg vise can be mounted at any height.

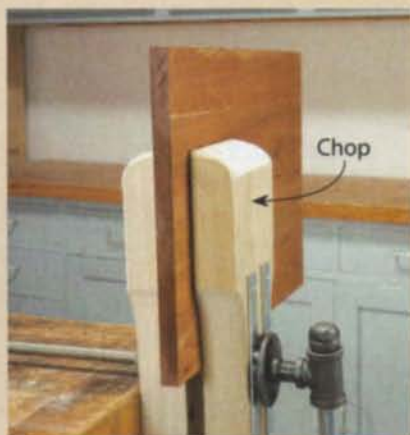
Building the vise

Cut the leg, front jaw (traditionally called a "chop") and adjustment arm to suit your bench. Use a stiff

The Benefits of a Leg Vise



Huge capacity. Make the vise as deep as you want—the length of the screw and adjustment arm determine how far the vise can open.



Deep reach. You can position the screw at almost any height. The chop on this vise has a much greater vertical depth than you'll find on a commercial vise.



Convenient height. You can make the vise's leg tall enough to raise the chop to chest height, placing your work at a more convenient level.

hardwood, such as 6/4 maple or hickory. Douglas fir or Southern yellow pine are good alternatives.

Make the adjustment arm 1-1/2" square. Cut a 1-1/2" x 1-1/2" notch in the chop's bottom end. Cut a corresponding 1-1/2" x 2" mortise in the leg. (The extra height allows the arm to pivot.) Drill 1/2" dia. holes in the front jaw and leg. Drill a series of corresponding holes in the adjustment arm, spaced 2" apart.

The vise's threaded rod goes through a coupler nut in the leg. To capture the nut, drill a 1" dia. hole, 1" deep, in the leg's back. Continue drilling a 5/8" dia. hole through the leg. In line with this hole, cut a 1" wide x 1-1/2" tall mortise in the front jaw. (The extra room in this mortise allows the front jaw to pivot.) Bandsaw the leg and jaw's shape and chamfer the edges.

To assemble the vise (Fig. A), pound the coupler nut into the leg. It doesn't have to be epoxied—a tight fit will keep the nut from spinning. Thread the short pipe nipple into the tee and the floor flange onto the nipple's other end. Insert the threaded rod all the way through the nipple. (You may have to file the rod's threads a bit to make it fit.) Drill two holes for roll pins (Photo 1). One goes through the tee, nipple, and threaded rod. The other goes through the floor flange, nipple, and threaded rod. Go slow and use cutting oil. Tap in the roll pins (Photo 2). Pass the long pipe nipple (the vise's handle) through the tee and add the O-rings and caps. When you rotate the handle, the threaded rod and flange will turn with it. Fasten the mending plates to the chop alongside the mortise—the flange bears against them when you tighten the vise. For additional support, you could cut a third mending plate in half and mount the two pieces between the plates shown here.

Fasten the leg to your bench. Mount the adjustment arm on the chop and pass the handle assembly through the chop's mortise. Slide the adjustment arm through the leg and thread the screw through the coupler. The vise is easy to remove if it occasionally gets in your way.

Shopping List

- Douglas fir 2x6, 8' long
- 5/8" x 24" threaded rod
- 5/8" x 2" coupler nut
- Two 1/2" x 5" bolts
- Two 1" x 6" mending plates
- Two 3/16" x 1-1/4" roll pins
- Two 3/4" O-rings
- 1/2" floor flange
- 1/2" x 1-1/2" pipe nipple
- 1/2" x 10" pipe nipple
- 3/4" x 1/2" tee
- Two 1/2" caps

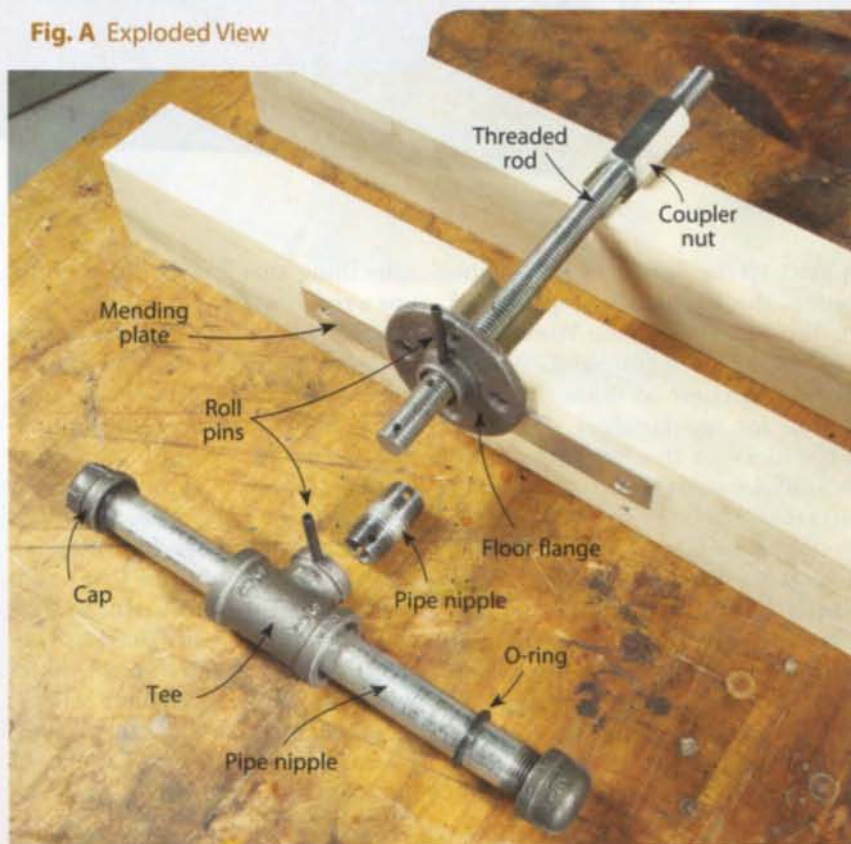
Drill holes for the roll pins. The pins fasten the handle assembly to the screw. To steady the work, use a utility knife to carve a "nest" in a piece of 2" foam insulation.



Tap in the roll pins. They're split down the middle, to fit tight in the hole. Use wood blocks to support the screw and the tee.



Fig. A Exploded View



Walnut Chest of Drawers

Building for the love of wood.

by Herman Vallejo



ANDREW PATTERSON

A VISIT TO the *Design in Wood* exhibition, the annual show sponsored by the San Diego Fine Woodworkers Association, inspired me to enter this chest of drawers, which I built for my daughter Christina. I got lucky on the day I found the beautiful walnut boards that I used to build it. Working with exceptional lumber is one of the things I most enjoy about woodworking, which has been my favorite pastime for more than thirty years—I sincerely do have a love for wood. Maybe that's why learning that my entry received the show's "Love of Wood" award took my breath away. Receiving such acknowledgment for

something that I truly enjoy doing was a real honor.

I decided on a contemporary design with clean lines because I wanted to highlight the boards' lovely figure, texture and color—this piece is all about the wood!

My methods of work range from simple to complex. I use machines to mill rough lumber, but I fit edge joints and remove all the milling marks with hand planes. The chest assembles with dowels, simply because I've been using dowel joints since I was in high school. The drawers, on the other hand, feature hand-cut dovetails because I like the way they look and enjoy the

challenge they present. Of course, drawers with machined dovetails or even simple lapped joints will work just as well.

A frame job

The chest consists of eight frames. Three paneled frames form the sides and back and five web frames provide the structure (A–C, Fig. A, page 66 and Cutting List, page 72). To keep things simple, almost all of the stiles and rails for these frames are the same width. The chest sits on a mitered base frame (D). A mitered riser frame (E) creates a reveal between the chest and the top (F).

A treasure hunt

Going to the lumberyard is like a treasure hunt. I prefer to buy roughsawn stock so I can mill it myself. Controlling this process allows more options and yields thicker, straighter boards.

The process of deciding how to use the boards should begin at the lumberyard. Look for matches of color and figure as you sift through the stacks. Take along a block plane, so you can remove portions of the boards' rough surfaces for a better look. This process continues in my shop, both before and after I mill the rough boards (**Photo 1**).

The goal is to choose the best-looking combinations of boards for the chest's most visible parts—its top and drawer fronts. The wide top must be glued up, but the drawer fronts look best when they're single boards. Set aside the boards you choose for these parts; then use the remaining stock for the frames and panels. Choose boards with the straightest grain for the side frame stiles and rails. Assign the leftover boards to become the back rails, panel slats, web frame front rails, and parts for the base and riser frames.

Assemble the frames

Start by jointing and thickness-planing the boards for the paneled frame stiles and rails (A1, A2, B1 and B2). Cut all the pieces to length and width and saw grooves for the panels. Then cut the tenons on the rails.

The panels consist of pairs of slats (A3 and B3) that are resawn and book-matched (**Photo 2**). The slats butt together inside the frames, but they aren't glued (**Photo 3**). In fact, I slightly bevel the edges. These vertical bevels add interest; they also lighten the chest and make it appear taller. Sand and finish the slats. Then install them and glue together each frame. Make sure both frames are square. After removing the clamps, stack the two side frames and make sure they're identical—make adjustments, if necessary. Then rout the rabbets in their back

Start by slightly planing the roughsawn boards to feel the texture and see the color and grain. This process helps me decide how to use each board.



Resaw narrow boards to make slatted panels for the frames that form the chest's side and back.



The panel slats float inside the frames because they aren't glued together. I bevel their long edges to create a reveal at each joint.



Use spacers to precisely locate the web frames for doweling. Clamp the top and bottom web frames in position between the side and back frames. Then mark the three middle frame locations one at a time.



Fig. A
Exploded View

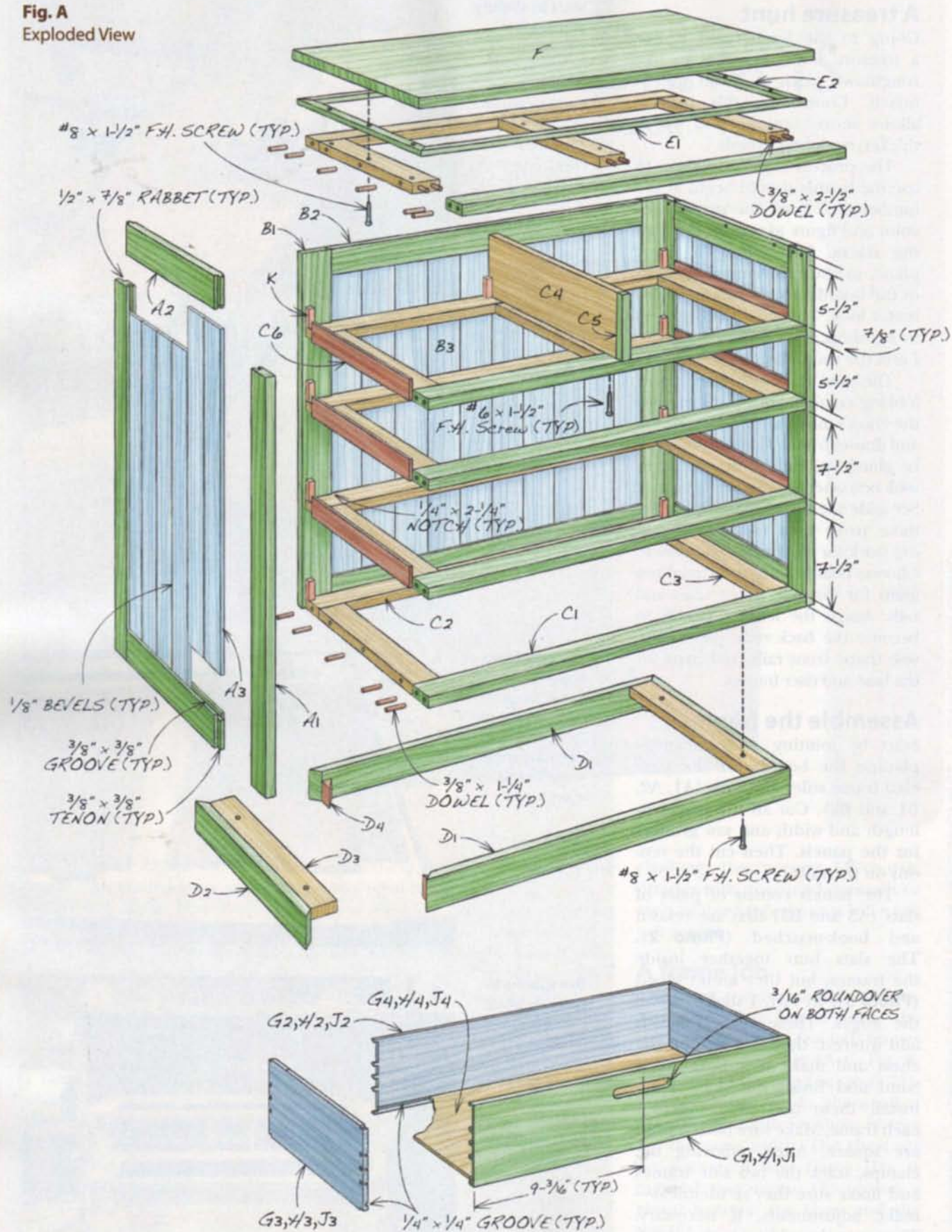


Fig. B Drilling Jig

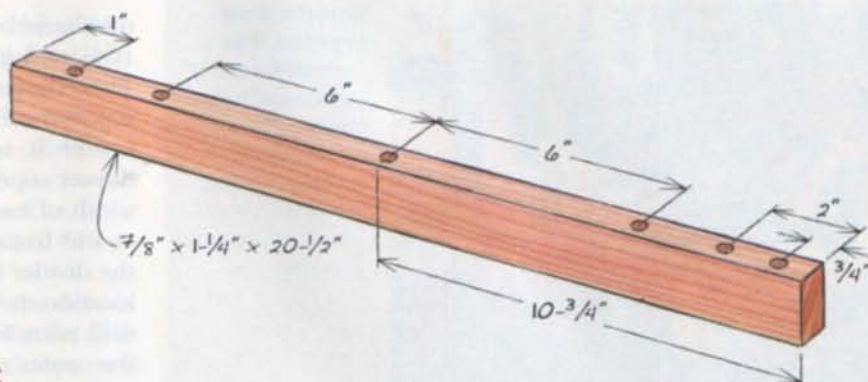


Fig. D Dovetail Layout

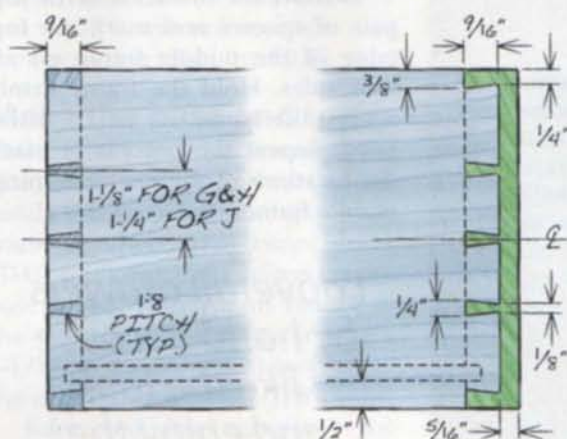
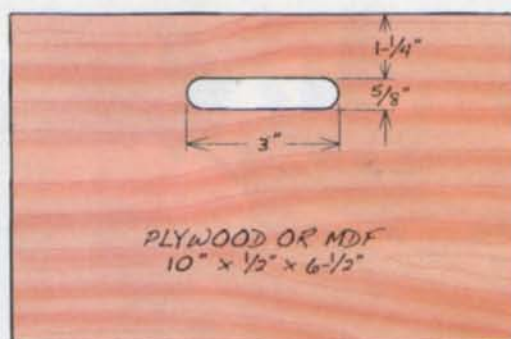


Fig. C Hand Grip Jig



edges for the back paneled frame.

Mill the stiles and rails for the web frames (C1-C3) and cut them to width and length. Drill holes for the $3/8" \times 2\text{-}1/2"$ dowels and then glue together each frame. Note that the top two web frames have a third, centered rail. Make sure all five glued-up frames are flat and identical in length, width and square-ness.

Assemble the chest

Assemble the chest without glue to locate the three middle web frames. Note: All five web frames have to be trimmed in back to fit flush with the front of the chest. Trim $1/4"$ from the back edge of the top and bottom web frames; cut $1/4" \times 2\text{-}1/4"$ notches in the back stiles of the three middle frames.

Clamp the back frame between the side frames. Then install the top and bottom web frames and use pairs of spacers to position the three middle frames (**Photo 4**). You'll need four $7\text{-}1/2"$ wide spacers and four that are $5\text{-}1/2"$ wide. Install the spacers and all three

Drill holes for dowels in each web frame using a shop-made drilling jig that's identical to the frames in thickness and length. Use the same jig to drill holes in the chest's paneled frame sides.



Install each web frame without glue to make sure it fits properly—square from side to side and front to back, and flush at both ends.





7

Glue the chest together. This complex assembly takes numerous clamps, glue with a long open time and help from a friend.



8

Joint all the boards that you've chosen for the top. I prefer to plane and fit these joints by hand.



9

Rough out the hand grip on each drawer front. Use the routing jig to lay out the hole and a Forstner bit to drill the rounded ends. Then saw out the waste.



10

Use a flush-trim bit and the routing jig to smooth the rough-cut hand grips. Finish by using a roundover bit to relieve the sharp edges on both sides.

middle web frames. Cut the divider (C4) and glue on its facing (C5). Then slide the divider between the top two web frames and precisely center it to create two identical drawer openings. Make sure the width of each opening is the same at the front and the back. Clamp the divider in position and mark its location on both web frames. Then drill pilot holes for screws through the center rails.

Remove the divider and the top pair of spacers and mark the top edge of the middle frame on all four stiles. Hold the frame firmly against the spacers as you draw the lines. Repeat the process to mark the locations of the two remaining middle frames.

I dovetail drawers by hand because I like the look and enjoy the challenge.

Make a drilling jig from a piece of scrap that's the same thickness as the web frames and cut as long as the frame is wide (Fig. B). Use a drill press to drill centered holes through the jig. Clamp the jig on each web frame, flush at the front and on both faces, and drill holes for the 3/8" x 1-1/4" dowels (Photo 5). Then clamp the jig on each side frame to drill corresponding holes. Use the location lines you've drawn on the stiles and the frame's front edge to position the jig.

Install each web frame to check its fit (Photo 6). Cut drawer guides (C6) to fit between the side panels' front and back stiles. Remove the middle web frames and glue a guide to the rail on each end. When the chest is assembled, these guides ensure that the drawers track properly by filling the gaps between the web frames and the side frame panels.

The big glue-up

Enlist a friend to help glue the chest together (Photo 7). Lay the side frames on a flat surface, apply glue

with a long open time and install the dowels. Brush glue into the holes in the web frames and install them on one of the side frames. Then install the remaining side frame. Turn the assembly right-side up. Slide in the divider and install the back without glue. Then clamp the joints. Check the assembly frequently as you go to make sure both it and the drawer openings remain square. Let the glue dry. Then remove the clamps and glue in the back. Position the divider and install it with screws; make sure the screws don't split the MDF.

Make the base and top

Mill the base and riser frame pieces (D1-D3, E1 and E2) and cut them to width. Cut the miters and glue each frame together. Install corner blocks (D4) to reinforce the miters on the base frame. Fasten both frames to the chest. The base frame sets back 1-1/2" on the front and both sides; the riser frame sets back 3/8".

Joint and thickness-plane the boards you've chosen for the top (F). Cut the boards at least 1" over-size in length. Then joint the edges (Photo 8). Glue the top together, trim it to final dimensions and fasten it to the chest on top of the riser frame so that it overhangs the chest by 1/4" on the front and both sides. The recessed riser frame makes the top appear to float weightlessly above the chest.

Rout hand grips

The drawers come in three sizes (G, H and J), but they're all made the same way. Mill the drawer parts (G1-G3, H1-H3 and J1-J3) and cut them to length and width. I size drawer parts to match each drawer opening and then trim the assembled drawers to fit by hand. I've learned from experience that making a drawer slightly smaller is much easier than making it slightly larger. Then make a jig to cut the hand grips in the drawer fronts (Fig. C). Use a 5/8" dia. Forstner bit to create the half-round ends and a jigsaw to remove the waste between them. Smooth and straighten the sawn edges with a file. Then use the jig to lay out the holes on the drawer

Dovetail the drawer joints.

For hand-cut dovetails, start by scribing the depth of cut—the thickness of the drawer back—on both ends of the drawer sides and back.

11



Scribe the ends of the drawer fronts to establish shoulders for the half-blind dovetails. Use the same gauge setting used to mark the drawer sides.

12



Lay out the dovetails on the drawer sides. I gang the sides together and use a dovetail marker to mark lines on the front face and across the top.

13



Use both lines to guide the saw. Make all the cuts that slope the same way. Then make the cuts that slope in the opposite direction.

14





15

Stack the sides to remove the waste. Establish a shallow shoulder at each scribe line and then remove the waste halfway through. Flip over the stack to finish the job.



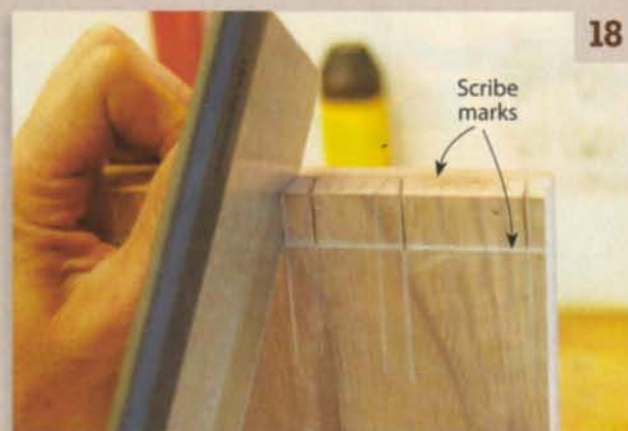
16

Transfer the pin locations from the side to the drawer front. Position the side flush with the scribe mark and flush at the top and bottom.



17

Tip ▶ Here's how to make a super-slim, super-sharp pencil to fit in those narrow pin sockets. Make sure to use a pencil with hard lead.



18

Bisect the lines on the edge and back face as you saw. Hold the saw at a 45° angle and cut in from the corner to the two scribe marks.

fronts. Center the holes on the two top drawer fronts and use their locations to lay out the holes on the other drawer fronts. Follow the procedure used to make the jig to rough out the holes on the drawer fronts, but use a 1/2" Forstner bit to stay inside the layout lines. Saw inside the layout lines, too (**Photo 9**). Use double-faced tape to attach the jig to each drawer front. Then rout the holes to final size (**Photo 10**).

Dovetail the drawers

Cut half-blind dovetails on the drawer fronts and through dovetails on the backs. The first step is to scribe the depth of cut on all the pieces. This measurement is determined by the thickness of the drawer sides and backs. On these drawers, they're the same thickness, so the scribe marks are all the same—9/16". Mark the faces and edges of the sides and backs (**Photo 11**). Mark the ends and inside faces of the drawer fronts (**Photo 12**).

Lay out the dovetails on the drawer sides and ends (**Photo 13** and Fig. D). I use a dovetail marker to ease this job. (see Sources, page 72). Make the width of the wide end of the pin socket (the waste) a tiny bit wider than your 1/4" chisel.

Follow both lines as you saw down to the scribe lines (**Photo 14**). I stopped using Japanese saws for dovetails when I got the Veritas dovetail saw (see Sources). It's great!

Remove the waste between the dovetails. Start by establishing a square shoulder. Position the 1/4" chisel on the scribe line at the wide end of each socket and tap lightly with a mallet to make a shallow 90° cut into the wood. Then reposition the chisel and make a shallow sloped cut from the waste end back toward the first cut. This creates a shallow "V" with a vertical shoulder at the scribe line that will support the chisel as you chop out the waste (**Photo 15**).

Use the drawer side to transfer the pin locations to the drawer front (**Photo 16**). Align the end of the drawer side with the scribe line on the end of the drawer front and flush at the top and bottom edges.

This half-overlay setup creates the half-blind dovetails. Use a super-sharp hard-lead (2H) pencil to mark the lines (**Photo 17**).

Extend straight lines down the inside face of the drawer front to guide the saw. Hold the saw at 45° to cut the half-blind pins (**Photo 18**). Sawing diagonally leaves the pins only partially cut, which makes it hard to remove the waste in the next step. I use a small card scraper (with tape!) to gradually square the kerf (**Photos 19 and 20**). To remove the waste, establish square shoulders to support the chisel as before. Then alternate between deepening the vertical shoulders and cutting in from the ends to chip out the waste (**Photo 21**).

To mark the pin locations for the through dovetails on the drawer backs, use a full overlay setup: Position the drawer side on top of the back's edge, so the back edge of the side and the outside face of the back are flush. Extend the line down to the scribe mark on the back's face. To cut the through pins, start with the saw at 45°, but this time, gradually level it as you cut across the top edge. This allows you to continue cutting down to the gauge lines on both faces. To remove the waste, use the same method you followed earlier to create the pin sockets in the sides: Establish 90° shoulders to support the chisel, chop halfway and then flip over the back and complete the job from the other side.

Fit the drawers

Plan to make adjustments when you test-fit each joint. You'll quickly learn that all the joint shoulders must be square. Level the bottom edges of each drawer. Then insert each drawer in the chest to test the fit (**Photo 22**). I remove the top before this step, to allow easier access and better visibility. Reduce the drawer heights appropriately to allow seasonal movement—the amount depends on your location and the time of year. Here in Los Angeles, seasonal movement isn't an issue, so I allow a minimal amount. Disassemble the drawers and saw grooves for

Sawing the pins leaves diagonal kerfs that have to be squared to remove the waste. Begin squaring by inserting a scraper blade and tapping lightly.

19



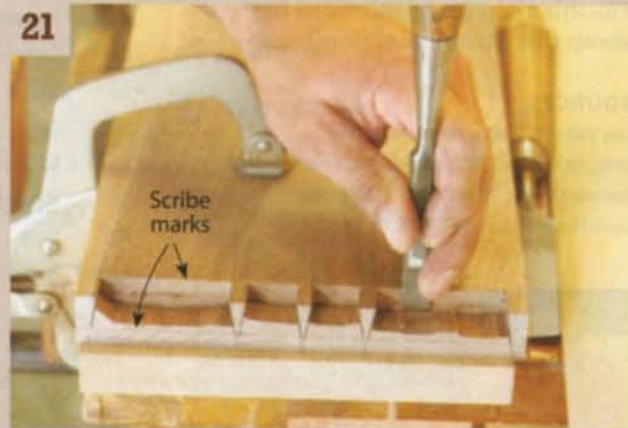
Continue to square the kerfs as you remove the waste between the pins. Alternate between squaring and removing.

20



Gradually remove the waste by alternating between vertical and horizontal chisel cuts. Cut precisely to the two scribe marks and make sure that both shoulders are square.

21



Test-fit each drawer. Aim for a tight fit that can be trimmed with a hand plane to allow smooth operation and seasonal movement.

22



the bottoms (G4, H4 and J4). Then cut the bottoms to fit.

Finish-sand the inside faces of all the drawer pieces. Then glue the drawers together. Slide each completed drawer in the chest and fine-tune its fit. I use a hand plane for this step. Then install the drawer stops (K).

Apply finish

Prepare the chest, drawers and top for finishing. I use a finish made by mixing boiled linseed oil, polyurethane varnish and turpentine, so I sand every surface up to 320 grit.

I apply a generous first coat and wet-sand with 400 grit silicon carbide sandpaper. The next day I apply a second coat and wet-sand with 600 grit. Let this coat dry for three days or longer, if necessary.

Apply a third very thin coat and remove the excess—I use a dry brush for this step. Keep the brush dry by wiping it on a clean, dry rag. The wood's surface should look dry when you're done. Let this coat dry for a week. Then apply a coat of paste wax. See "Wipe-On/Rub-Off Finishing" (page 57) to learn more about this exceptional finish. 

SOURCES

Lee Valley & Veritas, www.leevalley.com, (800-871-8158), Veritas 1:8 Dovetail Saddle Marker, #05N61.04, \$13.50; Standard Dovetail Saw, #05T05.01, \$65.



Herman Vallejo has been in the building trades for more than 35 years. In his spare time he enjoys using hand tools to build contemporary-style furniture.



See tips for cutting dovetails by hand at AmericanWoodworker.com/WebExtras

Cutting List

Overall Dimensions: 34-3/8" H x 40" W x 21-5/8" D

Part	Name	Qty.	Material	Th x W x L
A	Side frame	2	Walnut	7/8" x 21-3/8" x 30-3/8" a
A1	Stile	4	Walnut	7/8" x 2-3/4" x 30-3/8" b
A2	Rail	4	Walnut	7/8" x 2-3/4" x 16-5/8" b, c
A3	Panel board	12	Walnut	3/8" x 2-3/4" x 25-1/2" d
B	Back frame	1	Walnut	7/8" x 38-3/4" x 30-3/8"
B1	Stile	2	Walnut	7/8" x 2-3/4" x 30-3/8" b
B2	Rail	2	Walnut	7/8" x 2-3/4" x 34" b, c
B3	Panel board	10	Walnut	3/8" x 3-3/8" x 25-1/2" e
C	Web frame	5	Walnut/Beech	7/8" x 20-1/2" x 37-3/4" f
C1	Front stile	5	Walnut	7/8" x 2-3/4" x 37-3/4"
C2	Back stile	5	Beech	7/8" x 2-1/8" x 37-3/4"
C3	Rail	12	Beech	7/8" x 2-3/4" x 15-7/8"
C4	Divider	1	MDF	3/4" x 5-1/2" x 20"
C5	Divider facing	1	Walnut	1/2" x 3/4" x 5-1/2"
C6	Drawer guide	6	Walnut	1/4" x 2" x 15-3/4"
D	Base frame		Walnut	2-3/4" x 19-7/8" x 36-1/2" h
D1	Front and back	2	Walnut	7/8" x 2-3/4" x 36-1/2" j
D2	Side	2	Walnut	7/8" x 2-3/4" x 19-7/8" j
D3	Rail	2	Beech	7/8" x 2-3/4" x 18-1/8"
D4	Corner block	4	Beech	7/8" x 2" x 1-1/2"
E	Riser frame		Walnut	3/8" x 21" x 38-3/4" k
E1	Front and back	2	Walnut	3/8" x 1" x 38-3/4" j
E2	Side	2	Walnut	3/8" x 1" x 21" j
F	Top	1	Walnut	7/8" x 21-5/8" x 40"
G	Top drawer	2	Walnut	5-1/2" x 18-1/2" x 20-1/16"
G1	Front	2	Walnut	7/8" x 5-1/2" x 18-1/2" l
G2	Back	2	Rift white oak	9/16" x 5-1/2" x 18-1/2" l
G3	Side	4	Rift white oak	9/16" x 5-1/2" x 19-3/4" l
G4	Bottom	2	Rift white oak plywood	1/4" x 19-1/16" x 17-13/16" g
H	Middle drawer	1	Walnut	5-1/2" x 37-3/4" x 20-1/16"
H1	Front	1	Walnut	7/8" x 5-1/2" x 37-3/4" l
H2	Back	1	Rift white oak	9/16" x 5-1/2" x 37-3/4" l
H3	Side	2	Rift white oak	9/16" x 5-1/2" x 19-3/4" l
H4	Bottom	1	Rift white oak plywood	1/4" x 19-1/16" x 36-13/16" g
J	Bottom drawer	2		7-1/2" x 37-3/4" x 20-1/16"
J1	Front	2	Walnut	7/8" x 7-1/2" x 37-3/4" l
J2	Back	2	Rift white oak	9/16" x 7-1/2" x 37-3/4" l
J3	Side	4	Rift white oak	9/16" x 7-1/2" x 19-3/4" l
J4	Bottom	2	Rift white oak plywood	1/4" x 19-1/16" x 36-13/16" g
K	Drawer stop	10	Beech	7/16" x 3/4" x 1"

Notes:

- 1/2" x 7/8" rabbet on back stiles.
- 3/8" x 3/8" centered groove in inside edge.
- 3/8" x 3/8" centered tenons on both ends.
- Assembled panel consists of three bookmatched pairs of boards; the long edges of each board are beveled; overall width is 16-1/2" (allows 1/8" movement).
- Assembled panel consists of five bookmatched pairs of boards; the long edges of each board are beveled; overall width is 33-3/4" (allows 1/4" movement).
- Reduce the width of the top and bottom web frames to 20-1/2" by trimming the back stiles by 1/4"; cut 1/4" x 2-1/4" notches on both ends of the back stile on all three middle frames.
- Plywood thickness is nominal.
- Set back 1-1/2" from chest front and both sides.
- Both ends mitered.
- Set back 3/8" from chest front and both sides.
- 1/4" deep groove for plywood bottom.



MARKETPLACE

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Clamp-Ka-Bob

THIS MORNING I glued up a 4' x 6' tabletop made of maple 2x2s on my assembly table. I positioned 6' pipe clamps alternately on the top and bottom faces of the glue-up (spaced 8" apart) and tightened them. Then I removed all the squeezed-out glue.

To free up the assembly table, I decided to move the clamped-up top to another part of the shop. It was extremely heavy, so to stand it upright, I carefully tipped it over the edge of the table and let it slide to the floor.

Immediately, I realized the top was too heavy. As I struggled to control its descent, one of the pipes slid into my jeans pocket, ripped a hole in the bottom and emerged from another hole in the knee, effectively pinning me to the floor. The assembly was too heavy to lift and I couldn't reach far enough to remove the offending clamp. I didn't have scissors or a knife to cut myself free, and when I tried

removing my jeans, I almost brought the whole assembly down on top of me. My wife has been out of town all day and the dog, as usual, hasn't offered to help. If you have any ideas, please call.

Steve Rose



As the Bit Turns

ONE OF MY FIRST PROJECTS required doweling some oak boards. I clamped my doweling jig in position, chucked a bit in my brand-new cordless drill and went to work. Unfortunately, the bit spun uselessly. It was dull, I reasoned, because it was ancient, as were all my bits. What the heck—I decided to have them all sharpened. Unfortunately, the sharpened bit didn't work any better. Frustrated, I threw out all the old bits and bought a whole new set.

Then I tried again. Incredibly, the result was the same. No matter how hard I pushed, the brand-new bit barely penetrated the oak surface. Darn this new drill! Then I noticed a little black switch near the trigger, flanked by the letters "F" and "R." Gee, what a difference when the bit rotates in the right direction!

Dan Allmon



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