11 NEW TOOLS • 6 WAYS TO STRETCH YOUR SHOP $$$'s • 7 SHOP TIPS

American Woodworker

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#143, AUGUST/SEPTEMBER 2009

STAINING SECRETS A PRO'S METHOD

COMPLETE PLANS
Classic Stickley Dining Chairs

Tips for Advanced Template Routing

SEXY CHERRY SIDEBOARD

WEEKEND PROJECT
? MYSTERY DOVETAILS

Precision Routing for Traditional Inlays

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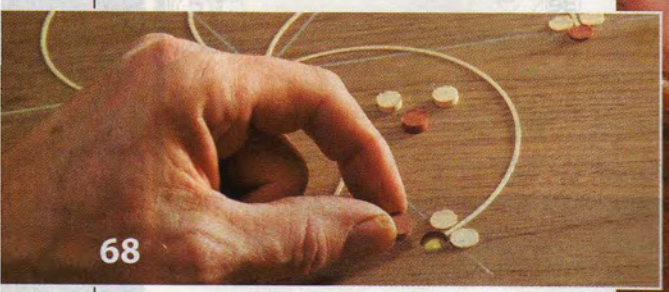
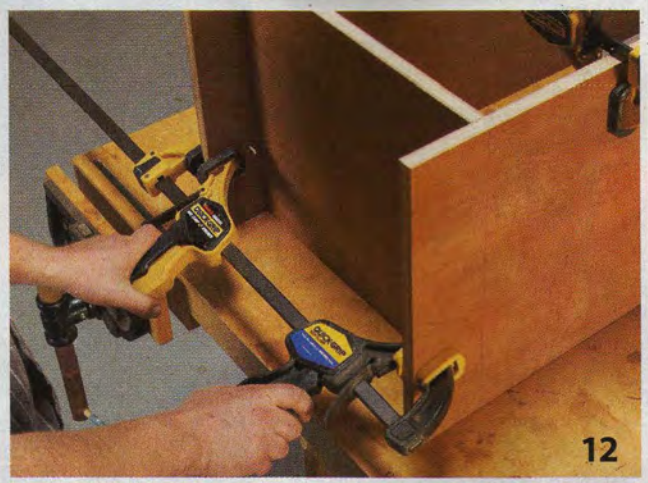
Features



Departments



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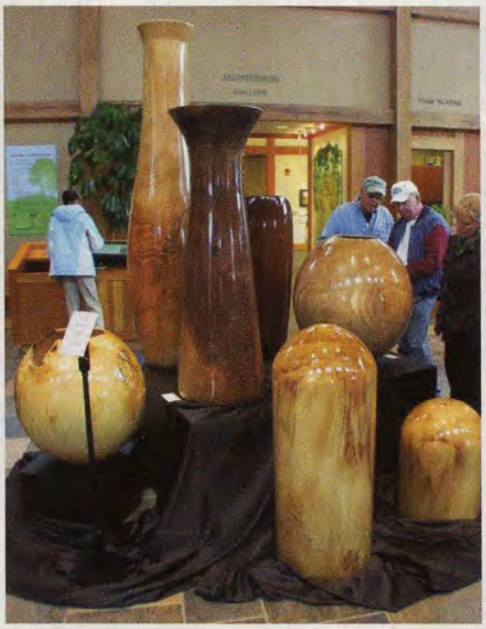
From the Editor's Desk

How Did He Do That?

WASTE NOT, WANT NOT. We've all heard the saying. Well, I just met a woodworker who's taking that adage to a whole new level. Virgil Lieh, a Minnesota artist, is making use of scrap wood in a really big way—literally. His scrap wood of choice comes from discarded tree trunks. From these, he makes vases, bowls, platters and other art objects.



Virgil has spent the past five years developing his technique, and recently, he held his first public show. His pieces initially command attention because of their sheer size. But after seeing them up close, most woodworkers scratch their heads for another reason: Despite their large diameters, none of Virgil's pieces show any cracks. If you've ever worked with whole logs or cross sections, you know that it's nearly impossible to keep cracks or checks from occuring. But not for Virgil—he's figured out how to prevent them. And at his recent show, he shared his technique with the crowd. Here's what it takes to turn a one ton log into a crack-free, 40-lb, 80" tall vessel:

1. Start with a fresh log, preferably the day it's cut.
2. Move it around with a forklift.
3. Trim the log to rough size, using a chainsaw with a 60" bar.
4. Mount the log on an 1917 Oliver lathe with a 7' x 7' capacity.
5. Rotate the log at very slow speed—30-100 rpm, tops.
6. Shape the log, using heavy-duty grinders and other industrial tools.
7. Remove the center of the log (the pith) as soon as possible. (This removes stress in the log, and explains why most of Virgil's turnings have no bottoms.)
8. Keep the log wet while turning. Use a garden hose if needed.
9. Shrink-wrap the log in plastic every night.
10. Measure the wall thickness, using long calipers, so you don't grind through.
11. When you're done turning, put the piece in a custom built, walk-in microwave oven, and slowly "nuke" it for 1 to 3 weeks, until it's dry.
13. Remount the piece on the lathe, so you can true the shape.
14. Finish sand to 220 grit. Then apply several coats of shellac.
15. Sand, sand, and sand again. Then buff to 4000 grit.
16. Store in your spare bedroom for a couple years, until you have a show.

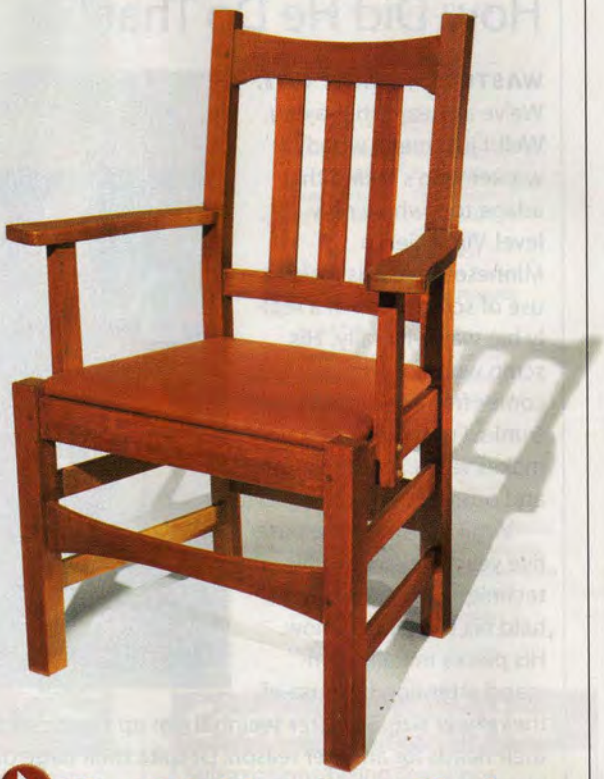
For more pictures of Virgil's tree art, visit **www.AmericanWoodworker.com/TreeArt**

Keep the chips flying,
Randy Johnson

More On the Web at AmericanWoodworker.com

Video

To see a pro's technique for glazing, visit
www.AmericanWoodworker.com/Glazing



The Stickley Arm Chair

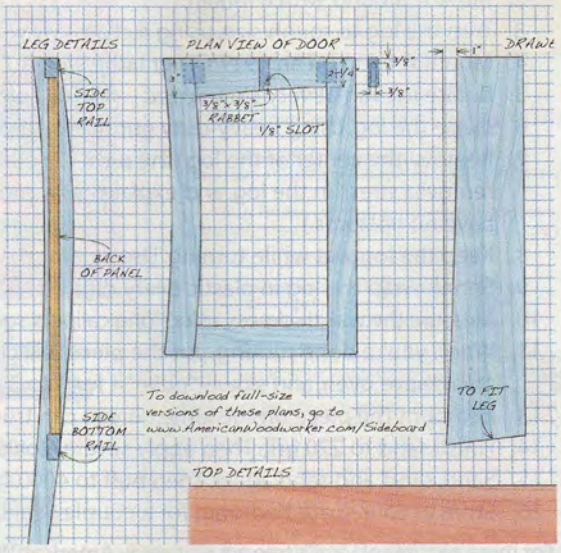
For the cutting list, patterns, technical drawings and how-to information, go to
www.AmericanWoodworker.com/StickleyArmChair

Top Secret Drawer

To find the secret drawer inside this cabinet, go to
www.AmericanWoodworker.com/AlHudson

Mystery!?

Show us your mystery dovetail joints at
www.AmericanWoodworker.com/MysteryJoints



Full-size Plans

To download full-size plans for our sideboard project, go to **www.AmericanWoodworker.com/Sideboard**

STAFF

Terrific Tip!

Two-Headed Clamp

I'VE COMBINED THE WORKING PARTS of two quick-action clamps to make a good tool even better. A two-headed clamp allows me to quickly make an adjustable-height table for my drill press or an outfeed table for my tablesaw. It also works great for holding cabinet parts in place for assembly. To make a two-headed clamp, use a punch to pop out the stop tubes from two clamps. Remove the trigger jaw from one clamp and slide it onto the other clamp, back-to-back with the other trigger jaw. Then slide on the second plain jaw.

Irwin Rappaport

Terrific Tips Win Terrific Tools!

We'll give you $100 for every original workshop tip we publish. One Terrific Tip is featured in each issue. The Terrific Tip winner receives a 12" Leigh Super Jig with VRS (Vacuum and Router Support), a $239 value.

E-mail your tip to workshoptips@americanwoodworker.com or send it to American Woodworker Workshop Tips, 1285 Corporate Center Drive, Suite 180, Eagan, MN 55121. Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions and use them in all print and electronic media.

EDITOR: BRAD HOLDEN; PHOTOGRAPHS COURTESY OF CONTRIBUTOR UNLESS NOTED

Fold-Away Outfeed Table

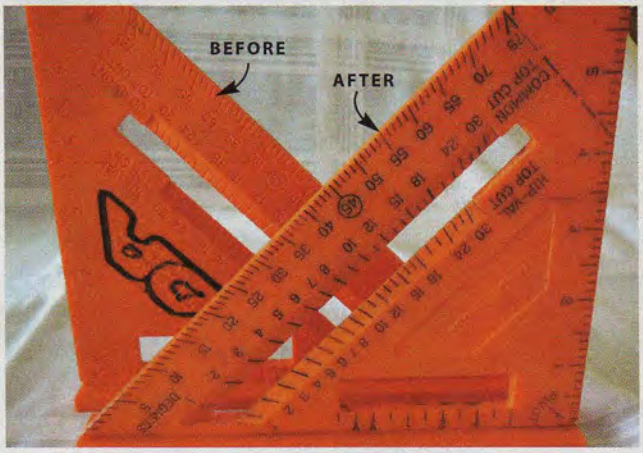
LIKE MANY OF YOU, I don't have room in my shop for a large outfeed table, although sometimes I need one. Using heavy duty folding brackets purchased from Rockler (12" - $22, 16" - $30), I made an outfeed table for my saw that's available when I need it and stowed out of the way when I don't. I made the top out of 3/4" x 36" x 36" MDF. The top is the same width as the saw's table; it's as long as it can be without hitting the floor when folded down. Rout grooves in the top that line up with your saw's miter slots. I notched one corner of the top so, when folded, the table clears my in-floor dust collector pipe. I screwed 2 x 4's to the underside to attach the brackets and to add strength and stability to the top. (This design won't work on a contractor saw, because its motor is in the way.)

Ray Merrell

Drip-Free Shellac

AVOID SHELLAC DRIPS, sags, and runs by making sure your brush is properly loaded. After dipping your brush in the shellac and drawing it across the edge of the can, lightly dab it on a lint-free absorbent cloth. The cloth draws away excess finish.

Kevin Southwick



Easy-Read Speed Square

I REALLY LIKE BRIGHT-COLORED speed squares because they're easy to locate on the job, but I find them difficult to read. To solve this problem, I spray-painted my speed squares black. After they were dry, I used a 3M Scotch-Brite pad to remove the paint. This left the marks and numbers black. Carpenter's squares, rules and combination squares may also benefit from this treatment.

Dewey Armstrong

Non-Slip Bench Hook

PLANING OR SCRAPING PARTS with angled or mitered ends is tricky. Bench dogs will damage a crisp corner, and clamps get in the way. To hold the work, I use an oversized bench hook with a new twist: a layer of 3M's grip tape, made for slippery sidewalks and steps. The grit doesn't mar the wood– even soft wood–and when I apply downward pressure with a plane or scraper, the part stays put.

John English

Rolling Scrap Bin

WHO SAYS YOU CAN'T PUT a square peg in a round hole? My scrap bin is made from round cardboard tubes made for concrete forms. These tubes are available at home centers; they're durable, come in various diameters, and are easy to cut. I use their different diameters and lengths as a filing system for my scraps. My bin is on wheels so that I can move it from tool to tool.

To make the bin, I cut the tubes to length, glued and screwed a 3/4" plywood disc inside the bottom of each tube, and screwed the tubes to a plywood base equipped with 3" casters. After the tubes were mounted, I glued them together where they touch for extra strength. Obviously, painting is optional.

Nancy Ballance

Tablesaw Trap

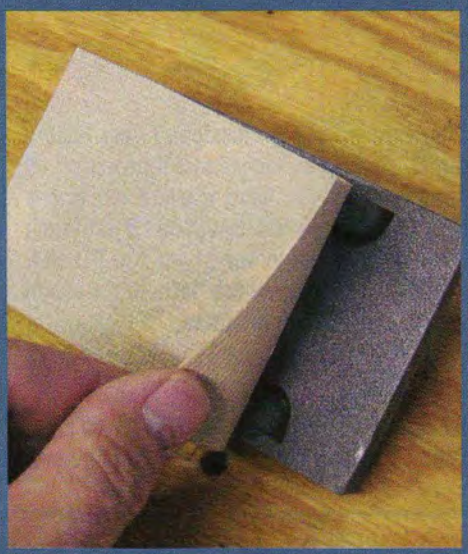
EVEN WITH A ZERO-CLEARANCE throat plate in my tablesaw, thin cut-offs slip through now and then. These pieces can clog a vacuum hose or damage the blades of a dust collector. I made a trap to catch them by attaching a piece of hardware cloth inside my saw, in front of the dust port. The trap also catches a dropped arbor nut or washer.

Dick Burns

PVC Lumber Storage

IN NEED OF SOME QUICK LUMBER STORAGE, I rummaged around my shop for a solution. I discovered a length of PVC pipe left over from a plumbing job and cut it into three 12" long pieces. I also found some 1/2" rope and cut it into three 5' long pieces. I tied knots on the ends of each piece, slipped them through the pipes, and used heavy-duty wire staples to attach the ropes to the ceiling joists. The knots keep the ropes from slipping through the staples. Once my racks were hung, I gave them the "pull-up test." They held my 250 lbs. with ease!

Jeff Coleson



Shelf Liner Sanding Pad

ONE ROLL OF SHELF LINER will provide a lifetime supply of pads for your sanding block–pads which will improve the block's performance. I bought an 18" x 48" roll at a local home center for about $5. At about 3/32" thick, I find that shelf liner has just the right combination of firmness and give for finish sanding. I use spray-on contact adhesive to hold the pad in place.

Mark Thiel

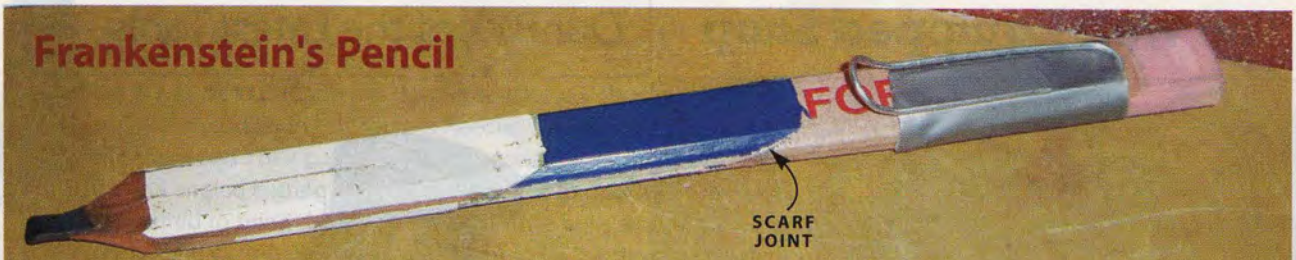
Extendo Chucks

I HAVE A HARD TIME throwing things away, such as these chucks from a couple of worn-out drills. To put them back into service, I bought a 3' long, 3/8" dia. threaded rod at the hardware store and cut it into two pieces, 12" and 24" long. I threaded the old chucks onto the rods and secured them with jam nuts. I covered the exposed threads with 3/8" i.d. vinyl tubing, also from the hardware store, to protect my fingers. I now have two extended chucks for drilling or driving in hard-to-reach areas.

Serge Duclos

EDITOR: BRAD HOLDEN • PHOTOGRAPHY COURTESY OF CONTRIBUTOR

Frankenstein's Pencil



I LIKE TO USE CARPENTER'S PENCILS until they're worn down to stubs. Stubs aren't very handy, though–they're hard to dig out of a pocket. To solve this problem, I gathered up all the stubs lying around the shop and cut scarf joints on them with a handsaw. I trued up the joints with a disc sander and glued the pieces together, making one new, longer pencil. I also duct-taped a paper clip to my new pencil, and glued on an old drafting eraser, for a little icing on the cake.

Dick Ayers

Home-Made Deep Reach Clamps

LIKE MOST WOODWORKERS, I never have enough clamps. Adding to a clamp collection is expensive, so when I needed some deep reach clamps, I made these auxiliary hardwood jaws. You can make them whatever size you like. The jaws are mortised to slide on the clamp's bar. A stiff wood that resists splitting, like maple, is ideal.

William J. Monahan

Task Light Retro-Fit

I MADE A GO-ANYWHERE TASK LIGHT by retrofitting an old fixture with a new, battery-powered LED light. I bought the LED at a home center for about $7. First, I removed the cord and inner workings from the task light. Then I screwed a plywood disc into the light's shade and stuck the adhesive-backed LED light to the disc. I've used my light for hundreds of hours and the batteries are still going strong, as LED's use a miniscule amount of power.

Lou Bush

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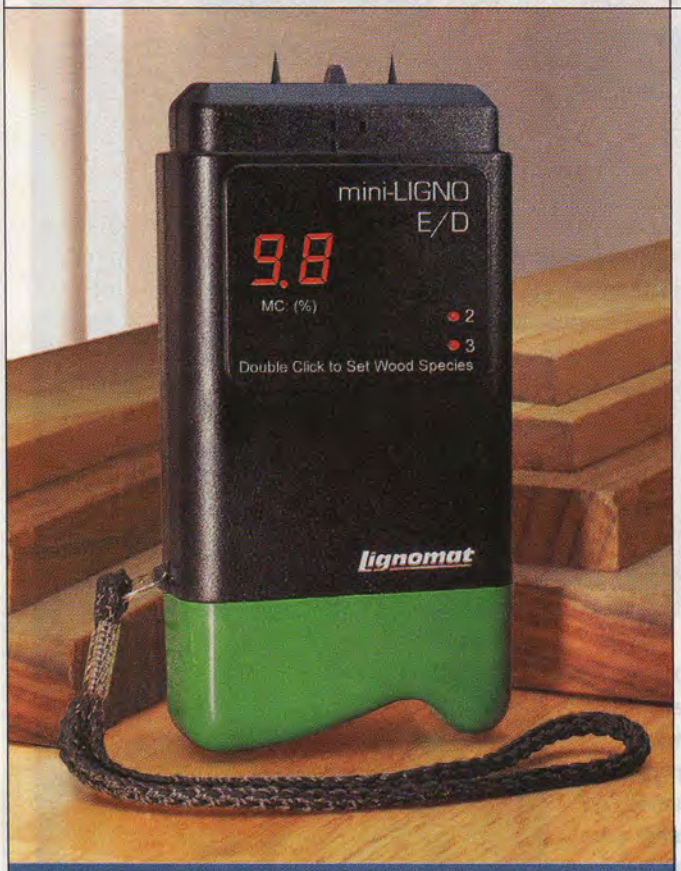
The Well-Equipped Shop



Compact Digital Moisture Meter Delivers Precise Results

KNOWING THE MOISTURE CONTENT of your wood before using it is important. If your lumber has been sitting for a while or if you enjoy milling your own boards, a moisture meter could be the difference between an heirloom table and kindling.

Lignomat's Mini-Ligno E/D is perfect for woodworkers. It is straightforward and easy to use. The digital readout displays moisture content in 0.1% increments below 10% and 1% increments above 10%. The moisture range (6-45%) is low enough for furniture builders, cabinetmakers and professional woodworkers, yet high enough for construction lumber and woodturning. The meter also comes with both 3/16" and 7/16" pin probes for different wood thicknesses. The Mini-Ligno E/D measures moisture content in wood groups two and three, which include most common American and tropical soft and hard woods. A temperature corrected reading chart is also included. One thing that we really liked about the design is that the cap doubles as a comfortable pushing base when in use.

Source: Lignomat USA Ltd, www.lignomat-moisture-meter.com, (503) 257-8957, Lignomat Mini-Ligno E/D, #ED-0, $125.

Our Pick of the Latest Tools

STAFF

New formulas provide strong, flexible bonds.

THESE OFFERINGS FROM GORILLA GLUE bring a couple of very useful bonding agents to woodworkers. They aren't intended to replace wood glues in the shop, but having an epoxy and a super glue (cyanoacrylate/CA) on hand is invaluable when you need them.

Epoxies have been around for a long time. Modern boat builders have used them extensively because of their water resistance and strength. In the shop, a small quantity of epoxy is useful for quick repairs and gap filling. Gorilla Epoxy is perfect for gluing joints or parts where the gap exceeds the thickness of a sheet of paper. It's also useful in multi-material pieces, as it bonds wood, steel, aluminum and ceramic among other materials. Their forumalu uses urethane in the resin, which gives the glue added strength and toughness. The resin and hardener also have similar viscosities, making it easier to dispense even amounts from the double syringe.

Gorilla Super Glue is quick-curing (30-60 seconds) and useful in precision gluing applications. Unlike traditional super glues, this one is impact resistant (small rubber particles are mixed in with the glue). It comes in handy when mending a handle or part that's likely to be exposed to vibration or other abuse. It's thicker consistency gives more control in application and spreads evenly with a short 5 to 10 minute clamping time. It doesn't run on vertical surfaces, making it useful for repairs, like gluing down loose veneer or quickly bonding broken trim work.

Source: Gorilla Glue, www.gorillaglue.com, (800) 966-3458, Epoxy, $4.99, Super Glue, $4.99.

Devilish Bits

THE NEW DAREDEVIL spade bits from Bosch feature threaded, conical tips. This allows for easier and quicker drilling. Little force is needed to start the hole, as the threads pull the bit down into the wood. Their patented spur and reamer design scores holes for a clean entry, and the angled cutting edges ream the hole for reduced breakout. The paddle is also contoured to bring debris up and out of the hole, allowing the bit to move more quickly and cleanly. Bosch claims this bit to be 2.4 times faster drilling through wood than a normal spade bit, and our tests show that they are indeed faster. All of this design results in very clean holes drilled quickly and easily.

If you're going to be drilling a lot of holes, or at awkward angles, the time and energy that these bits save could be well worth the investment. Though designed with handheld drills in mind, these bits perform just as well on a drill press, using clamps and a sacrificial board to achieve the cleanest results. They come in 4", 6" and 16" lengths with sizes ranging from 1/2" to 1-1/2", and 6" and 12" extension shafts are availble. You can get these bits in sets of eight as well.

Source: Bosch Tools, www.boschtools.com, (877) 267-2499, DareDevil Spade Bits, $2.56 to $11.34 depending on size and length, Sets range from $9.60 to $45.66.

Fan-powered dust collection

THE DEMO AIR NET turns an ordinary box fan or circular fan into a convenient, inexpensive tool for reducing airborne dust associated with sanding, routing and sawing when conventional dust collection isn't available. It's not intended as a replacement for central dust collection, but it will, however, reduce the floating dust particles associated with many common shop activities.

It's especially helpful for working on location and keeping a non-shop space clean through air circulation. It attaches to most common household fans, and chances are you've already got one laying around.

Source: Demo Air Net, www.demoairnet.com, 1-866-991-4141, Regular (fits fans up to 18" round) $54.97, other sizes also available.

Three Powerful Drills

THE NEW DEWALT XRP DRILLS are serious tools built to last. They feature a high-power, high-efficiency motor that provides plenty of muscle for drilling and fastening. The transmission has three speeds to adjust torque for different applications. The metal gears and gear case allow the transmission to dissipate heat efficiently and effectively. In use at our shop, these barely even warmed up, even after driving in 400 consecutive screws on a single charge.

One very nice feature is the self-tightening chuck. It's designed to have greater holding strength than traditional ratcheting chucks, and it self-tightens during use. This means that you don't have to worry about your bits coming loose in the middle of a project.

The drills come in 18 volt, 14.4 volt and 12 volt sizes and are powered by Ni-Cad batteries. Because these drills are heavier than many other cordless offerings, you might want to consider upgrading to a lithium battery, which boasts a substantially lighter weight with the same run-time as the standard Ni-Cad.

Source: DeWalt, www.dewalt.com, (800) 433-9258, Heavy-Duty 18V 1/2" XRP Cordless Drill/Driver, #DCD940KX, $27;, 14.4V 1/2" XRP Drill/Driver, #DCD920KX, $19;, 12V 1/2" XRP Drill/Driver, #DCD910KX, $179.

New Porter-Cable Lithium-ion Batteries and Tools

PORTER-CABLE RECENTLY EXPANDED its professional-grade cordless tool line with a slew of new tools and extended use 18 volt lithium-ion batteries to complement their current Ni-Cad and lithium-powered options.

Two impact drivers, a drill, a jigsaw, a rotary saw, a detail sander, a hand vac, an area light and two combination kits round out the new offerings. In addition to their standard lithium ion battery, the new lithium batteries come in two sizes, the LX and EX. These new batteries can be used interchangeably on all of their 18 volt tools to give an extended run time to demanding applications.

In our tests using the new compact drill/driver and the new impact driver, the LX battery lasted nearly twice as long as Porter-Cable's standard lithium-ion battery. The EX lasted nearly four times as long as the standard lithium-ion battery. Though, these extended-life batteries weigh slightly more.

Both the compact drill/driver and impact driver are lightweight and comfortable, offering greater control and precision than heavier tools. Both include an LED light to illuminate darker spaces. Their compact sizes easily fit in most spaces where larger tools couldn't fit before. We found that they are powerful enough for most jobs around the shop. The compact drill/driver has plenty of torque available for demanding applications. And the impact driver is perfect when you need maximum torque in a small, lightweight tool.

We also got a chance to test out the jigsaw and detail sander. Both are straightforward and easy to use. Blade changes on the jigsaw are quick and simple. And it includes a vacuum attachment for dust collection, as well as a tool-free steel shoe that positions with ease from 45 degrees to 90 degrees.

The detail sander comes with a detachable detail finger that is useful for getting into tight corners. The sander also includes an attachment for dust collection, a very useful feature to keep your lungs and work area clean.

These tools and others are available separately and in kit form. And all of these tools use the same battery footprint. Expanding your collection is as simple as adding a new tool and popping in your existing battery. Those who use their tools more regularly will find that more batteries, as well as the extended life LX and EX bring usability to a whole new level. Still, everyone will appreciate the lighter weight and longer-lasting charges that come with lithium-ion battery powered tools.

Source: Porter-Cable, www.deltaportercable.com, (888) 848-5175; Batteries: LX, #PC18BLX, $69.97; and EX, #PC18BLEX, $89.97; Detail Sander, #PC18DS, $29.97; Hand Vac, #PC18HV, $29.97; Jigsaw #PC18JS, $49.97; Rotary Saw #PC18SS, $39.97; 18 volt Lithium-Ion Impact Driver, #PC18ID, $69.97; 12 volt Ni-Cad Impact Driver Kit, #PC120IDK-2, $139; Area Light, #PC18AL, $29.97; Lithium-Ion Three-Tool Combo Kit, #PCL318IDC-2, $229; Lithium-Ion Four-Tool Combo Kit, #PCL418C-2, $269.

Bosch 4 Volt Lithium-Ion Screwdriver

DON'T LET THE SMALL SIZE fool you. The new Bosch 4 volt lithium-ion screwdriver fits in the hardest to reach places, making it perfect for attaching hinges and other finish work. It comes with a case, two batteries and a one-hour charger that charges both Bosch's 4 volt and 12 volt batteries.

One handy feature is Autolock, which automatically locks the bit holder in one position when the trigger is released. This allows you to manually tighten or loosen a net or screw by hand if higher turning torque is needed. It also has a magnetic hex chuck that holds the bit and screw in place during use. An LED light right below the bit illuminates dark spaces.

It's surprisingly powerful, and works in a pinch for more torque-heavy applications. The variable speed trigger, when used wisely, prevents breaking or stripping out a small screw.

In our tests, the drill was able to drive a #8 1-1/2" screw into a piece of poplar, though definitely not as quickly as higher-powered drills might have.

Source: Bosch Tools, www.boschtools.com, (877) 267-2499, 4V Max Screwdriver (SPS10-2), $85.

Small Scraping Plane

SOMETIMES A WOOD'S GRAIN DIRECTION is so unruly that planing just gets you in trouble–tearout is inevitable. Faced with this situation, the hand tool to pick up is a scraper. A card scraper is fine for small areas, but to avoid ripples or hollows, you're better off using a scraper plane. Here's a small one from Veritas that's a pleasure to use.

About the size of a block plane and stoutly made, this one-handed tool has a unique feature borrowed from the Stanley #80 scraper–a set screw that bows the blade. Bowing the blade allows you to easily make a fine depth-of-cut adjustment and prevents the corners of the blade from digging in and leaving ridges. The 2" wide blade also extends the full width of the tool's body, like a rabbet plane, so you can scrape up to a corner.

As with many other Veritas tools, this is not merely an updated version of an old design. It's new and different, and very well engineered. This unique plane would be a fine addition to a serious user's set of hand tools.

Source: Lee Valley, www.leevalley.com, (800) 871-8158, Veritas Small Scraper Plane, #05P29.50, $119.

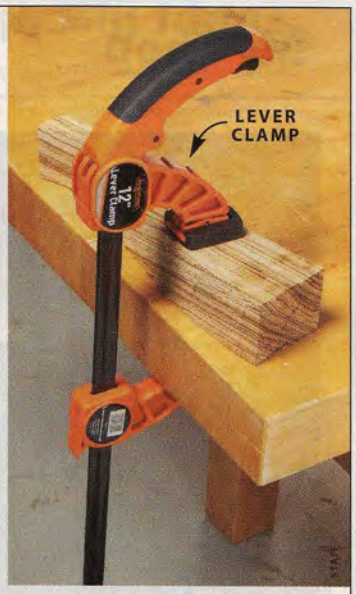
Bar Clamp Trio

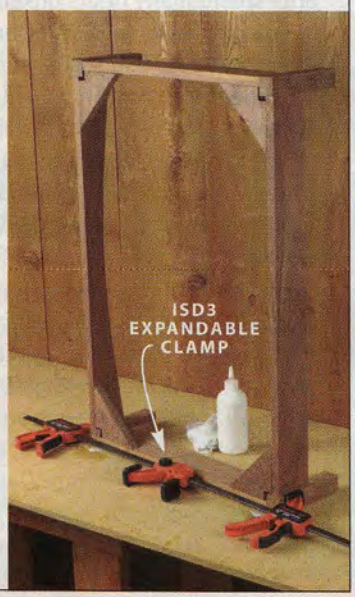
JORGENSEN RECENTLY INTRODUCED a trio of newly designed bar clamps. The Lever Clamp comes in 6" and 12" capacities and is perfect for assembly work, where a lightweight, quickly adjustable clamp can make things so much easier. Strength isn't sacrificed, however, and the lever clamp gives plenty of clamping pressure for smaller jobs. Nearly instantaneous clamp removal is possible with the clever lever/trigger design. Rubber padded feet won't mar your clamping surface, and flat-bottomed jaws allow the clamp to stand on its own –another very useful feature.

Another new introduction is the Gear Clamp. Available in 4", 8" and 12" capacities, we found it perfect for clamping to the bench top because of the angle and placement of the lever, though it's sure to be useful in a variety of other small assembly jobs. The ratcheting action of the lever is solid and won't slip, and a push-button release makes removal a snap. Like the Lever Clamp, it also stands on its own. This geared clamp has a metal clamping foot, but it's big enough that you don't need to worry too much about marring your work.

The ISD3 Expandable Clamp is an ingenious device. By itself it's similar to other clamps on the market: a lightweight, yet strong bar clamp. The real breakthrough comes in the design of the foot that allows two of the clamps to be used in tandem for larger clamping jobs. Just squeeze the handle to increase clamping pressure and click the trigger to release it. The foot can be removed and reversed for use as a spreader clamp. These clamps are sold individually or in 2-piece kits.

Source: Adjustable Clamp Company, www.adjustableclamp.com, (312) 666-0640, Jorgensen 4" Gear Clamp (38004), 8" Gear Clamp (38008), 12" Gear Clamp (38012), $27.99-$34.99; Jorgensen 6" Lever Clamp (38406), 12" Lever Clamp (38412), $24.99-$26.99; Jorgensen 6", 12", 18", 24" or 36" ISD3 Expandable Clamp, $18.99-$28.99; Jorgensen 6" 2-Piece ISD3 Expandable Clamp Kit (33506) $34.99, 12" 2-Piece ISD3 Expandable Clamp Kit (33512) $39.99.





Victorian Shop

I'M A HIGH SCHOOL MUSIC TEACHER. But I spend many hours tinkering and building in my garage workshop, my private retreat. I especially enjoy spending time there early on Saturday mornings, while the rest of my family sleeps.

We added the attached garage when we restored and expanded our 1870s vintage home in Red Wing Minnesota. Its generous 26' x 30' size provides room for all my woodworking tools, with enough space left over to park two cars inside during our cold winters. The 12' walls and upward sloping scissors trusses provide ample headroom. There's even a loft at one end for additional storage. During the summer, the cars stay outside and the shop stays "set up". To work on a proj-

EDITORS: DAVID RADTKE AND TIM JOHNSON • PHOTOS COURTESY OF PETE DULAK

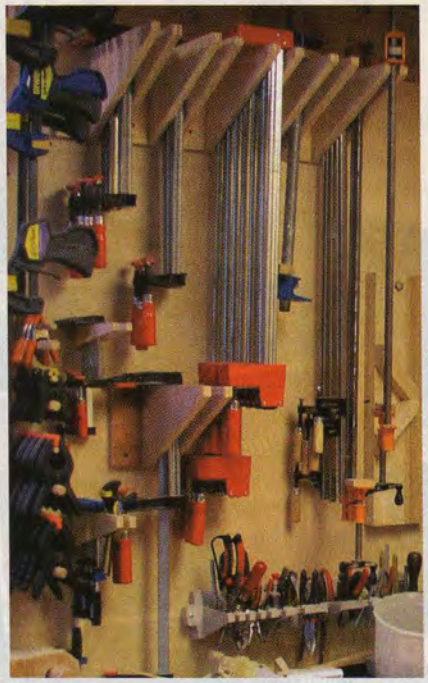
ect during the winter, I back out the cars, turn on the shop's infra-red heat and roll the tools into place.

Sharing the space with cars supplied the inspiration to make the workbenches and stationary tools mobile. I fitted the workbenches with casters (their bases are made from old storage lockers) and also mounted my cabinet saw and jointer on mobile bases. My planer and other benchtop tools set up easily on knock-down bases.

I get plenty of light from skylights, and the 16' wide garage door makes for easy access and instant ventilation, when needed. A dust collector with blast gates and flexible hoses attached to each machine controls sawdust. Airborne dust is captured by a ceiling mounted air purifier.

My shop has come in very handy for completing many of the intricate Victorian "gingerbread" details that I made during the restoration of our house. I also use it for building furniture pieces, built-in cabinets and various other projects.

Pete Dulak
Red Wing, MN



My workbench tops were salvaged from an old junior high school. They're mounted on old steel storage lockers and fitted with locking casters.

During the summer, the cars stay outside and my tools occupy the prime real estate. Rubber floor mats reduce fatigue and insulate my feet from the cold during the winter.

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 prints or 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

Wooden Plates

by Alan Lacer

ONE OF MY woodworking friends defines offcuts as boards that are too short to be useful, but too good to throw away. That explains why he always has a big stack of unused short boards. As a woodturner, I view those offcuts as prime material: Short, thin boards are perfect for making plates, platters and saucers. The turning process is fairly simple, because all three objects are really just shallow bowls. You don't need a big lathe, either, because these objects don't have much mass. The only tricky part is mounting the blank so you can turn both sides, and I'll show you a method that simplifies the process.

Use almost any board

Almost any offcut or short board will work, or is at least worth trying, as long as it is free of checks (cracks) and pith (the material at the very center of the tree). The board should also be relatively dry—plates made from wet wood are much more likely to warp. Any traditional hardwood used in furniture making is suitable. Maple, cherry, oak (especially quartersawn or riftsawn), walnut, hickory, butternut, birch, and beech are all good choices. Cypress, cedar and pine work well, too. These projects are also a good way to test the turning qualities of exotic woods, or local woods that you've cut yourself.

The plate's diameter depends on

EDITOR: TIM JOHNSON

the width (or length) of the board, of course, but it's ultimately limited only by your lathe's capacity. For starters, I recommend turning a plate with a diameter between 7" and 10". As the plate will be hollowed into the board's face grain, the board's thickness is another consideration. Hardwood lumber is available in a variety of roughsawn thicknesses—1", 1-1/4" and 1-1/2" thick boards all make good plate material. If you plan to turn a small saucer (6" dia. or less), you might even use a board as thin as 1/2".

Mount the blank backwards

Plates tend to be on the thin side, so mounting the blank is the first challenge. This story shows my favorite mounting method, which uses special double-faced tape. However, you should use this method only after you have turned a number of bowls and have developed a sound technique with bowl gouges.

The best strategy is to turn one side of the plate and then remount it to turn the other side. I prefer to turn the back of the plate first, so I start by mounting the blank "backwards," with its front face oriented toward the headstock (**Photo 1**). I use the double-faced tape later, when I remount the blank.

The tape must have a super-strong grip (see Sources, page 30). Do not substitute garden-variety tape from the hardware store, or even carpet tape. For the tape to adhere properly, the blank must be flat, clean, unfinished, dry and absent of oily resins. If the wood is oily or resinous (teak, cocobolo, or bocote, for example), scrub the surface with lacquer thinner or acetone.

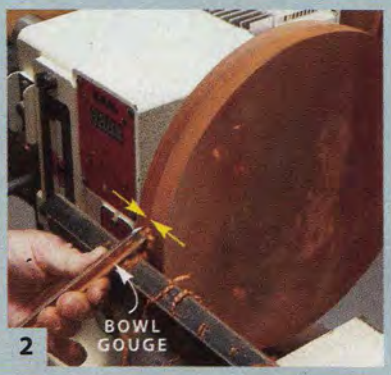
Turn the back side

1. Start by truing up the blank's edge (**Photo 2**).

2. Next, true up the blank's back side and determine the size of its base (**Photos 3 and 4**). The center area must be absolutely flat.

1

Prepare the bandsawn blank for turning. The back of the plate will be turned first, so fasten a faceplate on the front of the blank. The screw holes will disappear later, when the front (or "open") side of the plate is shaped.



2

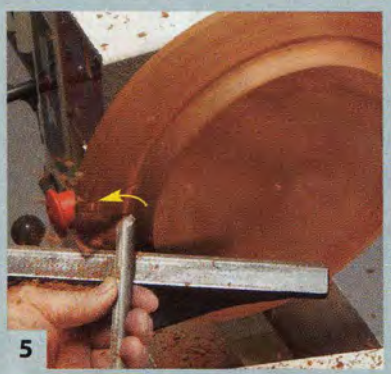
Use a bowl gouge to true up the edge of the blank and make it round. Avoid splintering the blank's faces by working the edge from both sides. Start at the outside and move to the center.

3

Flatten the back side of the blank. Work from the center to the outside. Start with the bowl gouge; then switch to a square-ended scraper to level the surface.

4

Use a straightedge to check the leveled surface. The center area must be absolutely flat, so you can successfully remount the faceplate when it's time to turn the plate's open side.



5

Use the bowl gouge to shape the back side of the rim. Work from small to large diameter. As you shape the outside, consider your intentions for the inside shape.

6

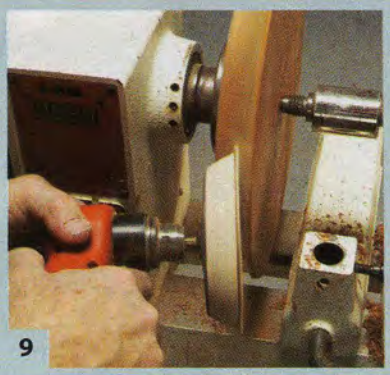
Mark a circle slightly larger than the faceplate on the spinning blank. Then remove the blank from the lathe, and the faceplate from the blank.

7

Install the faceplate on the outside of the blank, using the centered circle and high strength double-faced tape (see Sources, page 30). Trim the tape to match the faceplate.

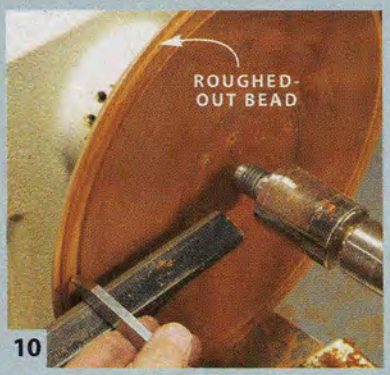
8

Remount the blank. Then use the tailstock and a block to clamp the taped joint. The block isn't glued; it's used to distribute the clamping pressure. Allow at least one hour for the tape's bond to fully strengthen.



9

Sand the back of the rim using a cushioned disc mounted in a drill. Before sanding, remove the clamp block and reposition the tailstock so it continues to support the plate.



10

Always work from the outside edge towards the middle when shaping the open side of the blank. Start by creating the rim. It can be flat, curved or detailed. Here, cutting in with a parting tool roughs out a bead.

11

Roll the bead using a detail/spindle gouge. Complete each half of the bead's rounded shape separately, by starting at the center and working to the edge.

12

Remove waste beyond the rim, using the bowl gouge. Plunge down and toward the center. This step provides clearance, so you can complete the rim.

3. Shape the back side of the plate (**Photo 5**). This shape should roughly mirror the shape you have in mind for the plate's open (front) side.

4. Draw a circle on the base to mark the faceplate's next location, so when you reverse the blank, it will remain accurately centered (**Photo 6**).

5. Remove the blank; then remove the faceplate. Make sure that the faceplate is absolutely clean of rust and residue by wiping or scrubbing it with lacquer thinner. Cover the faceplate with the double-faced tape and mount it on the outside of the blank (**Photo 7**).

6. Remount the blank on the lathe—its open side now faces the tailstock. Use a block of wood and the tailstock center to clamp the blank/faceplate assembly (**Photo 8**).

7. Complete the back side of the rim by power sanding, using a drill and a 5" cushioned disc (**Photo 9** and Sources). Power sanding is a fast and effective way to true up any slight irregularities.

Turn the open side

8. Determine the shape of the rim: bead, flare, rolled edge or just a gentle transition into the bottom of the plate. If you intend to do a bead, lay it out with a parting tool (**Photo 10**), and finish the shape with a detail/spindle gouge (**Photo 11**). Then complete the rim (**Photos 12 and 13**).

9. Use the bowl gouge to shape the plate's interior (**Photo 14**). Work from the rim towards the center in stages, one section at a time. The goal is to complete the turning for each section as you go. Consider the wall thickness as you create the transition from the rim to the bottom of the plate. Cut in decisively—it's difficult to go back and rework this shape later, due to the lack of support. Leave the tailstock in position until only a 2" dia. section remains at the center (**Photo 15**). Remove the tailstock and peel down this remaining section.

10. The bottom of the plate's interior is usually flat or curves gently to the center. Remember that you often

have very little thickness to work with on these projects, so don't overdo the hollowing—leave the bottom of the plate at least 3/16" thick. I normally shape the bottom with the bowl gouge, followed by very light scraping with a square-ended scraper (**Photo 16**). Sanding completes the process. I prefer to sand this side of the plate by hand, especially if it has beads and other fine details.

Apply the Finish

11. Removing the plate from the taped faceplate can be challenging, because of the strong bond. The key is a steady, even pull for 20 to 30 seconds (**Photo 17**). If the project has turned out to be on the thin side, work some mineral spirits or naphtha into the area of the tape and wait a few minutes. Then try the slow and steady pull—don't force it.

12. Clean the bottom with mineral spirits or naphtha; then sand lightly by hand.

13. For functional objects that will be well cared for, I like to use food-safe oil finishes, such as pure tung oil, walnut oil or mineral oil (**Photo 18**). Tung and walnut oils will eventually dry; mineral oil never dries. For stain resistance, I suggest using a film-type finish, such as a wiping varnish. Plan to apply at least four coats. Once they've fully cured, these finishes are food safe.

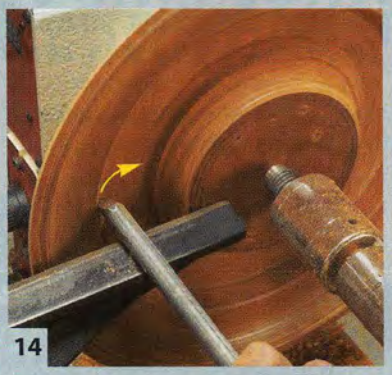
SOURCES

- Packard Woodworks, www.packardwoodworks.com, (800) 683-8876, High Strength Double-Faced Tape, 1" width, #121091, $20.95; 2" width, #121092, $41.95.
- The Sanding Glove, (www.thesandingglove.com, (757) 665-4597), 5" Disc Holder, #SM5M, $15.95; 12-Piece Sanding Disc Assortment, #275-AST-5", $5.95.

Alan Lacer is a woodturner, writer and instructor living near River Falls, WI. You can find out more about Alan and his work at www.alanlacer.com.

13

Complete the rim. It can be tapered or flat and wide or narrow, depending on your taste and the shape you've created on the outside of the plate.



14

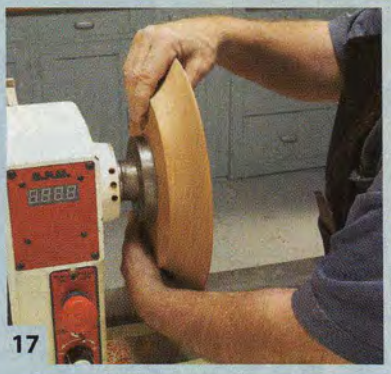
Establish the plate's depth. Cut in decisively from the edge of the rim, plunging down and towards the center.

15

Remove the waste at the center, using the opposite side of the gouge and working in the opposite direction. Plunge in and down to full depth. Back off the tailstock to complete the job.

16

Make a light, cleaning cut with the bowl gouge to blend the transition between the previous two cuts. Switch to a square-ended scraper to level the surface. Then finish sand this side of the plate.



17

Remove the plate from the faceplate with a slow, steady pull. Remove any tape or residue that remains with mineral spirits. Finish sand the back side of the plate by hand.

18

Apply your chosen finish. This is pure tung oil.

Wartime Scroll Saw

MY GRANDFATHER, HENRY HAUER, made this foot-powered jigsaw during World War II. The Depression had taught him to be very frugal, so he built the saw from orange and grapefruit crates. (You can make out the words "California Fruit Exchange" on the fixed arm, which steadies the blade.) As a toolmaker in Detroit, Grandfather clearly knew how to build a functional machine. The pedal mechanism has gone missing, but it was connected to a solid wood pulley located on the left side of the saw.

My grandfather built two of these jigsaws–one for himself and one for his brother. They cut out pictures from magazines, glued the pictures onto pieces of wood, and went up into the attic to saw puzzles into the wee hours. The puzzles weren't for their own enjoyment, though–they were sent through the USO to the troops fighting in Europe. The puzzle makers also wrote generic letters to the soldiers describing the weather, news, sports and life's events, and packaged the letters and puzzles in old cigar boxes. Many of the young men overseas never got mail from home and they were often bored. A puzzle and a letter from home were, in a small way, things that my grandfather hoped might relieve the drudgeries of war. I proudly display his tool in my shop!

Martin Hauer

Tool Chest Odyssey

WHILE ON VACATION in Maine, I purchased this classic tool chest at a yard sale. The case was missing its handle and had only two drawers remaining. The seller said he had every intention of restoring it. Of course, he never got around to it. I bought the chest for $15 and proudly showed it to my friend Roger, who immediately identified it as an H. Gerstner and Sons tool chest, made in his hometown of Dayton, Ohio. (I live in Alabama.) Roger volunteered to take it back to Dayton and check on having new drawers made for it by Gerstner. The company still makes a similar chest, the No. 52 Journeyman's Tool Chest, and sells replacement hardware.

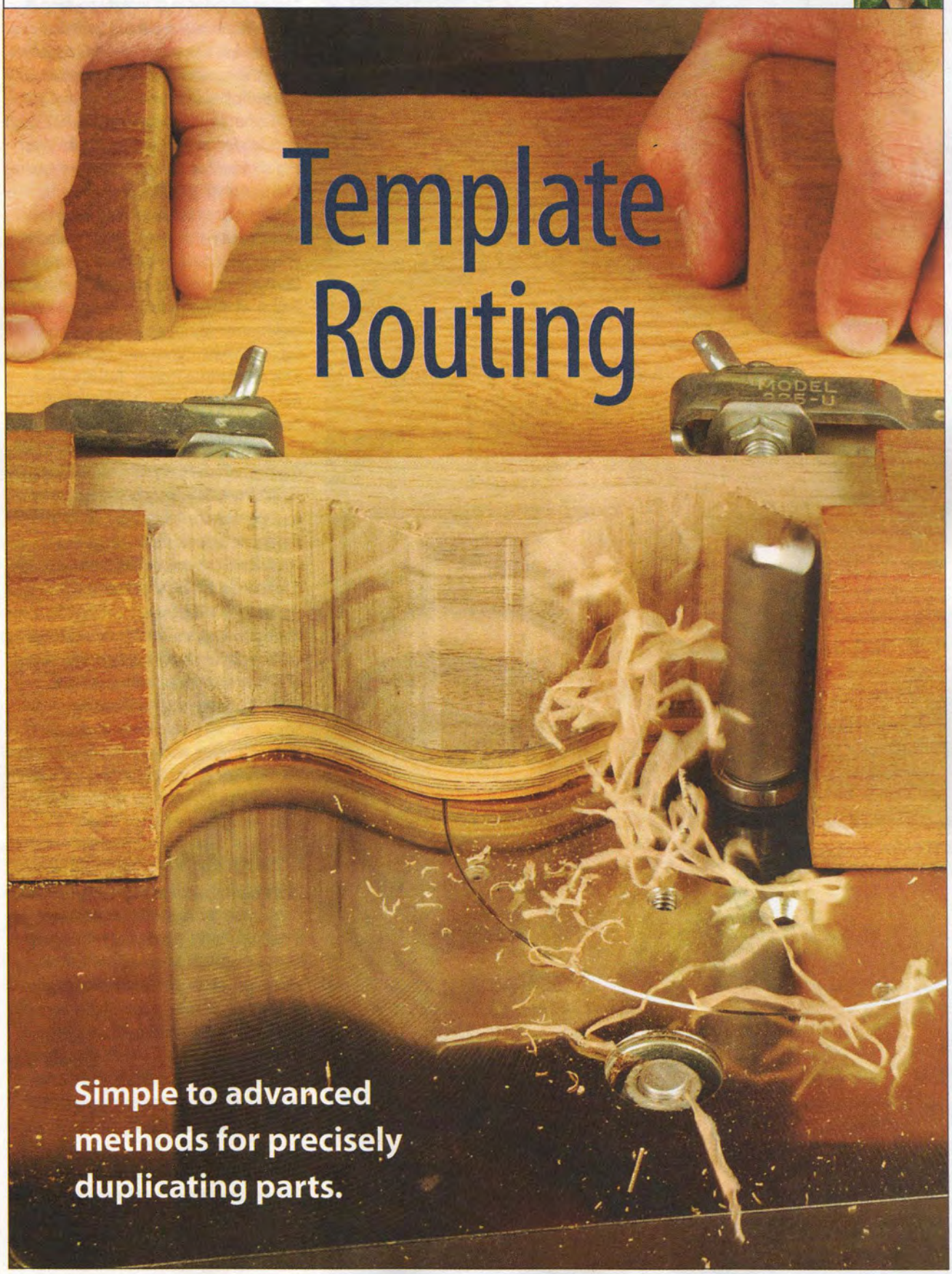
On the way back to Ohio, Roger's car caught on fire at a Massachusetts Turnpike tollbooth. The car was totaled, but somehow Roger managed to save the chest. Back in Dayton, the drawer replacement deal didn't work out because it was too expensive. Roger sent the chest back to me on a fishing boat headed down the Ohio and Mississippi Rivers. I built the new drawers in my woodshop and bought a replacement handle. Now that's a strange journey! I wonder–where are the missing drawers?

Harold L. Trammell

We'll pay you $100 to share your favorite tools, new or old, with fellow readers. Contact us by e-mail at **toolnut@americanwoodworker.com**, or mail us at American Woodworker, 1285 Corporate Center Drive, Suite 180, Eagan, MN 55121. If possible, please include digital photos of your tools.

EDITOR: TOM CASPAR • PHOTOGRAPHS COURTESY OF CONTRIBUTOR

Template Routing



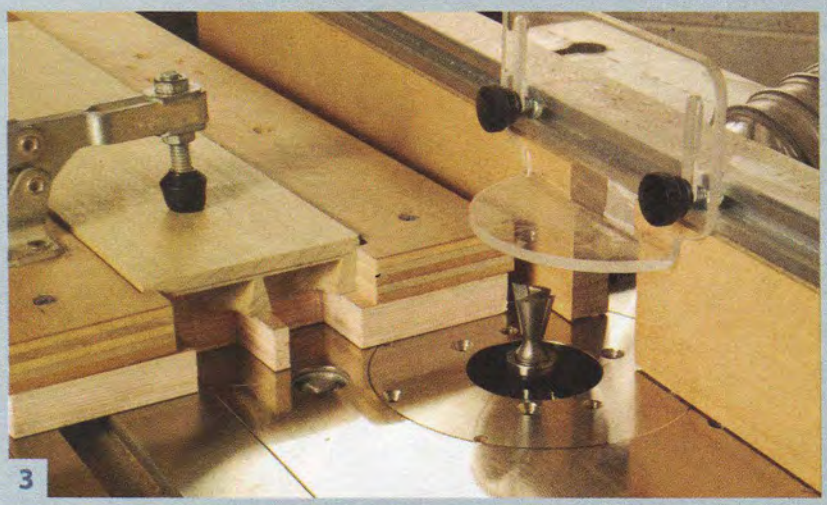
Simple to advanced methods for precisely duplicating parts.

1

Template routing is a method for guiding a router bit with a shop-made pattern, or template. Here, the bearing on a flush-trim bit follows a plywood template.

2

Identical parts with smooth, uniform surfaces are easy to make using a template.



3

Precision joints can also be made with shop-made templates. I designed this template for routing half-blind dovetails in a drawer front.

NO OTHER METHOD for shaping is as fast or efficient as template routing. It works like this: the part to be shaped is fastened to the template; the router follows the template as it is guided around the template's perimeter (**Photo 1**).

Template routing ensures that each part is identical; whether you're shaping six parts or sixty, each one matches the template (**Photo 2**).

Template routing is versatile, too. You can use this method for shaping almost any part, large or small. It works for making straight cuts, curved cuts, and even for moldings. The part can be as ordinary as a straight-sided shelf for a corner cabinet or as complicated as a serpentine drawer front, which has a convex section between two concave ones.

There are many methods of template routing, which I'll explain below. They range from simple techniques, such as routing that corner cabinet shelf, to advanced setups, such as shaping a complex S-curve molding (see Routing A Gooseneck Molding, page 41).

Template routing is not just for production work. In fact, there are some cuts, such as shaping the entire edge of a curved tabletop or cutting a curved groove, that cannot be routed any other way. Once you understand this technique and use it a few times, you'll begin to imagine other possibilities for its use. I even use a template for routing some joints (**Photo 3**).

Straight-sided parts

Even though most straight-sided work is crosscut or ripped on a tablesaw, there are times when the tablesaw is not as practical as using the router and a template. For example, the diamond-shaped shelves of a corner cabinet have straight sides, but most of them are not parallel. Odd shapes such as these are quickly and easily shaped with a router, a template and a flush-trim bit (**Photo 4**).

Curved parts

Curves can add a lot of interest to a piece of furniture. Routing these curves, following a template, is one of

the best ways to ensure that the curves are uniform. Curved legs and drawer fronts, for example, are easy to duplicate (**Photo 5**). All you have to do is to make one perfectly shaped template, and the router bit will do the rest of the work for you.

Seemingly difficult curves, such as a gooseneck molding, can be easily shaped with a template. After the rough shape of the molding is created with a bandsaw, a template and a flush-trim bit can be used to smooth away the bandsaw marks and fair the curves. Afterwards, the molding profiles can be shaped using an overarm guide at the router table–more about that later.

Routing grooves and dados

Although there are a number of ways to cut grooves and dados with a router, using a template is among the most accurate methods–and in some cases the only choice available. When constructing fine casework, a template ensures accurate alignment of dividers and partitions (**Photo 6**). Instead of measuring and marking the location of the dados, a graduated set of templates, which register to the side of the case, provide pinpoint accuracy.

Tambours slide in curved grooves and disappear when opened. Routing matching curved tambour grooves, both S-curved and semi-circular, is no problem with a template (**Photo 7**).

Methods of guiding the router

The key to making various cuts with a template is to guide the router through the intended path. There are essentially four methods of doing this:

1) Using the guide bearing on the end of a bit;

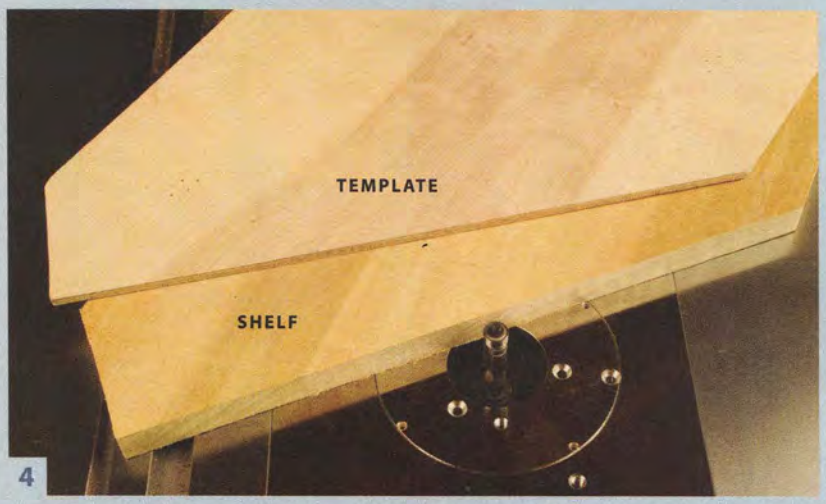
2) Using a bushing attached to the router's sub-base;

3) Using the sub-base of the router;

4) Using an overarm guide attached to the top of a router table.

THE GUIDE BEARING METHOD

The most convenient method for guiding the router is with the bearing on the end of a bit. Most profile bits have

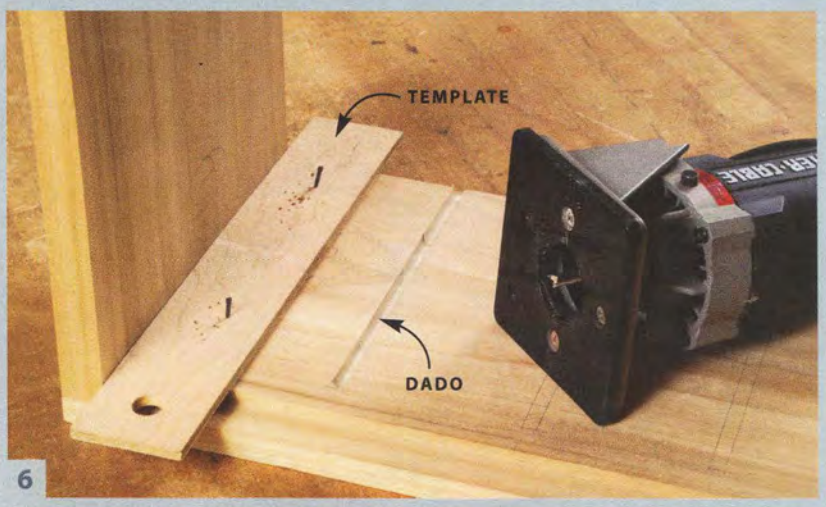


4

A straight cut that's not parallel to another side is hard to set up on a tablesaw, so it's an ideal candidate for template routing. This is a diamond-shaped shelf for a corner cupboard.

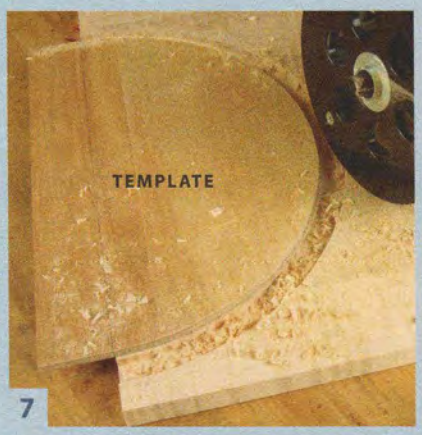

5

Curved parts, both large and small, can be duplicated by template routing. Here, I'm using a tall flush-trim bit to shape a small serpentine drawer front.



6

Templates are also useful for routing grooves and dadoes, such as this dado for a partition inside a cabinet. The template precisely locates the dado.



7

Using a curved template is just about the only way to make a curved groove. This groove will receive a tambour door.

8

There are many ways to guide a router bit around a template. The simplest method is to use a bit with a guide bearing. Here, the template was fastened to the top of the workpiece.

9

Some flush-trim bits have two bearings. These bits are ideal for avoiding tearout when routing curves. By flipping the template and workpiece, you can always rout downhill, with the grain.

10

A bushing mounted in a router's sub-base is also a common method of guiding a bit around a template. This method is well suited for cutting grooves of any width.

11

A router's sub-base is also a good guide for following a template. Here, I'm routing mortises inside a carcase. Setup is straightforward and convenient.

a guide bearing which can be used to shape the edge of a curved surface such as a tabletop. Router bit guide bearings are precisely machined and mounted concentric to the bit's profile. This ensures that the profile's depth remains consistent along the entire edge that's being shaped. The small diameter of most guide bearings allows the bits to be used to shape tight contours (**Photo 8**).

Flush-trim bits also use a guide bearing. These bits are ideal for smoothing irregular shapes, such as the sloped edge on the sides of a slant-front desk, as well as smoothing tight bandsawn curves.

Most flush-trim bits have a bearing below the bit, but others have a bearing above the bit, on the shank. These bits are often called "pattern bits" in tool catalogs, and are quite handy when it's more convenient to mount a template on the top of a workpiece, rather than on the bottom.

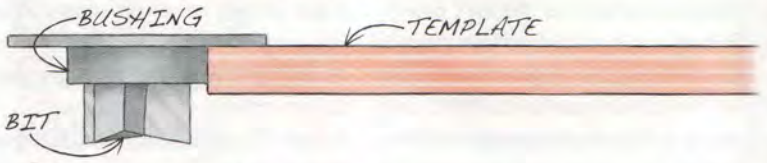
Some flush-trim bits have two guide bearings, one on the end of the bit and a second bearing on the bit's shank (**Photo 9**). This design allows you to always cut "downhill" with the grain and avoid tearout. When routing a semicircle, for example, you rout one half of the arc with the template positioned below the workpiece, riding on the bearing on the bit's shank. To rout the other half, you flip over the workpiece and template, so the template is above the workpiece. Then you readjust the bit's height and ride on the bearing at the end of the bit. This bit is very useful for any S-shaped curve, where the grain of the workpiece is likely to change direction.

Designing a template to use with the guide bearing method is quite simple. Just make the template the exact size and shape as the pattern you wish to duplicate.

THE GUIDE BUSHING METHOD

When cutting on the end of the bit,

Fig. A Calculating the Template Offset



When using a guide bushing, there's always a small gap between the bit and the template. You'll need to know this offset when designing your template. To calculate the offset, measure the diameter of the bit, subtract it from the outside diameter of the guide bushing, and divide the result by two.

such as when routing a curved groove, I use a guide bushing. (Guide bushings are also called "template guides" in tool catalogs.) The guide bushing is just a metal ring which fastens to the base of the router (**Photo 10**). These rings come in a variety of diameters and lengths for use with different diameter bits. When selecting a guide bushing, keep in mind that there must be at least a 1/64" gap between the bit and the bushing, so the bit doesn't cut into the bushing. The inside diameters of many bushings are 1/32" larger than the diameters of commonly used straight bits.

Unfortunately, guide bushings are usually not perfectly concentric to the router collet, because the router's sub-base isn't perfectly centered on the base. This means that the gap between the bit and bushing may be different on one side of the bushing than on another side. The practical result is that the distance between the bit and template may vary, depending on how you orient the router to the template. However, most of the time the slight amount of eccentricity is not an issue. When eccentricity matters, I mark a spot on the base and am careful to always guide the router from that point. This ensures that the distance from the cut to the template remains constant.

When you're designing a template to use with the guide bushing method, first select the bushing and bit and install them in your router. Next, measure the diameter of the bushing and subtract the diameter of the bit (Fig. A). Divide the result in half to give you the distance between the template and the cutting edge of the bit.

THE SUB-BASE METHOD

Using a router's sub-base to guide a cut is straightforward and convenient, especially when routing certain joints (**Photo 11**). When using this method, I prefer a square or rectangular sub-base as opposed to a round one. Guiding each cut from the same side of a square sub-base ensures that the spacing is consistent. Some plunge router sub-bases have one straight side, for example, and I prefer to reference from that side when template routing. I have also made or bought square or rectangular sub-bases for some of my routers to use when accuracy is critical. However, you can also achieve consistent results by guiding off of a round sub-base. Just mark a spot on the sub-base with bright red paint and keep that spot against the template.

When designing a template to use with the sub-base method, you must also factor in an offset, similar to the guide bushing offset above. Measure the diameter or width of the base, subtract the diameter of the bit, and divide the result in half. This will give you the distance from the template to the cutting edge of the bit.

THE OVERARM GUIDE METHOD

An overarm guide is a shop-built device that mounts on top of a router table (**Photo 12**). It consists of a long arm whose end is curved to match the smallest radius on the template, a support for the arm, and a bearing securely fastened to the arm. You may purchase the bearing at an auto supply shop or borrow a bearing from a router bit.

This method is similar to using a guide bearing, but unlike a guide

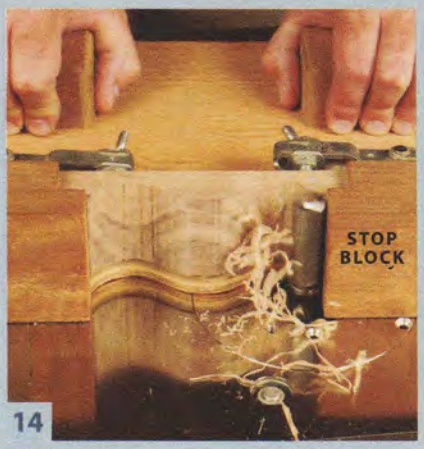
Template Safety

I teach woodworking to new students each year, and of course I'm particularly concerned that they learn to work safely. We often use templates for routing, and before we get started, I cover these safety guidelines:

1. The template should be large enough to safely distance your hands from the bit.
2. The template should be securely fastened to the workpiece.
3. Screws, nails and clamps should be positioned out of the bit's path.
4. The template should extend beyond the workpiece, on both ends. This way, the guide bearing or bushing will make contact with the template before the bit comes in contact with the workpiece.
5. Avoid heavy cuts. A light cut is safer and creates a smoother surface.
6. When using a router table, install or make a guard.
7. Never climb cut. (Climb cutting is routing in the same direction that the bit rotates.) Climb cutting can be dangerous because the router bit can grab the workpiece and draw your hands into the bit. Always cut against the rotation of the bit. When routing by hand, the router should be pushed in a counter-clockwise direction for external cuts (see drawing, below). When the cut is internal, the router should be pushed in a clockwise direction. When the cut is made at a router table, the work should be fed from right to left. An internal cut at the table should be made in a counter-clockwise direction.

An overarm guide on a router table is a fairly sophisticated device for following a template, but it allows you to use router bits that don't have a bearing, or make cuts where a bearing would get in the way.

I prefer cabinet-grade plywood for making templates. I design them to extend an inch or so beyond the workpiece, which ensures a smooth entry when starting the cut.



When making a heavy cut or shaping small parts, I build a template jig to securely hold the workpiece. The jig usually has stop blocks to position the workpiece.

bearing, the overarm guide can be positioned eccentric to the bit's profile. This allows for shaping into the interior of the stock where a bearing-guided bit cannot reach. I use this technique when shaping large molding profiles on curved surfaces (see Routing A Gooseneck Molding, page 41). The arm is positioned above the bit and follows the curve of the template. After each cut, the arm is backed away from the bit to increase the depth of subsequent cuts.

Designing a template for use with an overarm guide is usually pretty straightforward. Make it the same size as the shape you'd like to duplicate, as when using a bearing-guided bit. The offset is created by moving the arm, rather than by adjusting the size of the template.

Template material

One of the most important elements in template routing is the material of the template itself. Although I've used a number of materials through the years, I prefer cabinet-grade plywood, which is solid and stable.

All plywood isn't created equal, though; cabinet-grade plywood is free of voids, which can catch the guide bearing and spoil the cut. Less expensive plywood may have voids, which you won't be able to see until you cut into it. Cabinet-grade plywood is easy to cut and shape, and it is readily available at hardwood lumberyards.

After many uses, the edge of a plywood template can begin to show signs of wear. Before any problems develop, I usually make a new template from the old one with a flush-trim bit.

Making the template

When making a template, I take the time to make it perfect; any irregularity in the template will be duplicated in the workpiece, or dozens of workpieces. On a straight template, I make sure that the edges are truly straight, and the angles are correct. This is not a good time to take anything for granted.

I use a number of methods to draw curves on a template. I may use a compass, a French curve or draw freehand. Often I draw the shape on the computer with AutoCAD, print the drawing, and glue it to the template with contact cement.

After bandsawing the profile, I carefully smooth the curves with files and sandpaper. This is the fussy part. I carefully inspect the template to make sure the curves are fair, checking by eye and by feel. If there's a hump or flat spot, it's back to the file or sanding block.

When making a template, I extend the template ends beyond the length of the workpiece by at least an inch or two (**Photo 13**). The guide bearing then makes contact with the template before the bit makes contact with the workpiece. This ensures a smooth entry and exit when making the cut.

The template jig

I often use a template jig for heavy cuts or for securing small work that would otherwise be unsafe to shape with a router (**Photo 14**). Template jigs demand a little more work than just making the template. The purpose of the jig is to securely fix the workpiece as it is routed. This requires adding stop blocks on the jig to position the workpiece and to counteract the forces of the spinning bit. I begin by making the template (the jig's base), then glue the stop blocks in position and fasten them with screws.

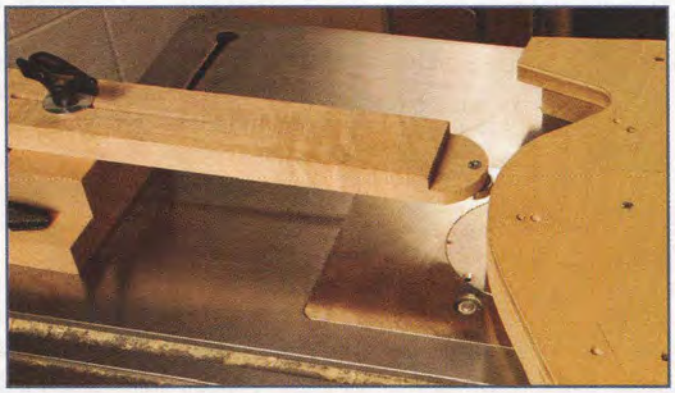
Sawing the workpiece

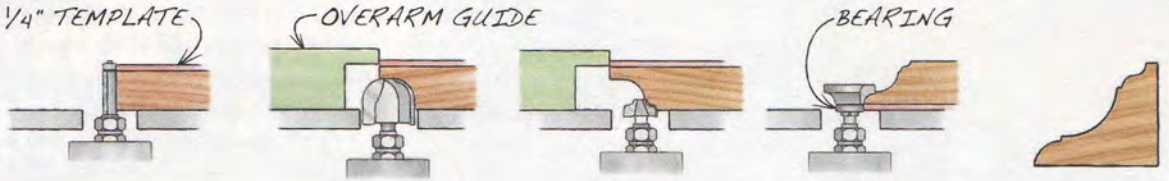
Once the template or jig is complete, I use it as a pattern for laying out curves on the workpiece. After tracing the template, I use a bandsaw to cut just outside the layout line. I aim for a 1/16" margin. If it's less than 1/16", I run the risk of cutting within the template's outline. A margin greater than 1/16" requires a heavy cut, which can cause tearout or pull the workpiece loose from the template.

Routing a Gooseneck Molding

MAKING THE MOLDING on the top of this clock required an unusual method of template routing: using an overarm guide (see photo below). The overarm guide is attached to the top of a router table, and is really just a long arm with a bearing screwed to its end. The bearing rides against the template, and can follow inside or outside curves and straight sections.

The overarm guide allows you to shape a profile that wouldn't be possible to make with standard bearing-guided bits. Let me walk you through the steps of making this molding, and I'll show you how the guide works.





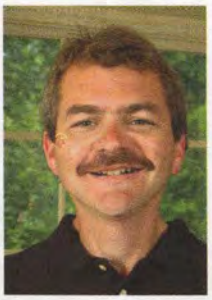
1 First, I made a template the shape of the gooseneck's inside curve. I traced the template onto the workpiece, which at this point is extra-wide, and bandsawed the curve, staying 1/16" away from the line. Next, I fastened the template to the back of the workpiece, installed a flush-trim bit in the router table, and shaped the workpiece to match the template.

2 Next, I shaped a large cove using the overarm guide to bear against the template. This required a number of light cuts, which I accomplished by moving the overarm guide slightly farther back from the cove bit each time. In the final cut, you can see that the center of the bit is offset from the edge of the template. This cut would not have been possible with a bearing-guided bit (unless, of course, it had a custom-made profile).

3 In this step, I cut a small S-shaped curve next to the cove using a standard ogee bit. (I removed the bearing from the bit.) Once more, the overarm guide follows the template. As with the cove bit, this cut would not have been possible with a bearing-guided bit, because the bearing would not have fit within the cove.

4 To complete the profile, I flipped over the workpiece and template, and used a roundover bit. This specialty bit has a bottom bearing which rides directly on the workpiece.

5 I completed the molding by bandsawing the outside curve, then smoothed the curve with an oscillating spindle sander.

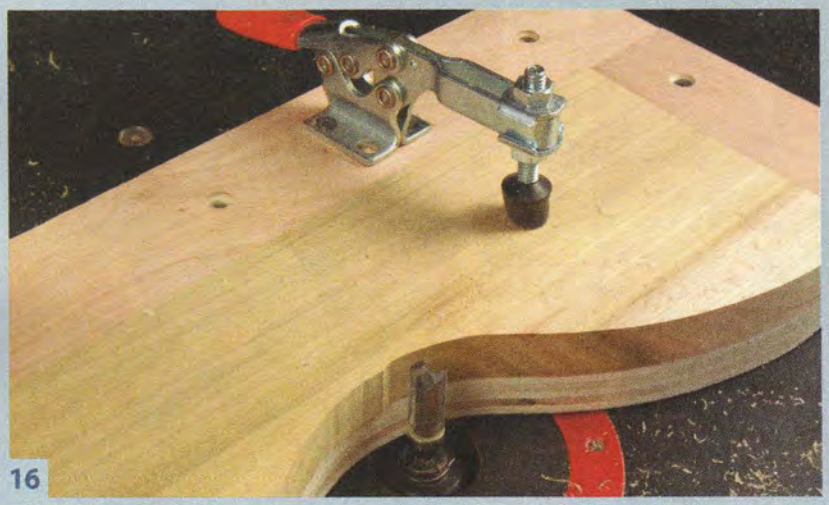


Lonnie Bird

Long-time woodworker, author and teacher, Lonnie runs a school in East Tennessee. You can find out more about his school at www.lonniebird.com.

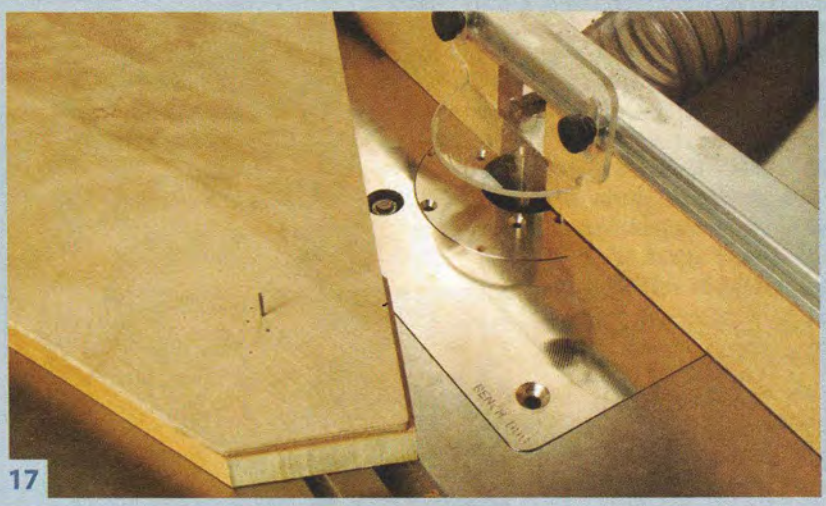
15

I use brads or screws to attach most templates to a workpiece, but where holes will mar a finished piece, I use woodturner's double-faced tape.



16

Toggle clamps are ideal for holding a workpiece in a template jig, particularly when you have a lot of duplicate parts to make. Mounting a new part in the jig is quick and easy.



17

I prefer to use a router table for template routing whenever possible. Even though I'm not using the fence to guide the work, the fence provides dust collection and a guard.

Fastening a template

I use brads, screws, double-faced woodturner's tape or toggle clamps to fasten the template to the workpiece. The easiest method is just to attach the template with a few brads. This method works well for small work and light cuts; it's fast and the nails grip well. For larger and heavier cuts, I opt for screws.

With either method, it's critical that you position the fasteners out of the path of the bit. Although nails and screws both leave holes in the finished work, that's not necessarily a problem. Usually, the holes will be hidden from view in the completed workpiece.

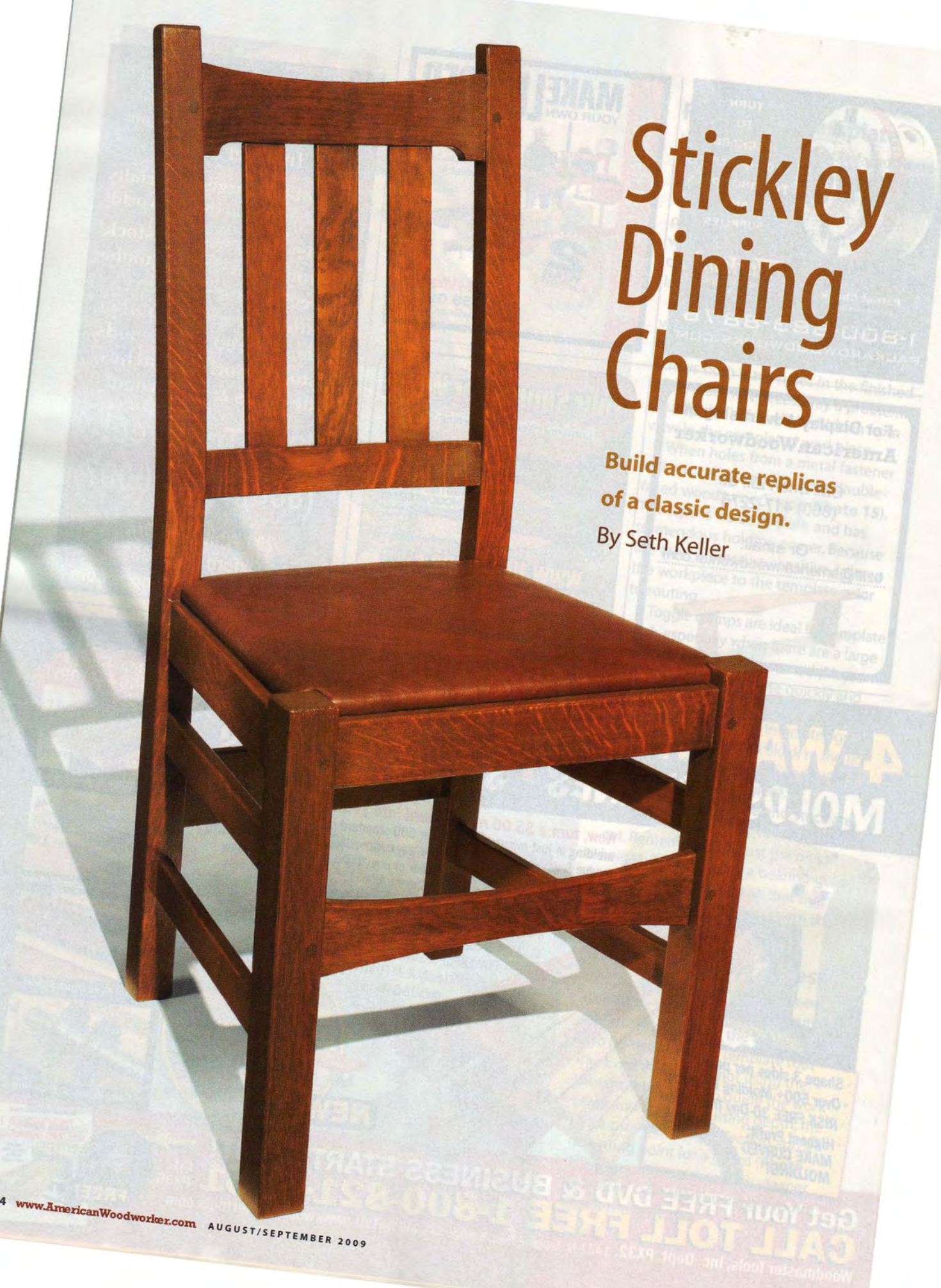
When holes from a metal fastener will not be acceptable, I use double-faced woodturner's tape (**Photo 15**). The tape is made of cloth and has tremendous holding power. Because the tape is pressure sensitive, I clamp the workpiece to the template prior to routing.

Toggle clamps are ideal for template work, especially when there are a large number of parts to be routed (**Photo 16**). They open and close quickly and have good holding power. I use toggle clamps on most of my template jigs. Usually, I have to add a block to the jig to bring the toggle clamp approximately level with the workpiece.

Once your template and stock are prepared, you're ready to make the cut. Remember to adjust the bit's height. If you're using a bearing-guided bit, position the bit so that the bearing makes full contact with the template.

The router table is best

Whenever I have a choice between using a hand-held router or a router table, I always opt for the table. This also holds true when template routing. Even though I'm not using the router table's fence to guide the workpiece and limit the cutting depth, the fence provides dust collection and a mounting point for a guard (**Photo 17**). Using the router table is cleaner and often safer than pushing a router across the work.



Stickley Dining Chairs

Build accurate replicas of a classic design.

By Seth Keller

HAVING BUILT THE Mission oak dining table that recently appeared in American Woodworker (Dec/Jan 2009, issue #139), my next project was to build chairs to go with it. A friend had a vintage set that I admired, and she graciously loaned me a couple chairs (one with arms, one without) to inspect and measure. These chairs were classic Mission style, and although they were a bit small by today's standards, they were comfortable to sit in. I was excited to find labels identifying their manufacturer as the Stickley Brothers Company, because according to the magazine article, the table I had built was also based on a Stickley Brothers design.

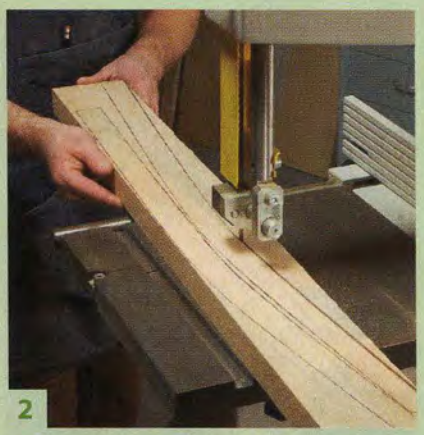
I did some research, using Stickley Brothers Quaint Furniture catalog reproductions. Tables and chairs were most often pictured independently, but in one catalog, I found these chairs, identified as #479-1/2, facing the table that I had just built. That was it; these were the right chairs for my table.

Including an arm chair as part of a set is optional (see "The Arm Chair," page 46), so in this story, I'll focus on building the side chairs. At first glance, these chairs look pretty simple to build, thanks in part to their rectilinear style. But closer inspection reveals subtle details that make them a challenging project. Of course, they're made out of quartersawn white oak, with the

EDITOR: TIM JOHNSON • ILLUSTRATION: FRANK ROHRBACH

1

This chair assembles primarily with loose tenon joinery, which is a variation of traditional mortise and tenon joinery. This method simplifies the complex joints between the legs and rails.



2

Start by sawing out the back legs. To get the most from your lumber, nest them together. Remove saw marks by sanding, scraping or planing to the layout lines.

3

Lay out the rail mortises on the back legs. Clamp the legs together so the mortises are perfectly parallel. Use a square to transfer the back rail mortises to the legs' inside faces.

4

To rout the mortises, clamp the leg against the side of the jig and flush with its top. The router's edge guide bears against the side of the jig when you rout, so the mortises are parallel to the edge of the leg.

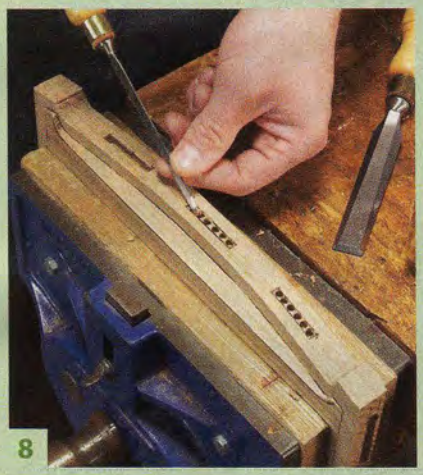
5

The mortises for the crest and lumbar rails are skewed, rather than parallel to the front face of the back legs. To skew these mortises, install a wedge between the leg and the edge of the jig. Measure to ensure the mortises are coplanar.

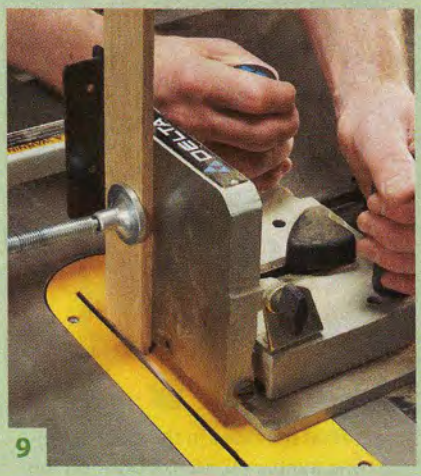
6

Rout offset mortises in the ends of the crest and lumbar rail blanks. Draw on the rails' curved shape, so you can locate the mortises. Clamp the blank vertically, so it's end is flush with the jig's top.

Saw out the crest rail in two steps. First saw out the bowed faces. Then reattach the offcuts to saw the curved top and bottom edges.



Chop mortises for the back slats in the crest and lumbar rails. Drill out the centers, then use chisels to remove the waste and square the corners.



Use a tenoning jig to cut tenons on the back slats. Shave a small amount off both faces of each slat, to create the cheeks. Then use a handsaw to cut the shoulders.

quartered faces presented on the chairs' fronts and backsides.

I couldn't disassemble the chairs I'd been given, so I made thoughtful choices about the construction techniques I would use. Most of my joints are fitted with loose tenons (**Photo 1**). In addition to creating strong joints, loose tenon joinery is versatile—a major consideration, as each chair requires several types of mortise-and-tenon joints. All of the loose tenon mortises are routed with a simple shop-made jig (Fig. A). I decided to use traditional mortises and tenons to assemble the curved rails and back slats.

Make the legs

1. Cut lumber for the back legs to rough size (Part A, Fig. B, page 47, and Cutting List, page 51).

2. Make a full size pattern for the back legs (Fig. C). Trace the profiles onto a blank, nesting the second leg behind the first.

3. Carefully cut the legs on the band saw (**Photo 2**). Use scrapers, planes or a sander to remove the waste.

4. Cut the front legs (B) to final dimensions.

5. Clamp the front and back legs to each other in pairs to lay out the mortises (**Photo 3** and Figs. D, E and F). All of the seat rail mortises and lower mortises are centered on the leg faces. Note that the seat rail mortises are 3/8" wide. All the other mortises are 1/4" wide. Whenever possible, orient the legs so the mortises will be cut on their least attractive faces. On the curved back legs, use a square to transfer the mortise locations to the correct leg faces.

6. Mark the back legs for the crest rail and lumbar rail mortises (Fig. C). These mortises are not centered on the leg faces and they run at a skewed angle. They must be in the same plane for the back assembly to fit properly. To determine their locations, you must line up two points on the inside face of each leg: one at the top edge of the lumbar rail, 1/4" in from the leg's front edge, and the other at the top edge of the crest rail 1/8" from the front edge. Draw a straight line between the two points. Use this line to locate the crest and lumbar rail mortises.

7. Rout all the 3/8" mortises for the seat rails first, then rout all the 1/4" mortises—it's easier to change leg pieces in the mortising jig than it is to change router bits.

8. Set up to rout the leg mortises. Clamp the mortising jig to your bench. Attach an edge guide to your router and install a 3/8" spiral bit (see Sources, page 51). During operation, the router rides on top of the jig; its base straddles the edges and its edge guide bears against one side. Lay out a mortise on a test piece that's the same size as a front leg. Clamp this piece against the side of the jig and flush with its top. Then make test cuts to center the mortise and set the depth. Adjust the edge guide to center the mortise; adjust the plunge mechanism to set the depth. Rout to the layout lines to establish the length.

More on the WEB

The Arm Chair

Vintage chair sets often included an arm chair, usually a larger version of the side chairs. For this set, the part dimensions and rail angles of the arm chair are different, but all the basic building steps are the same. For the cutting list, patterns, technical drawings and how-to information, go to www.AmericanWoodworker.com/StickleyArmChair.

9. Install each front leg and rout 1" deep mortises for the front and side seat rails (**Photo 4**). Start by plunging 1/8" deep; complete each mortise by making successively deeper passes.

10. Install each back leg and rout 1" deep mortises for the side and back seat rails. For the side seat rails, clamp the bottom half of the leg against the side of the jig and flush with its top, the same way you clamped the front legs in Step 6.

11. Set up to rout the lower rail mortises. Install a 1/4" spiral bit in the router, adjust the plunge depth to 7/8", and confirm that the mortises will be centered.

12. Rout mortises for all the lower rails in the front and back legs.

13. Mortise the back legs for the lumbar and crest rails. These mortises run at an angle, so use wedges to hold the legs in the correct position (**Photo 5**). Once the leg is wedged in position, adjust the edge guide to properly locate the mortises.

Front and back assembly

14. Cut the front seat rail (C) and front lower rail (D) to final dimensions. Mark the center of the lower rail and strike a pair of arcs. Cut the curves on the band saw and smooth the edges.

15. Cut the back seat rail (E) and back lower rail (F) to final dimensions. Cut blanks for the crest rail (G), lumbar rail (H) and back slats (J) to final length.

16. Make a pattern to transfer the curved shapes of the crest and lumbar rails onto the blanks (Fig. G). Mark the ends of these blanks, too, so you can locate the mortises, which are offset. These mortises are located 1/8" from the back face of the finished part (not the blank), so they won't cut through its curved front face.

17. Rout 1/4" x 7/8" deep mortises in both ends of the crest rail and lumbar rail blanks (**Photo 6**).

18. Rout 1/4" x 7/8" deep mortises in both ends of the front and back lower rails. Mount these rails in the jig vertically, the same way the crest

Fig. A Mortising Jig

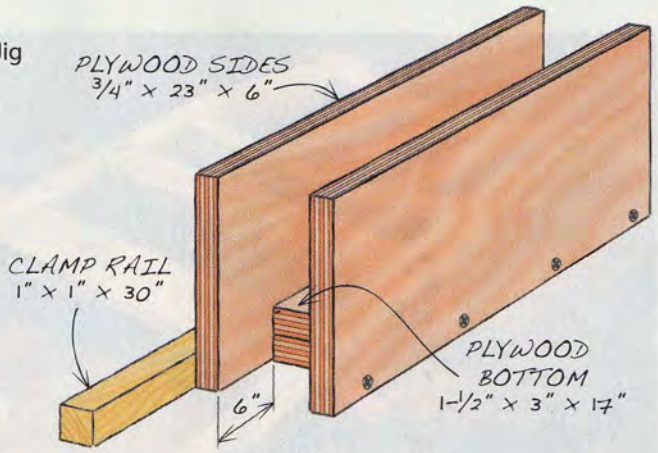
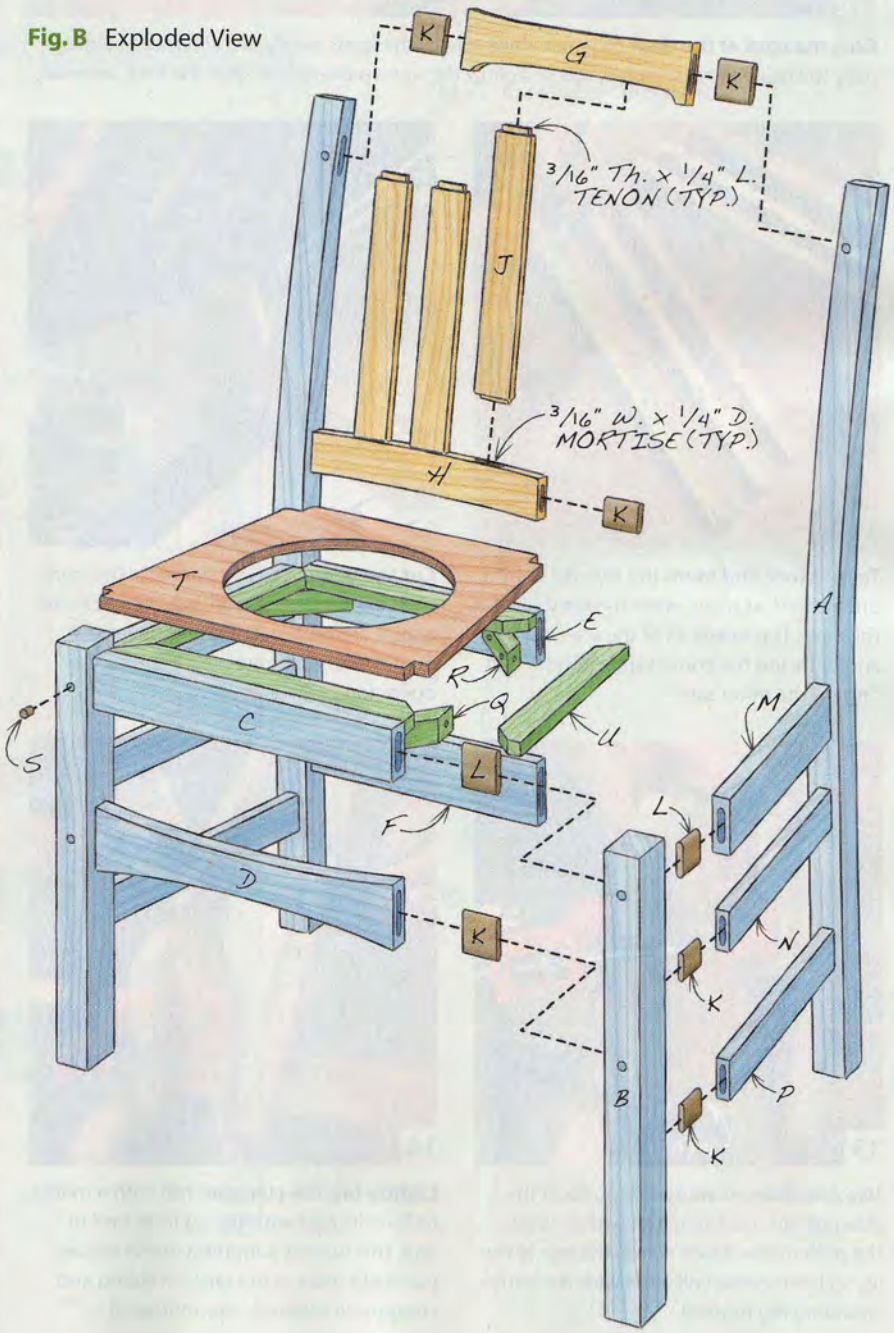
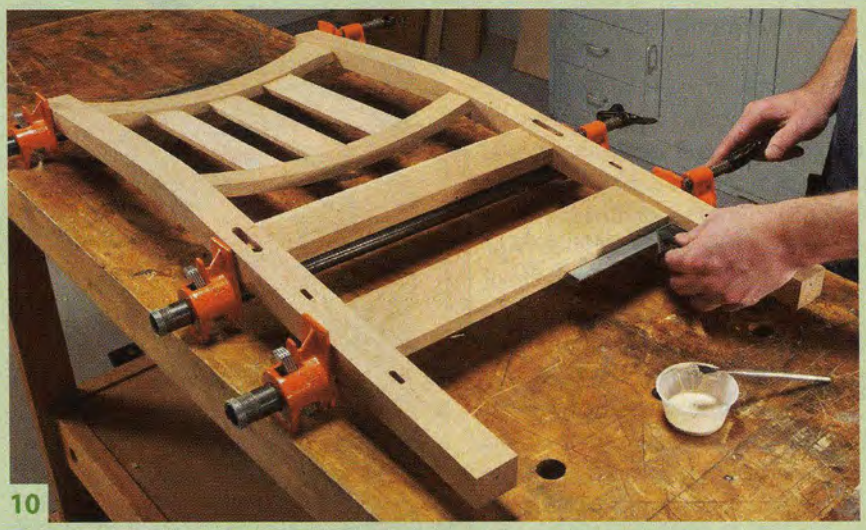


Fig. B Exploded View



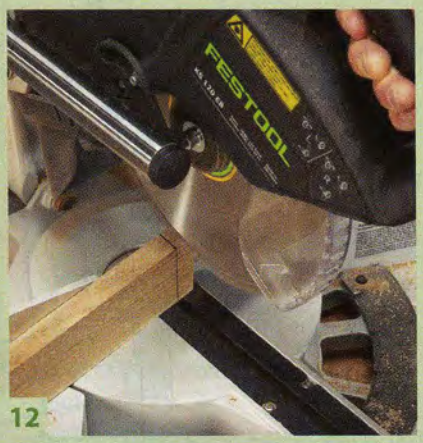


10

Glue the back of the chair together. Make sure all the joints are square, and measure diagonally to ensure the assembly is square. Follow the same procedure to glue the front assembly.

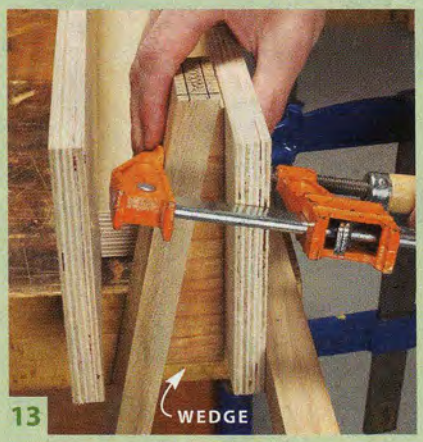
11

To measure and mark the side rail blanks, orient them as if you were standing behind the chair. This keeps all of the important angles facing the correct direction for cutting on the miter saw.



12

Cut the ends of all the side rails. The front ends are simply mitered, but the back end angles are both mitered and beveled. A dual-compound miter saw handles this operation with ease.



13

Use a tacked-on wedge to position the side rails for mortising. The wedge levels the rail's mitered face across the top of the jig, so the mortise will align with the corresponding leg mortise.

14

Lightly tap the clamped rail with a mallet, to level its face with the jig from end to end. This two-step method works to position both ends of the rails—mitered and compound mitered—for mortising.

and lumbar rail blanks were mounted. Change bits and rout 3/8" x 1" deep mortises in both ends of the front and the back seat rails.

19. Mill loose tenons (K and L) to fit the 1/4" and 3/8" mortises. Plane lengths of stock to appropriate thickness and rip them to width. Then use your router table and a 1/8" roundover bit to round the edges of the 1/4" stock (see Sources). Make two passes, one on each face. Round the 3/8" stock, using a 3/16" bit (see Sources). Use a pull saw to cut individual loose tenons from each length of stock. The tenons for the seat rails are mitered on one end. I make my 1/4" tenons about 3/16" undersize in width. This allows some adjustability when I'm assembling the chair; it's especially helpful for fitting the compound miters between the side rails and back legs.

20. Assemble the front legs and rails without glue, to check the fit and alignment of the joints. Do the same with the back legs and rails.

21. Bandsaw the bow-shaped crest and lumbar rails from the blanks (**Photo 7**). Reattach the crest rail offcuts with tape; then bandsaw the crest rail's curved top and bottom profiles.

22. Mark the mortise locations for the back slats on the crest and lumbar rails. Use the offcuts from sawing to securely clamp these bow-shaped rails in a vise. Then chop the 3/16" wide x 1/4" deep mortises (**Photo 8**).

23. Mill 3/16" x 1/4" tenons on the back slats, using a tablesaw tenoning jig and a handsaw (**Photo 9**).

24. Assemble the slats and curved rails to test the fit. Then assemble the entire chair back to check the fit.

25. Finish sand all the parts and ease the edges—I use a laminate trimmer and a 3/32" roundover bit for this job (see Sources).

26. Glue the entire back leg assembly on a flat surface (**Photo 10**).

27. Glue the front assembly the same way.

More on the WEB

www.AmericanWoodworker.com/Stickleyarmchair

Fig. C Back Leg

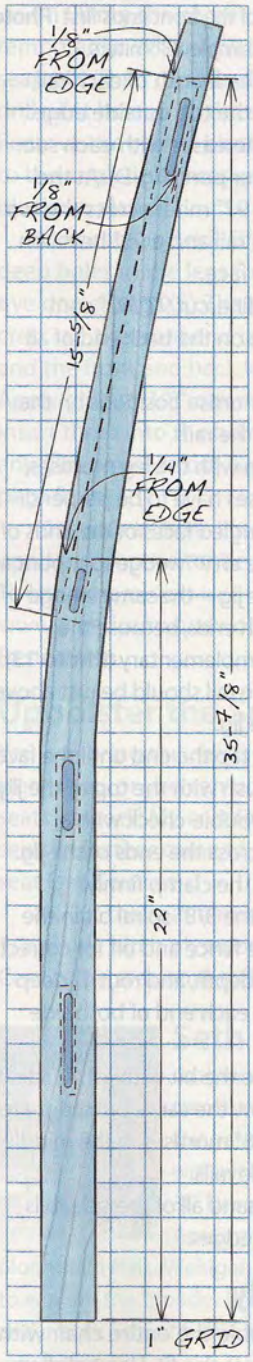


Fig. D Side View

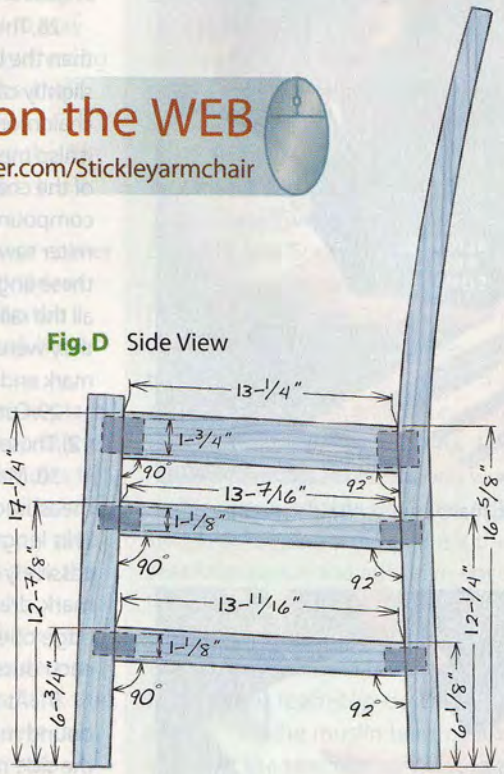


Fig. E Front View: Back Assembly

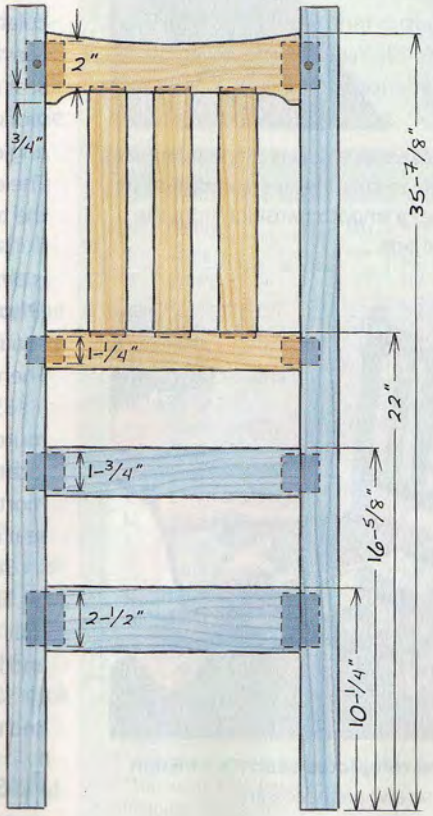


Fig. F Front View: Front Assembly

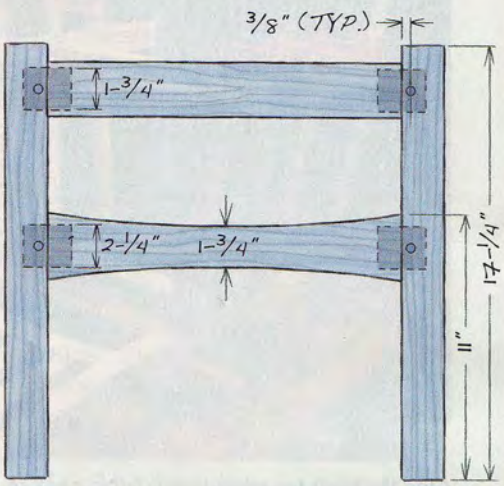


Fig. G Crest and Lumbar Rails

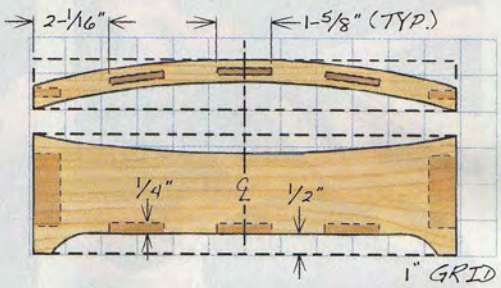


Fig. H Top View

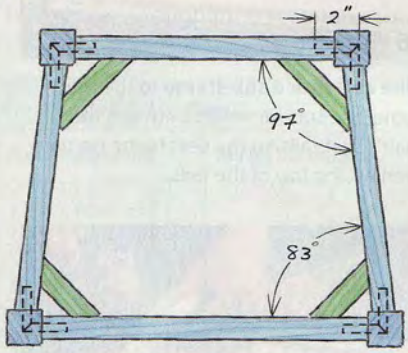
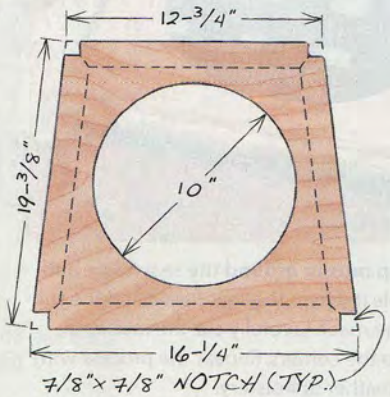
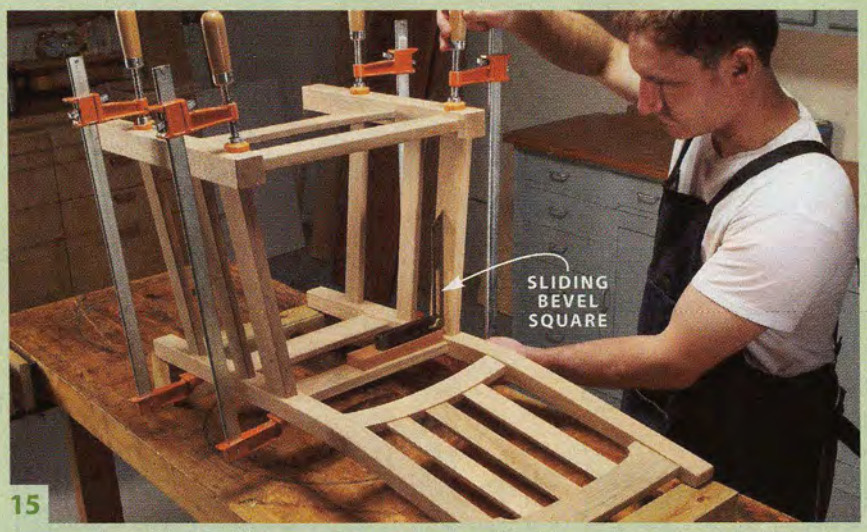


Fig. J Seat Frame



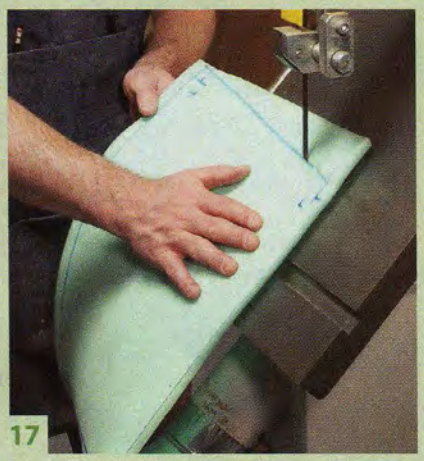


15

Glue the chair together. Use a sliding bevel square to make sure both sides widen at the same angle.

16

Glue and tack a sub-frame to the seat frame. The sub-frame fits between the chair's seat rails, so the seat frame partially overlays the top of the rails.



17

Saw the foam that covers the seat frame at a 45° angle to create a tapered edge, so the seat makes a smooth transition from the top to the side.

18

Wrap muslin around the seat frame and staple it where the seat frame and the sub-frame meet. Carefully cut the muslin to wrap the corners. Repeat the process with the leather upholstery.

19

Install the completed seat. It's a friction fit, so no screws are necessary.

Make the Side Rails

28. The chair seat is wider at the front than the back (Fig. H), and the legs are slightly canted (Fig. D). This makes the chair more comfortable and stable, but it also means that the rails on the sides of the chair are mirrored parts with compound angles. A dual-compound miter saw is the best tool for making these angled, mirror-image cuts. I keep all the rails (M, N and P) positioned as if they were in the chair while I measure, mark and cut the ends. (**Photo 11**).

29. Cut all of the front ends first (**Photo 12**). These are simple 83° miters.

30. Mark the length of each rail, measured at the top outside edge. This length increases with each successively lower part (Fig. D). At the mark, draw a 97° miter across the top edge of each rail and a 92° bevel on each outside face.

31. At the line, cut 97°/92° compound miters on the back end of all the side rails.

32. Mark mortise positions on the ends of all of the rails.

33. To align with the leg mortises, the rail mortises have to be perpendicular to the angled faces of the ends of the rails. Make an 7° wedge to mount a seat rail in the jig—the same wedge works for both ends, because the angles are complementary (**Photo 13**). The end of the rail should be just above the top of the jig.

34. Gently tap the end until the face is perfectly flush with the top of the jig (**Photo 14**). Double-check with a square laid across the ends of the jig. Then tighten the clamp firmly.

35. Install the 3/8" spiral bit in the router. Set the fence and bit for correct location and depth, and rout 1" deep mortises into each end of both side seat rails.

36. Replace the bit with a 1/4" spiral bit. Then follow the same procedure to rout 1/4" x 7/8" mortises in the middle and lower side rails.

37. Finish sand all of the side rails and ease the edges.

Assembly

38. Assemble the entire chair without glue to test the fit. Use a sliding

bevel square to make sure the angles of the side seat rails match. You may have to finesse a few joints by shaving or trimming the tenons, so the chair clamps up even and square.

39. Once you've fine-tuned the fit, disassemble the chair and glue it together (**Photo 15**).

40. Cut angled front and rear corner blocks for the chair (Q and R). Orient the grain to run lengthwise on the blocks. Drill countersunk shank holes for screws.

41. Clamp the corner block in place temporarily, 3/8" below the top of the seat rails. Then use the shank holes to drill pilot holes into the seat rails. Remove the corner blocks, apply glue to the angled surfaces, and screw the blocks in place.

42. Locate and drill 3/8" dia. x 3/8" deep holes in the legs for the decorative dowel pegs (S). The pegs flank the crest rail, the front and back seat rails, and the front and back lower rails. Apply glue to 3/8" oak dowels and insert them into the holes. Remove any glue squeeze out. Saw or sand the pegs flush.

43. Apply a finish. I used one developed by conservator Kevin Southwick. To learn more, visit www.americanwoodworker.com/TableRestoration.

Upholster the Seat

You can bring the chairs to an upholstery shop, or you can upholster the seats yourself. My cost for covering the seats in leather came to about $50 per seat (see Sources).

44. Cut the seat frame (T) out of 1/2" Baltic birch plywood (Fig. J). Center the seat on the chair. Reach under with a pencil and trace the position of the seat rails. Glue and nail a sub-frame (U), 1/8" inside the line you've scribed around the bottom of the seat frame (**Photo 16**).

45. Round over the top edge of the seat frame with a 1/4" roundover bit.

46. Staple webbing across the seat opening (see Sources).

47. Trace the outline of the seat frame on 1/2" foam, 3/4" oversize in width and length (see Sources). Using the bandsaw, cut to the lines at a 45° angle, for a smooth transition around the edges of the frame (**Photo 17**).

48. Lay the foam on a clean work surface, beveled side up. Spray adhesive onto it (see Sources). Press the seat frame onto the adhesive-covered foam, upside-down and centered. Trim out the corners with a scissors.

49. Lay muslin on the work surface. Lay the seat foam-top-down onto the muslin. Pull the muslin back over the edges of the seat and staple it to the bottom, at the intersection of the seat and sub-frame. Staple the sides first, then the back, and finally, the front. (**Photo 18**). Keep the muslin uniformly tight, but not so tight that it puckers.

50. To wrap the muslin at the corners, carefully slice it diagonally towards the center of the corner, and staple the flaps into the corner. Trim the excess material with a utility knife.

51. Repeat this process to install the upholstery material. Then install the seat in the chair (**Photo 19**).

SOURCES

- Freud, www.freudtools.com, (800) 334-4107, 3/8" Up-Spiral Bit, #75-106, $48.99; 1/4" Up-Spiral Bit, #75-102, $22.99; 1/8" Roundover Bit, #34-104, $28.99; 3/16" Roundover Bit, #34-108, $29.99.
- Eagle America, www.eagleamerica.com, (800) 872-2511, 3/32" Roundover Bit, #156-0112, $19.95.
- Rochford Supply, www.rochfordsupply.com, (866) 681-7401, 1/2" x 24" x 72" Foam (enough for 3 chairs), #331950 $5; 2" Elasbelt Webbing, #9141, $48; 3M Super 77 Adhesive, #0192, $12.
- Van Dyke's Restorers, www.vandykes.com, (800) 558-1234, 3/8" x 36" Oak Dowel, #206624, $1.50.
- Leather Unlimited, www.leatherunltd.com, (800) 993-2889, Light Weight Upholstery Leather, Full Hide, #AD1100, $139 (should be enough for 6 seats).

Seth Keller designs and builds custom furniture in St. Paul, Minnesota. This fall, he will pursue his MFA in 3D Design at Cranbrook Academy of Art in Bloomfield Hills, Michigan. He is excited to explore the broader historical, cultural and artistic role of furniture in contemporary society.

CUTTING LIST — Overall Dimensions: 18-3/8" x 16-1/2" x 37"

Part	Name	Qty.	Material	Final Dimensions	Rough Dimensions
A	Back leg	2*	QS White Oak	1-1/2" x 1-3/8"** x 37"	1-1/2" x 4"*** x 37"
B	Front leg	2*	QS White Oak	1-3/4" x 1-3/4" x 18"	
C	Front seat rail	1	QS White Oak	7/8" x 2-1/4" x 14-7/8"	
D	Front lower rail	1	QS White Oak	5/8" x 2-3/4" x 14-7/8"	
E	Back seat rail	1	QS White Oak	7/8" x 2-1/4" x 11-3/4"	
F	Back lower rail	1	QS White Oak	5/8" x 3" x 11-3/4"	
G	Crest rail	1	QS White Oak	5/8" x 3-1/4" x 11-3/4"	1-3/8" x 3-1/4" x 11-3/4"
H	Lumbar rail	1	QS White Oak	5/8" x 1-3/4" x 11-3/4"	1-3/8" x 1-3/4" x 11-3/4"
J	Back slat	3	QS White Oak	5/16" x 1-3/4" x 11-5/8"^	
K	Small loose tenon		QS White Oak	1/4" x 1-5/8" long^^	
L	Large loose tenon		QS White Oak	3/8" x 1-9/16" x 1-7/8"	
M	Side seat rail	2*	QS White Oak	7/8" x 2-1/4" x 15"^^^	
N	Side middle rail	2*	QS White Oak	5/8" x 1-5/8" x 15"^^^	
P	Side lower rail	2*	QS White Oak	5/8" x 1-5/8" x 15"^^^	
Q	Front corner block	2	QS White Oak	1-1/8" x 1-1/8" x 3-3/4"	
R	Rear corner block	2	QS White Oak	1-1/8" x 1-1/8" x 4-3/4"	
S	Decorative peg	10	Oak dowels	3/8" dia. x 1/2"	
T	Seat frame	1	Baltic birch ply	1/2" x 16-1/4" x 14-3/8"	
U	Seat sub frame	4	Pine	3/8" x 1-1/4" x 16"+	

*Parts are mirrored
**At bottom; tapers to 15/16" at top
***Includes both back legs
^Includes 1/4" tenons
^^Five different widths: 15/16", 1-1/16", 1-13/16", 2-1/16" and 2-5/16"
^^^Cut to final length after mitering front end; see Fig. D
+Miter to fit"

Mystery Dovetails

Baffle your friends with perplexing joints.

By Jock Holmen

PRESS A DOVETAILED BOARD into another board with matching sockets, and you've created woodworking's most iconic joint. The dovetails and sockets wedge the boards together, so the joint can't pull apart; the only way to disassemble it is to lift the dovetailed board back out of the sockets.

So, what if you can't lift out the dovetailed board? How do you disassemble the joint? And how would you assemble this joint in the first place? Those are the questions to ask when you show a friend the dovetail joints shown here. These puzzling joints appear to wedge together on more than one surface—an impossible feat for traditional dovetails!

Test your hand tool skills

The secret behind these joints, of course, is that they don't assemble the traditional way. The first two are elaborate sliding dovetails and the last is a complex pivoting joint. There's no simple method to machine these joints; they must be cut primarily by hand. And creating them will test your hand-dovetailing skills, because of their compound angles and large joint surfaces.

Unlike most wooden puzzles, these joints shouldn't be constantly assembled and disassembled. The pieces include fragile short grain that can easily break and delicate edges that will quickly show wear. It's best to glue the joints together as soon as they've been satisfactorily fitted.

You're bound to make some mistakes, so always start by making a practice joint. Make sure to use stock that is straight-grained on all four sides—it's difficult to pare against the grain's slope. Also, it's a good idea to use hardwood for one piece and softwood for the other. This method is more forgiving, because the softwood piece will conform to the hardwood piece when you assemble the joint. Using hardwood for both pieces requires absolute precision, because there's no forgiveness: If the pieces don't fit perfectly, short grain parts will simply break off.

Use the same steps you would follow to cut dovetails by hand to create all three joints. Start with pieces that are cut perfectly square. Lay out the dovetails and sockets on each piece. It's best to scribe or knife the layout lines, so you can precisely bed your chisel for paring; if you pencil the lines, make sure they're crisp and narrow. Clearly mark the waste areas.

Make sure your tools are razor sharp. Cut the cheeks first (**Photo 1**). The safest method is to cut outside the lines. Next, remove the waste (**Photo 2**). Finish by paring to the lines (**Photos 3 and 4**).

Secret to easy assembly

When all of the cheeks and shoulders of these joints are pared absolutely flat, it's difficult to slide the pieces together, due to friction resulting from the joints' large surface area. Fortunately, there's a work-around. The only places where the joints have to fit perfectly are the faces that show. So, to make the pieces slide together more easily, slightly hollow the joint surfaces that don't show.

EDITOR: TIM JOHNSON • ILLUSTRATION: FRANK ROHRBACH

Devious End Joint

Assemble this joint by sliding the pieces together from corner to corner.

Through dovetails appear to cross inside this joint, which of course, is impossible. Instead, two dovetails run diagonally across the top of Piece A and two diagonal sockets are cut into the bottom of Piece B (Fig. A). On each piece, the layout is identical on all four sides.

Make the pieces

1. Lay out the dovetails and sockets. Mark the waste.

2. Saw the dovetail cheeks in Piece A and the socket cheeks in Piece B (**Photo 1**). Sawing these compound angles accurately is tricky, so don't be a hero: Cut in the waste area, outside the lines.

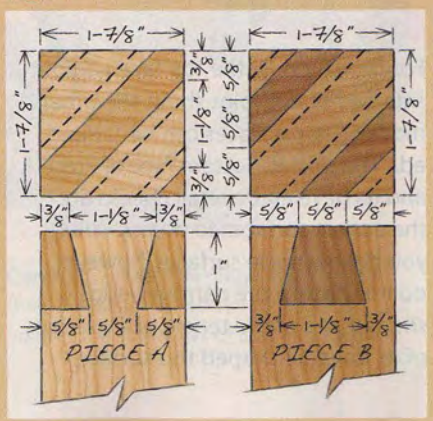
3. Remove the waste to establish the joint shoulders (**Photo 2**). Insert the coping saw into one of the cheek cuts, turn the blade and saw to the other cheek cut.

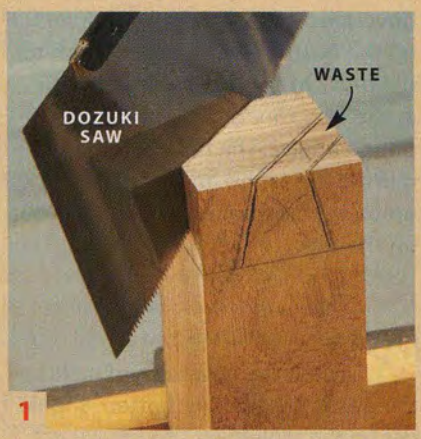
4. Pare to the lines (**Photo 3**). Use a wide chisel to pare the cheeks and a narrow chisel to pare the shoulders. Beveling the sides of the chisels makes it easier to get into the acutely angled corners (**Photo 4**).

Ease the fit

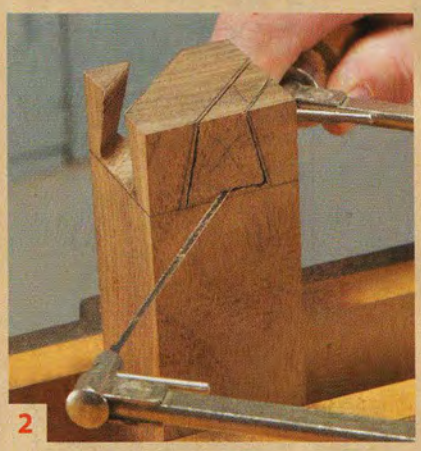
On this joint, all four faces of both pieces show. To ease the fit, hollow each dovetail cheek on Piece A and the shoulder of each socket on Piece B. Always start paring 1/16" inside the outside edge, to create a lip. Then pare to the center. When the pieces slide together, the 1/16" lips at the outside faces will be the only parts of the joint that fit flush.

Fig. A

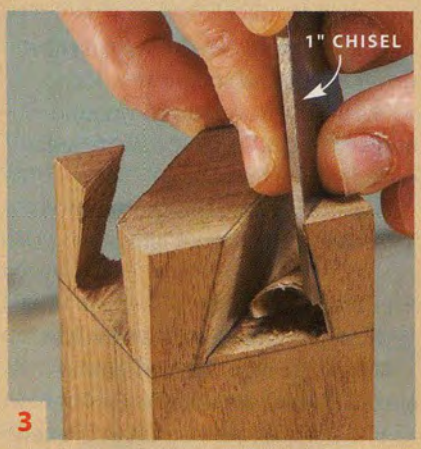




Cut the dovetail cheeks. The best strategy is to stay outside the layout lines.



Remove the waste with a coping saw.

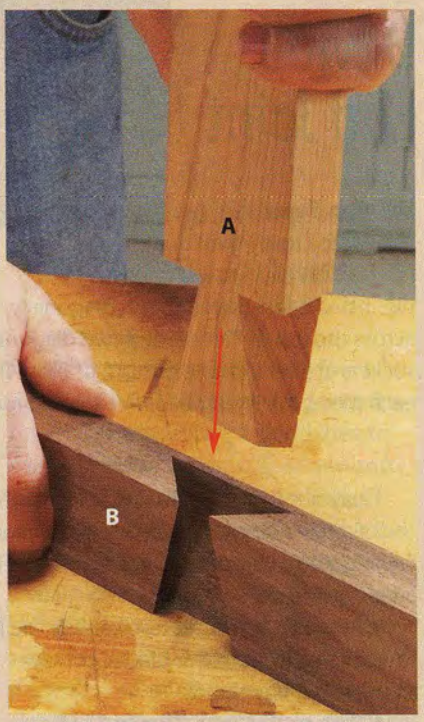


Pare to the lines. Remove the excess material in several thin shavings. This requires a razor-sharp chisel and light, controlled pressure.

To pare cleanly into the acutely angled corners, bevel the sides of your chisel.

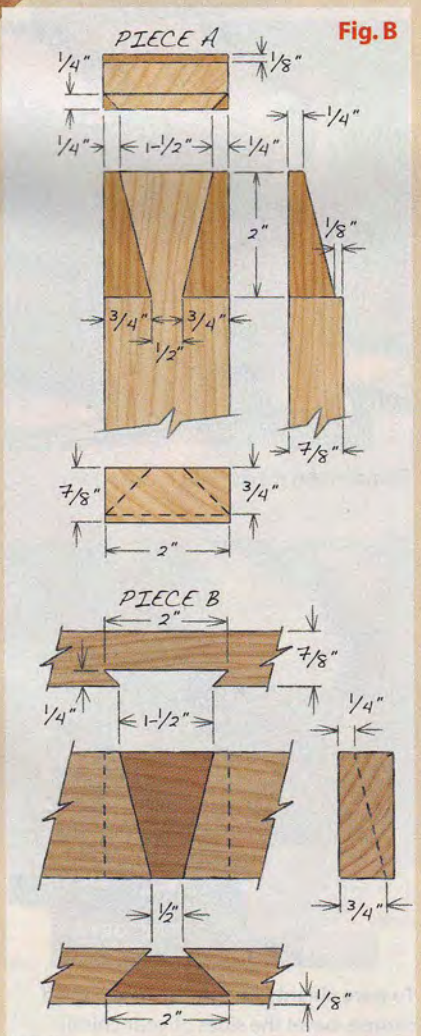
Devilish Lap Joint

On a typical lap joint, Piece A would simply press into Piece B. Well, that can't happen here. Neither can the two pieces pull apart. So what gives? A clever version of a tapered sliding dovetail, that's what (Fig. B). The dovetailed tenon on Piece A tapers on the bottom, from the shoulder to the end. On the top, its edges slope in the opposite direction, at compound angles. The mortise in Piece B mirrors the tenon on Piece B, sloping up on the bottom, and down and out on the top.



Assemble this joint by inserting Piece A into Piece B. The dovetailed tenon is thin at the end, so it fits at the bottom of the mortise. As tenon slides into the mortise, the dovetail on the face of Piece A rises until it's flush with the face of Piece B.

Fig. B



Make the pieces

PIECE A

1. Lay out the dovetail and mark the waste. Cut the 1/8" bottom shoulder on the tablesaw.

2. Tilt the blade and use a tenoning jig to cut the tenon's angled bottom face.

3. Use a handsaw to crosscut the dovetail's canted square shoulders.

4. Saw the dovetail's compound-angled cheeks. Cut in the waste area, outside the layout lines.

5. Precisely pare the cheeks and shoulders to the layout lines.

PIECE B

1. Lay out the mortise and waste.

2. Saw the mortise's compound-angled cheeks; cut outside the lines.

3. Make a lengthwise cut in the center of the mortise, to divide the waste in half. Cut deep at the butt end and shallow at the open end, following the slope of the mortise.

4. Saw out the waste. Insert the coping saw in the lengthwise cut, turn the blade and saw to one corner. Remove the waste and then saw to the other corner.

5. Pare to the lines. When you pare in from the butt end, the acute angles inside the mortise will trap the waste, so be prepared to progress slowly.

Ease the fit

Fortunately, only the top face and outside end of this joint show; the other hidden joint surfaces can be "adjusted." The sloped bottom face of Piece A and its beveled dovetail cheeks are the easiest surfaces to access. When you hollow these surfaces, however, do not disturb the narrow wedge-shaped end of the tenon, or the edges of its dovetail-shaped top surface.

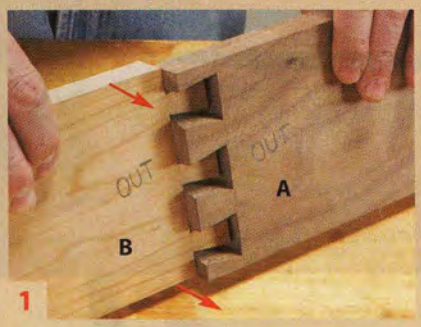
Diabolical Corner Joint

On the Web

show us your mystery dovetail joints at www.AmericanWoodworker.com/mysteryjoints

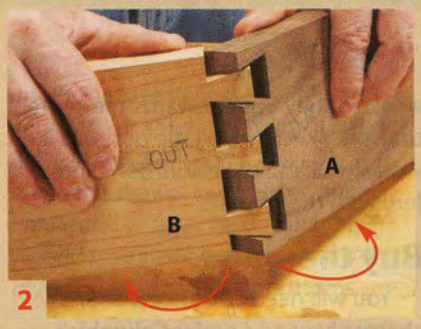
The flared ends of the dovetail pins mean this corner joint can't disassemble the traditional way. And no evidence of a sliding joint appears on the back side, so it can't go together like the double-dovetailed tenon in the previous joint.

The secrets are dovetails that slope at three different angles and sockets with coved shoulders (Figs. C and D). They allow the boards to slide together in line and then rotate 90° to form the corner. For the record, the dovetails on the outside face of Piece A match the sockets on the end of Piece B, the dovetail ends on the end of A match the sockets on the outside face of B, and the dovetails on the inside face of A match the sockets on the inside face of B. The coved sockets in A provide clearance for the outside corner of B as the boards pivot.



1

Assemble this joint in two steps. First, with both pieces oriented outside-face out, slide Piece B into Piece A from the back. When the pieces are flush, the dovetails on the outside faces won't fit.



2

Carefully rotate the pieces to complete the joint. Bear the inside corners of A against the shoulders of B as you rotate.

Make the pieces

PIECE B

1. Lay out the dovetails and waste.
2. Saw the dovetail cheeks, following—but staying outside—the layout lines on the end and the outside face. This cut won't follow the lines you've laid out on the inside face, because they slope more steeply.
3. Saw out the waste.
4. Pare to the lines. On the cheeks, work from each face to the center—on the inside face, you'll have to remove more material. Because the outside and inside slopes differ, the faces of the cheeks will be faceted, rather than flat. Notice that the dovetails on both faces are the same width at the neck.

PIECE A

Follow the same procedure used to cut Piece B, with this exception: Hollow out the socket shoulders, leaving tiny (1/16" wide, or less) flat lips at the outside face, to seat the joint.

Ease the fit

The cuts on the ends and outside faces of both pieces are the ones that show, so they must remain precise. To ease the fit, slightly widen the socket cheeks and shoulders on the inside face of A—but do not disturb any dimensions at the end of the board. Gently ease the facet lines. Make sure each socket shoulder in A is hollowed into a fair curve, so the ends of B can rotate through.

Fig. C

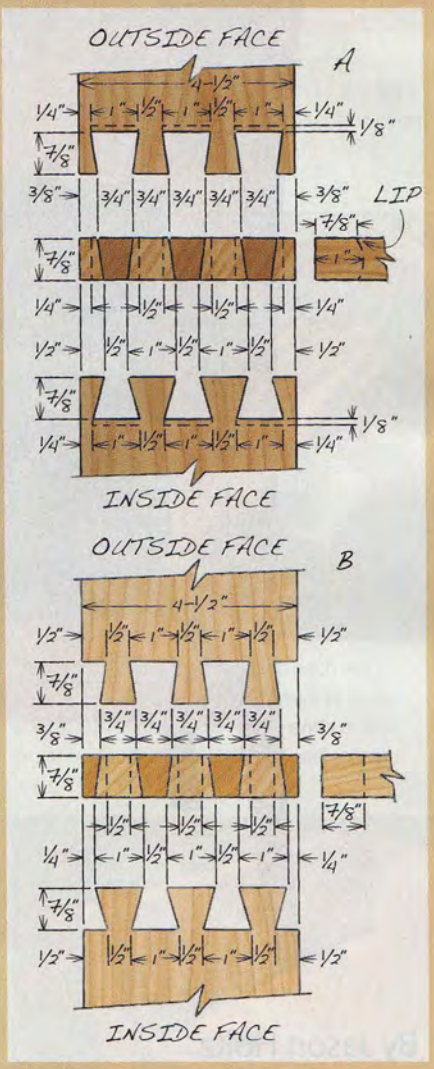
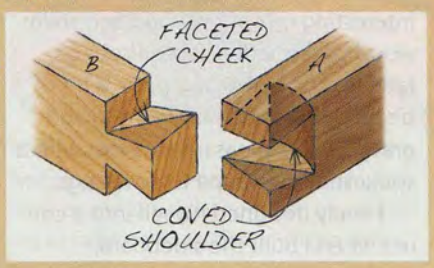


Fig. D



Cherry Sideboard

By Jason Holtz

THIS SIDEBOARD IS a hybrid-an interesting mix of plywood and solid-wood construction. It requires accurately cutting plywood parts, a lot of biscuit joints (you may want to add gravy!), and a pleasant workout with a spokeshave to shape the oval legs.

I really designed myself into a corner when I built the sideboard, though. I had previously made a similar piece with rectangular sliding doors, which fit behind the curved legs. I built standard doors for this piece and intended to hinge them on the legs. Nothing doing. I think I exhausted every hinge solution available, but none worked on a curved door stile inset next to a curved leg.

I realized there was only one solution: hanging the doors on the straight sides, so they open towards the center drawers. I know it's a little odd, but it works well and the doors don't interfere with the drawers.

Buy the wood

You will need two sheets of 3/4" cherry plywood. I prefer Columbia's Classic Core (see Sources, page 62). It has an aspen veneered core, which is free of voids, and MDF crossbanding

Curved parts add flare to a simple, square plywood box.

under the face veneer. It's light and very flat. For solid wood, you'll need 8/4, 6/4 and 4/4 cherry. You can make the drawer boxes from any hardwood or from Baltic birch plywood. You'll need one sheet of 1/4" plywood for the drawer bottoms.

Build the interior case

1. Cut out all of the plywood case parts: the back (A1), bottom (A2),

1

The sideboard's interior is an open-ended rectangular plywood box, joined with biscuits. The back, which makes the structure rigid, goes on last.

2

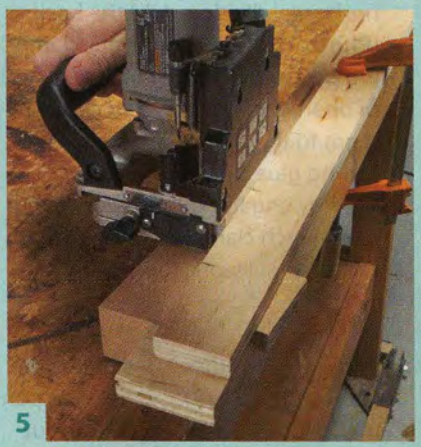
Lay out the curved legs using a window-style pattern. Position the pattern so the leg's curve follows the wood's grain direction, then draw the pattern and bandsaw the blank.

3

Use a spokeshave and a plane to smooth the bandsawn surfaces. Work the leg down to the pencil lines.

4

Cut the legs to length. Place each leg against a template mounted to a straight board. This ensures that both ends of the leg are square and parallel to each other.



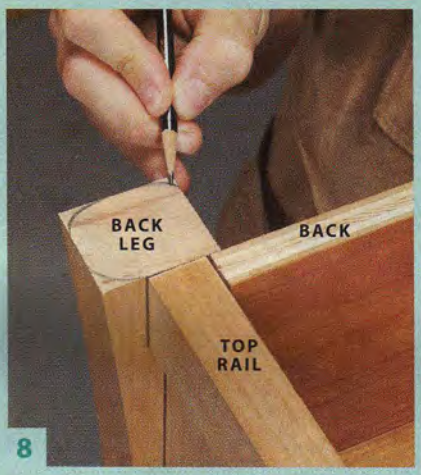
5

Cut biscuit slots in the legs. Clamp a board to the leg to guide the plate joiner. Assemble the sideboard's sides, without glue.

6

Clamp each side to the case and mark the horizontal divider's position on the front leg. Remove the side and cut a notch in the leg to receive the divider. Re-clamp the sides onto the case.

Cut the lower front rail extra-long and hold it up to the case. Cut both ends of the rail at an angle to fit the legs.



Mark the legs for shaping into an oval. Mark around the rails and panel–these areas on the leg will be left flat.

Spokeshave the leg to create its oval shape. Leave flat areas between the pencil lines, where the rails and panel go.

vertical divider (A3), horizontal divider (A4) and upper divider (A5). Cut each piece about 1" extra-long and 1/2" extra-wide.

2. Mill strips of solid edgebanding (A7). Glue the edgebanding on the bottom edge of the back and the front ends of the vertical, horizontal and upper dividers. (Note that the bottom, A2, doesn't receive edgebanding.) Trim the edging flush with the panel's surfaces and rip the pieces to final width. Crosscut the pieces to length.

3. Cut biscuit slots to join the pieces together (Fig. A). Space the slots about 4" apart, center to center. To reference the biscuit slots for the vertical dividers, use a piece of plywood with a strip screwed onto one end. Mark the location of the slots on this jig, then hook the strip onto the end of the piece you are cutting slots in.

4. Dry clamp the dividers to the bottom, then put on the back and mark a line under the horizontal divider. Take off the back and clamp a straight board on the bottom side of that line. Cut biscuit slots in the back for the horizontal divider, then cut matching slots in the divider itself. Cut slots in the ends of the back, bottom and horizontal dividers.

5. Sand all the interior surfaces. Cover the biscuit slots with tape and apply your finish of choice. I use shellac and wax.

6. Glue the bottom, vertical and horizontal dividers. Add the back (**Photo 1**). Getting sufficient clamping pressure is tricky. I made a couple of open-ended boxes and clamped them to the horizontal divider. During glue-up, I pulled the back tight by engaging these boxes with deep-reach clamps. Screws through the back will work, too.

Build the sides

7. Mill the side's top and bottom rails (A11 and A12). Cut the side panels (A6) to exact length and about 1/2" extra-wide. These panels are quite prominent on the finished piece, so I plan the cuts carefully. I want the panels to have a balanced, bookmatched look, as if I had laid them up myself. Sand the faces of the panels. Glue the rails flush to the backside of the panel, then rip the assemblies to their final width. Draw a curve on the bottom rail (Fig. D). Bandsaw and smooth the curve.

8. Mill blanks for the legs (A8). Use a negative-space paper pattern to lay out the legs (**Photo 2** and Fig. D). Orient the pattern so the wood's grain direction follows the leg's curve. Bandsaw the leg blanks and spokeshave the legs to the pencil lines (**Photo 3**). Make a jig to cut the legs to length (**Photo 4**).

9. Cut biscuit slots to join the legs to the sides. Draw lines on the legs following the inside edge of the panel. Clamp a narrow board to the legs following this line and cut the biscuit slots (**Photo 5**). Cut matching slots in the side panels.

10. Cut biscuit slots to join the sides to the interior case. There is one row of slots down the back, a second row across the bottom and a third row along the horizontal divider. Be careful to position the slots for the back so they don't coincide with the slots for the legs.

Assemble the case

11. Clamp the legs to the sides, without glue, and clamp the ends to the case. Use a single-bevel marking knife to scribe, in each front leg, the location of a notch for the horizontal divider (**Photo 6**). Mark the intersection of the bottom (A2) to the legs–this is where the bottom rail (A9) joins to the legs. Unclamp the side assembly and remove the front legs. Cut the notches with a handsaw, then chop and pare to the knife lines. Re-clamp the legs to the sides and the sides to the case.

12. Mill the bottom rail about 1" extra-long. Both ends of the rail must be cut at an angle to fit the legs, and this is best done one end at a time. Clamp the rail to the case and mark the angle on one end. Cut the angle to an exact fit, then clamp the rail back in place and mark the other end (**Photo 7**). Cut this angle on the rail

Fig. A Exploded View of Case

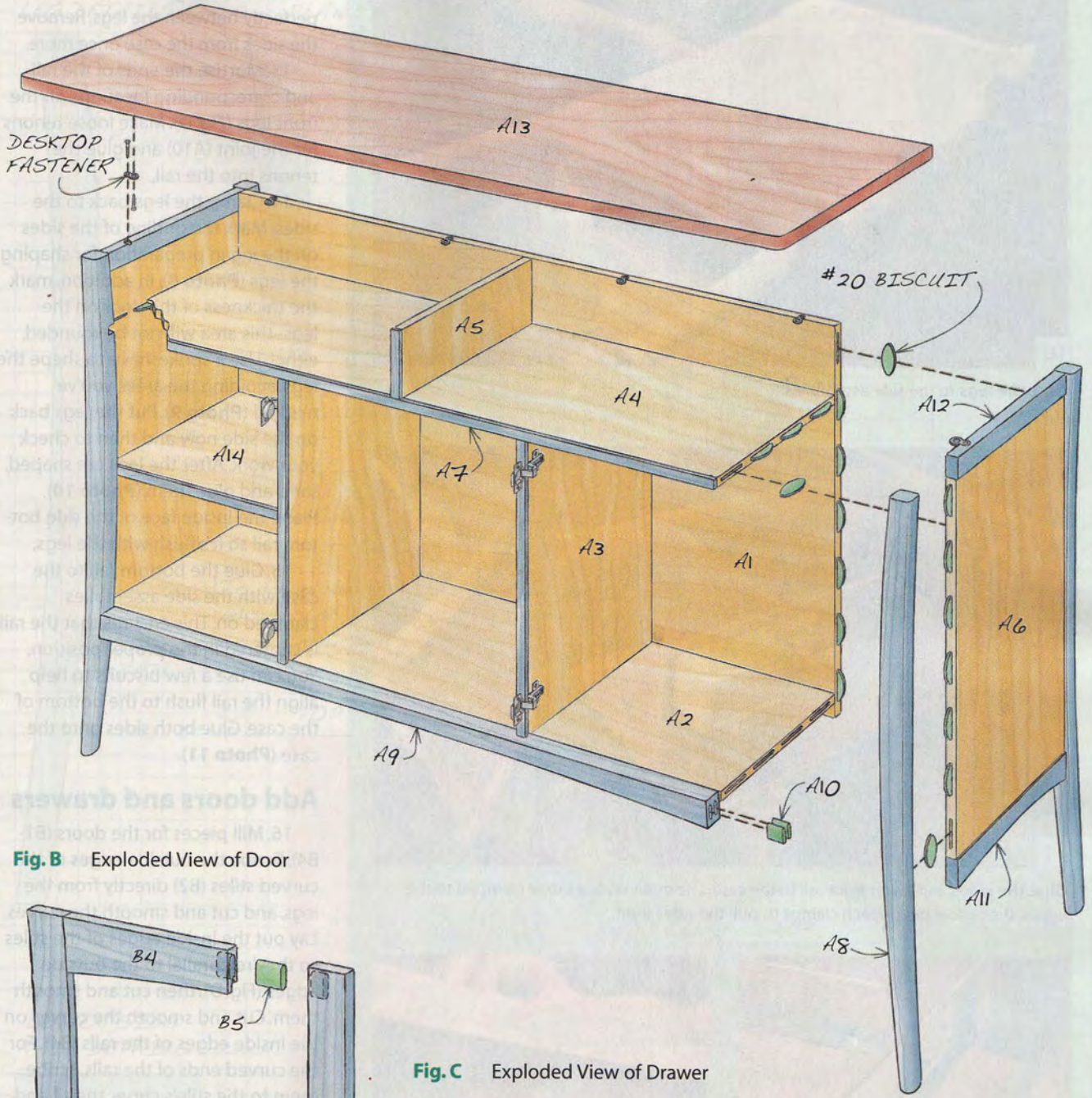


Fig. B Exploded View of Door

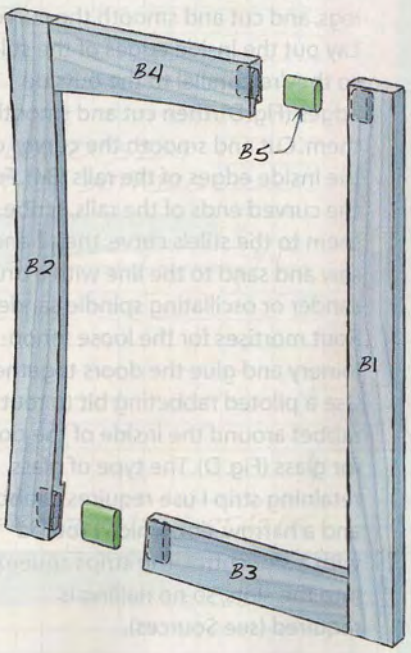
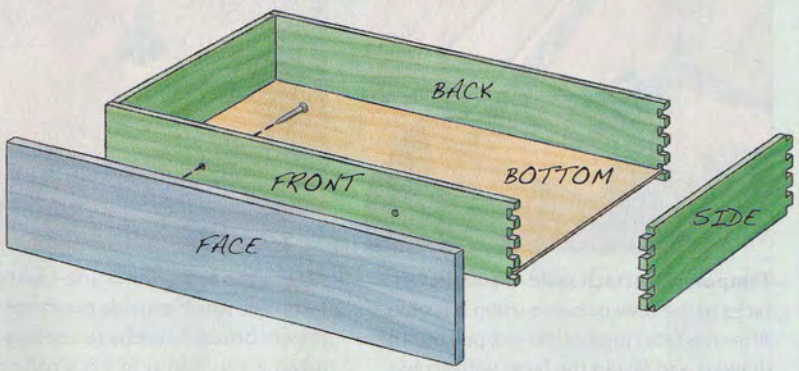
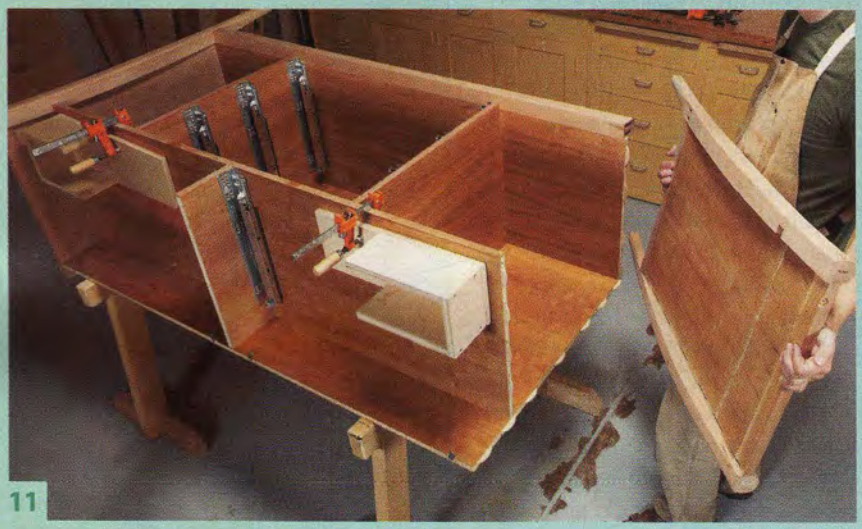


Fig. C Exploded View of Drawer



10

Glue the legs to the side assemblies.

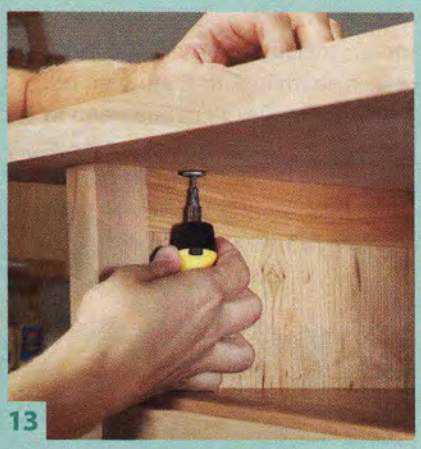


11

Glue the sides and lower front rail to the case. The open-ended boxes clamped to the upper shelf allow deep-reach clamps to pull the sides tight.

12

Temporarily attach solid-wood drawer faces to the drawer boxes using hot glue. After the faces are positioned, pull out the drawers and fasten the faces with screws.



13

Attach the top using figure-eight desktop fasteners, which provide clearance for the drawer boxes. A stubby ratcheting screwdriver is very handy in this small opening.

about 1/8" past the mark, then make a series of nibbling cuts until the rail fits perfectly between the legs. Remove the sides from the case once more.

13. Mortise the ends of the rail and corresponding locations on the front legs (Fig. D). Make loose tenons for the joint (A10) and glue the tenons into the rail.

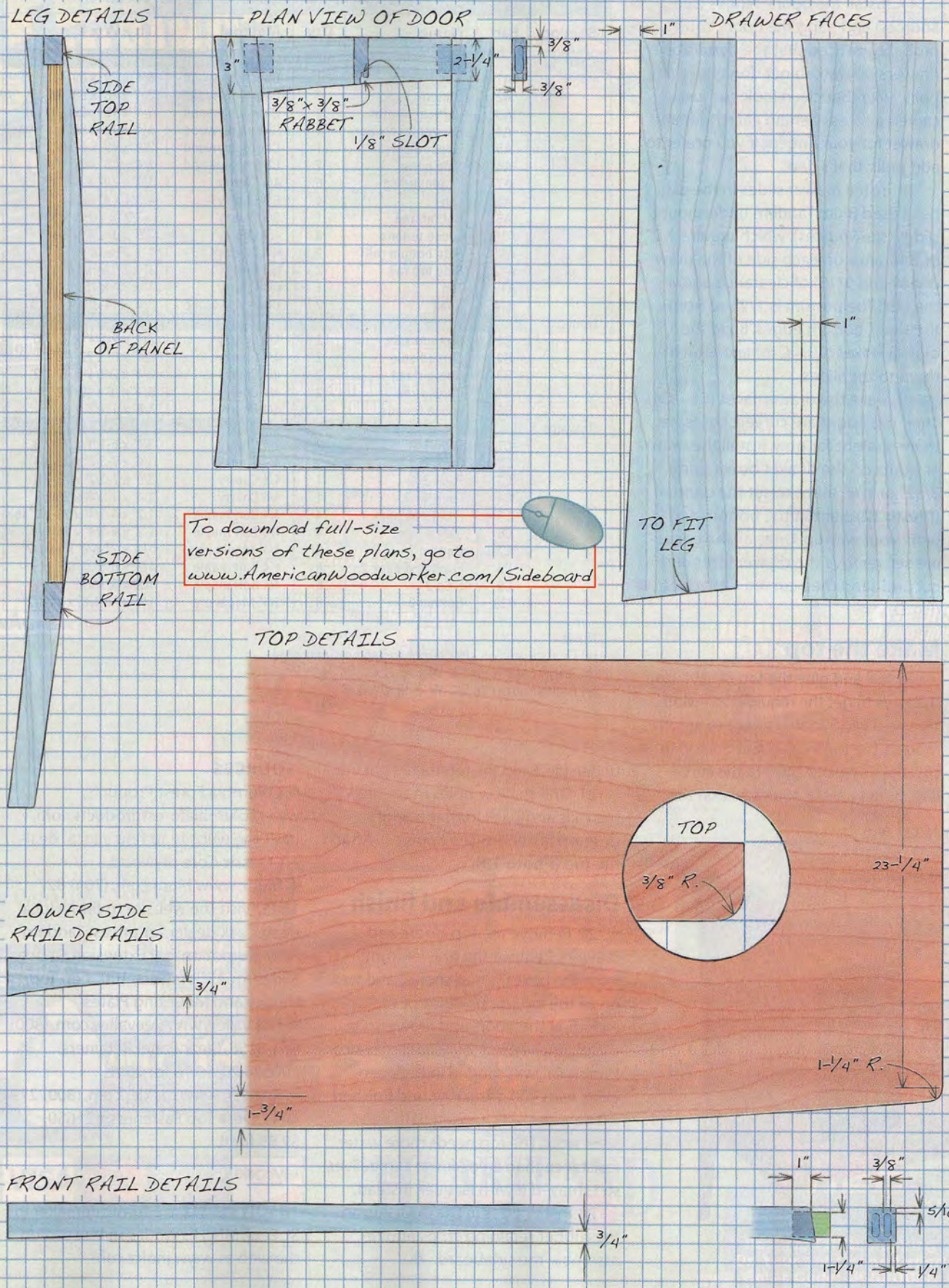
14. Clamp the legs back to the sides. Mark the outline of the sides on the leg in preparation for shaping the legs (**Photo 8**). In addition, mark the thickness of the door on the legs–this area will not be rounded, either. Use a spokeshave to shape the legs, avoiding the areas you've marked (**Photo 9**). Put the legs back on the side now and then to check your work. After the legs are shaped, sand and glue them (**Photo 10**). Plane the inside face of the side bottom rail so it's flush with the legs.

15. Glue the bottom rail to the case with the side assemblies clamped on. This ensures that the rail is centered in the proper position. You can use a few biscuits to help align the rail flush to the bottom of the case. Glue both sides onto the case (**Photo 11**).

Add doors and drawers

16. Mill pieces for the doors (B1-B4). Scribe the outside edges of the curved stiles (B2) directly from the legs, and cut and smooth the curves. Lay out the inside edges of the stiles so they're parallel to the outside edges (Fig. D), then cut and smooth them. Cut and smooth the curves on the inside edges of the rails (B4). For the curved ends of the rails, scribe them to the stile's curve, then bandsaw and sand to the line with a drum sander or oscillating spindle sander. Rout mortises for the loose tenon-joinery and glue the doors together. Use a piloted rabbeting bit to rout a rabbet around the inside of the door for glass (Fig. D). The type of glass retaining strip I use requires a rabbet and a narrow slot, which I routed with a slot cutter. The strips squeeze into the slots, so no nailing is required (see Sources).

Fig. D Cabinet Details



17. Install the doors' hinges (see Sources) and hang the doors. You probably noticed that the doors and drawers on my cabinet don't have any pulls. I like that clean look, so I just carved a recess behind each door and drawer for your fingers. If you prefer to add pulls, that's fine.

18. Install drawer slides in the cabinet. I used Blum Tandem undermount slides (see Sources), which require 1/2" of clearance on each side of the drawer box and 9/16" of clearance under the box. The bottom is 1/2" up from the sides' bottom edges. Build the drawer boxes (C5 – C10) and attach them to the slides.

19. Make the drawer faces (C1 – C4). Their top edges are curved, but leave them straight for now. Install the drawer fronts on the drawer boxes using 3/32" or 1/8" shims to set the gaps (**Photo 12**). Start at the bottom and work your way up. Once all the gaps are set, remove the drawer faces and cut and sand their curved top edges (Fig. D).

Make the top

20. Mill and glue the top (A13). I used 4 boards to get the required 25" width, placing a wide board in front to accommodate the top's curve. Cut the top to size, then saw and smooth the curve (Fig. D). Rout a 3/8" roundover on the underside. Sand the top to 220 grit.

21. Drill shallow holes in the side top rails and back for figure eight desktop fasteners (see Sources). Attach the top (**Photo 13**).

Disassemble and finish

22. Remove the top, doors and drawers. Remove the drawer fronts from the boxes. I used shellac and wax on all the interior portions of the case, including the doors and drawers. On the exterior, I used four coats of Watco Danish Oil, wet sanded in between coats with 400 grit paper, and finished with a paste wax applied with 0000 steel wool. The top needs more water resistance than an oil finish can deliver, so I sprayed it with lacquer, instead.

23. Install glass in the doors using the rubber retaining strips and reassemble the sideboard.

CUTTING LIST Overall Dimensions: 42" H x 75" L x 25" D

Section	Part	Name	Qty.	Material	Th x W x L
Case					
	A1	Back	1	Cherry plywood	3/4" x 30" x 60" (a)
	A2	Bottom	1	Cherry plywood	3/4" x 18" x 60" (a)
	A3	Vertical divider	2	Cherry plywood	3/4" x 18" x 22-1/2" (a)
	A4	Horizontal divider	1	Cherry plywood	3/4" x 18" x 60" (a)
	A5	Upper divider	1	Cherry plywood	3/4" x 18" x 5-3/4"
	A6	Side panel	2	Cherry plywood	3/4" x 18" x 27-1/2"
	A7	Edgebanding	6	4/4 Cherry	1/4" x 7/8" x 62"
	A8	Leg	4	8/4 Cherry	1-3/4"x 4" x 41"
	A9	Bottom rail	1	8/4 Cherry	1-1/2" x 1-7/8" x 60"
	A10	Loose tenons	4	4/4 Cherry	3/8" x 1-1/4" x 2"
	A11	Side bottom rail	2	6/4 Cherry	1" x 2" x 18"
	A12	Side top rail	2	6/4 Cherry	1" x 1-1/2" x 18"
	A13	Top	1	6/4 Cherry	1" x 25" x 75"
	A14	Shelf	2	Cherry plywood	3/4" x 14-3/8" x 17" (a)
Doors					
	B1	Straight stile	2	4/4 Cherry	3/4" x 2-1/4" x 22-7/8"
	B2	Curved stile	2	4/4 Cherry	3/4" x 3" x 22-7/8"
	B3	Straight rail	2	4/4 Cherry	3/4" x 2-1/4" x 10-1/2"
	B4	Curved rail	2	4/4 Cherry	3/4" x 3" x 10-1/2"
	B5	Loose tenons	8	4/4 Cherry	3/8" x 1-1/2" x 3"
Drawers					
	C1	Face 1	2	4/4 Cherry	3/4" x 6-1/8" x 29-7/8"
	C2	Face 2	1	4/4 Cherry	3/4" x 7-3/8" x 29-3/4"
	C3	Face 3	1	4/4 Cherry	3/4" x 7-1/2" x 29-3/4"
	C4	Face 4	1	4/4 Cherry	3/4" x 7-3/4" x 29-3/4"
	C5	Front and back 1	4	4/4 Soft maple	1/2" x 4-1/4" x 28-1/8" (b)
	C6	Side 2	4	4/4 Soft maple	1/2" x 4-1/4" x 15"
	C7	Bottom 1	2	1/4" Maple ply	1/4" x 27-5/8" x 14-1/2"
	C8	Front and back 2	6	4/4 Soft maple	1/2" x 6" x 28-5/8" (c)
	C9	Side 2	6	4/4 Soft maple	1/2" x 6" x 15"
	C10	Bottom 2	3	1/4" Maple ply	1/4" x 28-1/8" x 14-1/2"

Notes
(a) Final dimension after edgebanding one long edge
(b) Drawer box is 28-1/8" W x 15" D x 4-1/4" H
(c) Drawer box is 28-5/8" W x 15" D x 6" H

SOURCES

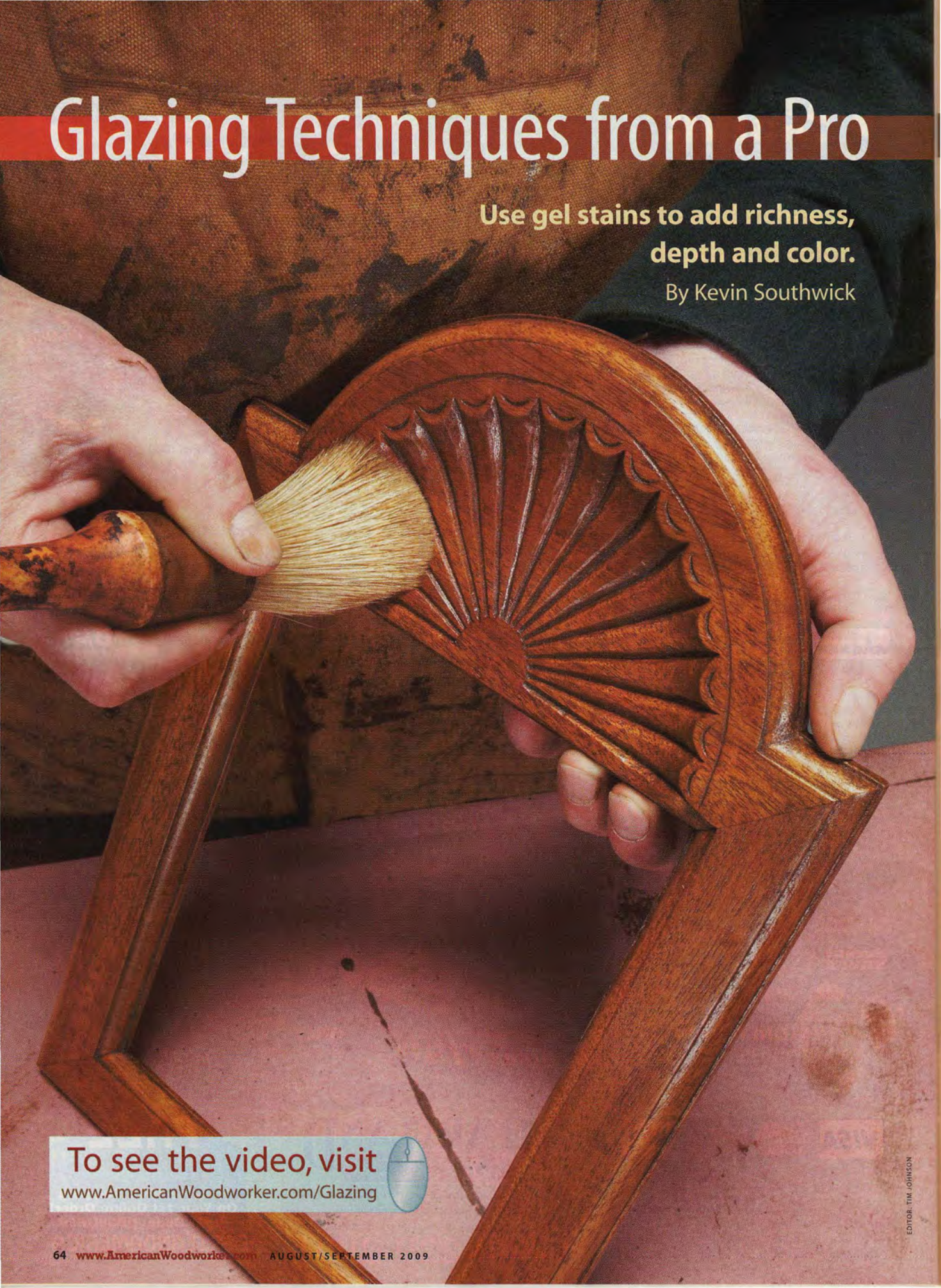
- Columbia Forest Products, www.columbiaforestproducts.com, (visit the website to find a local dealer), Classic Core plywood.
- Blum, www.blum.com, (704) 827-1345, (visit the website to find a local dealer; ask dealer for prices),Tandem with Blumotion Full Extension Drawer Slides for 15" drawers; 100° Clip Top Hinges and Mounting Plates.
- Lee Valley, www.leevalley.com, (800) 871-8158, Clear Panel Retainers, #00S24.20, $9.10 for 25 ft.
- Rockler, www.rockler.com, (800) 279-4441, Desk Top Fasteners, #21650, $2.69 for 8.

Jason Holtz is a furnituremaker in St. Paul, MN. His work can be seen on the web at www.jholtz.com

Glazing Techniques from a Pro

Use gel stains to add richness, depth and color.

By Kevin Southwick



To see the video, visit
www.AmericanWoodworker.com/Glazing

EDITOR: TIM JOHNSON

SOME WOOD FINISHES have richness and depth that combine to create a special warm glow. This glow usually comes with age, resulting from natural changes in the wood, due to its exposure to light, and to a patina that develops at the wood's surface, in and on the finish. By imitating the effects of time, glazing can also create this glow. Basic glazing techniques are easy to learn, and they provide a much faster way to enhance a finish than waiting for Father Time.

Glazing techniques use stains differently than the way they're normally used. Instead of staining the raw wood, glazing is done after a finish has been applied, so instead of soaking in, the color sits on top of the sealed, nonporous surface.

Glazing can be done with any coloring material that will adhere well to a sealed surface (see "Glazing Materials," page 67). Glazing materials need to be thick. Several brands of oil-based gel stains work well as glazes. However, regular thin oil stains don't work well, because they don't contain enough binder to stick to the finish, or enough color to be effective. In general, oil-based glazing materials are usually easier to work with, because they have a longer working time than water-based materials. They're also easier to remove, if something goes wrong.

Projects of all sizes can be glazed. Here, I'll use a mahogany picture frame to demonstrate how to use a couple of basic glazing techniques to add color and character. These techniques can also be used to change a color for matching purposes, to add a subtle warm tone to an otherwise cold finish, and to age reproduction pieces. Many fancy faux finishing techniques also use glazing methods and materials.

Virtually goof-proof

Because glazing is done on a sealed surface, it's very forgiving. If you don't like the results, oil-based glaze can easily be erased with mineral spirits, as long as you act before the glaze hardens. (Color will be retained only in areas where the surface is left porous.) This means that

1

Start by brushing on thin coats of amber shellac to seal the wood and add a warm tone. Let the shellac dry, then sand lightly.

2

Next, cover the surface with glaze. The simplest method is to generously brush on the glaze using a disposable brush.

3

Finish by using cheesecloth to wipe off the excess glaze. Cheesecloth provides more control than ordinary cotton rags, so you can leave a little color in grooves and crevices.

For maximum control, use a natural bristle sash brush to glaze the sealed surface. Put a small amount of glaze on a palette. Dip the brush in the glaze and then remove the excess on a clean part of the palette.

Dab on the glaze and then brush it out. The sash brush allows you to delicately apply and spread the glaze.

As you work the surface, keep the brush from becoming saturated with glaze by cleaning it on an absorbent towel or rag.

almost nothing can go wrong, and you can practice all you want.

The best colors for glazing to imitate the effects of age are in the medium brown range, like dirt. Golden or amber colors are best for adding warmth to a pale finish, such as a clear finish on new pine, birch or maple. The goal for this mahogany frame is to deepen the overall color and enhance the molding and carving by leaving a little more color in the grooves and crevices. The gel stain I'm using is a medium dark brown color that's on the cool side. No thinner was added.

Seal the Surface

The first step for both techniques is to seal the wood so that the glaze can't soak in (**Photo 1**). Here, I'm using amber (also called orange) shellac for sealing, because of its warm glow and fast dry time, but any film building finish will work. Four coats of 1-1/2-lb cut shellac will ensure thorough sealing and provide an attractive finish. (To create a 1-1/2-lb cut, mix 1 part canned amber shellac with 1 part denatured alcohol.) More coats may be required to fully seal end grain or carvings. Let each coat dry for half an hour. Sand lightly between coats with 400 grit sandpaper or '0000' steel wool. Sand after the last coat, too, to prepare the surface for glazing. The scratches from the fine abrasive will help catch the glaze.

Glazing with cheesecloth

Once the wood has been sealed, the first glazing technique is similar to staining raw wood. You apply the glaze (**Photo 2**) and then wipe it off (**Photo 3**). But instead of using an ordinary rag for wiping, you use cheesecloth. Like the bristles of a brush, cheesecloth's loosely woven texture gently removes the glaze from the surface, so you can remove as little or as much as you want. You can remove the glaze uniformly, to leave an even coating of color, or wipe across carvings, flutes and fillets to leave glaze in the crevices.

Glazing with brushes

Round natural bristle sash brushes are hard to beat for applying and removing

glaze. They're especially well suited for pushing glaze into corners and grooves. They're also excellent for leaving just the right amount of glaze on the surface to create the desired effect. The best strategy is to use one brush to apply and work the glaze, and a second, clean brush for final touch-up. Start by working a small amount of glaze into the first brush on your disposable palette (**Photo 4**). Then transfer the glaze to the surface (**Photo 5**). Sash brushes allow you to apply, work and remove glaze all at the same time. You can add or remove color, work selectively or overall, and you can work crevices as easily as high spots.

As you continue to apply and remove glaze while you work the surface, it's important to keep the brush from becoming overloaded (**Photo 6**). Switch to the clean brush to finish the job (**Photo 7**).

The glaze begins to harden and becomes difficult to work after about five minutes. It's important to finish working the glaze before this happens. Remember, it's also possible to remove the glaze and start over. Once you've completed the job, allow the glaze to dry overnight. After the first coat is dry (24 hrs above 60° for gel stains), you can repeat the process to add more color and/or highlights.

The final step is usually to apply clear finish to lock the glaze down under a protective layer, or to provide an appropriate sheen. But if the finished object is more decorative than functional, and the sheen is consistent, this step may not be necessary, as is the case with this frame.

7

Switch to a clean brush for final glaze removal. It's a good idea to take off your glaze-stained gloves for this step, so you don't mess up the work you've done.

Glazing Materials

Gel stains work well for glazing, but making your own glaze offers unlimited options for color and consistency. To make your own glaze, you need concentrated color, such as japan color or artist's oil, and an oil-based glazing medium to use as a "binder," to make sure the color will adhere to the surface, and to provide a smooth, thick consistency.

Clear gel varnish and artist's glazing medium both work well as binders; artist's glazing medium allows a longer working time. Start by putting a small amount of binder in a mixing container, then add small amounts of color and whisk in with a brush until the desired concentration is reached. Paint thinner or mineral spirits can be added in small amounts (from 5% to 20%) to increase working time. Just remember, glaze needs to be fairly thick to work.

Kevin Southwick is a wood finishing specialist and furniture restorer/conservator in Minneapolis, MN.

Line and Berry Inlay

By Tom Caspar and Al Hudson

Make this traditional design with a router and plug cutters.

LINE AND BERRY INLAY is an old American tradition. There are many variations of the design, but all consist of a series of circular arcs made with narrow inlay, called stringing, which often terminate in round discs, or berries. Back in 18th century Pennsylvania, where the patterns originated among Welsh settlers, the curved grooves for the stringing were made by hand with a modified compass. A router, pivoting on a nail, can do the same job.

I'll show you how to make a basic line and berry design which Al used to decorate the front of the spice cabinet at right. This design is a good starting point to learn the technique, but I hope that you'll also try other traditional patterns or create your own. Old designs are generally symmetrical, but a free-form pattern would work, too.

What you'll need

You can make 1/16" stringing, but it's much easier to buy it (see Sources, page 71). In this example, the stringing is made from holly, a white wood without visible grain. To make the berries, you'll need 1/8" thick pieces of solid holly and a contrasting wood. Al made red berries from aromatic eastern redcedar, the wood commonly used to line chests and closets. The background wood is black walnut.

To make the semicircular grooves for the stringing, you'll need a router and a 1/16" bit. I used a Dremel rotary tool mounted in a Dremel router base, but a laminate trimmer would work as well. You'll need 3/8" and 1/2" plug cutters to make the berries.

On the Web

To see the secret drawer inside this cabinet, go to www.AmericanWoodworker.com/AlHudson

Lay out the design

It's best to make a drawing of the whole design on paper before you begin routing. Just follow the steps below using a compass instead of a router. On a drawing, you can experiment with the radius of the semicircles and diameters of the berries to best suit your project. I'm working on a panel that is 13" square, and the semicircles have a 2-1/2" radius.

Begin laying out the pattern by drawing a vertical line on the workpiece. You can use this line as the pattern's axis, but I've found that tilting the axis makes the design more dynamic (Fig. A).

I used a soft white pencil to lay out the centering lines (**Photo 1**) because

white lines are easy to see and photograph on walnut. I recommend that you use a regular pencil, though, because white lead gets into the wood's pores and can be difficult to remove.

Set up the router

Install a 1/16" bit in your Dremel or router (**Photo 2**). Add an adjustable fence to the router that allows you to use a 3d nail as a pivot point (**Photo 3**). Adjust the distance between the nail and bit to match the radius of the arc in your drawing. If your laminate trimmer doesn't have a fence, make a new, oversize sub-base and drill a hole through it for the nail.

Make a test pass on a piece of scrap wood (**Photo 4**). Start with the bit hanging free off the side of the wood, rather than plunging the bit into the wood, which could break it. Place a piece of inlay in the groove–it should be proud by at least the thickness of a piece of paper, although a little bit more is safer.

From this point on, accuracy is essential in order for all the semicircles to precisely radiate from the pattern's center. Use a divider rather than a ruler to measure the radius of the semicircle you routed (**Photo 5**). Next, step off this distance on one of the centering lines (**Photo 6**) and make a hole at this point with an awl. Make the hole large enough so you can easily find it with the 3d nail. Before routing, drill the hole for the center berry (**Photo 7**). This hole should be about 1/32" deeper than the thickness of the berry material.

Rout the semicircles

To rout the first semicircle, place the router on the workpiece with the bit sitting free in the center hole. Locate the nail in the hole you made in step 6 and hammer the nail into it. Rout the semicircle, stopping at the point where the bit touches the centering line (**Photo 8**). Take it easy–a slow, steady pace is best, because the bit is fragile. Turn off the router and pull out the nail–a

1

Begin by drawing centering lines on your workpiece. First, draw a slightly offset vertical line in the center. Next, draw four lines radiating at 60°.

2

Install a 1/16" bit in a Dremel or small router. If you're using a Dremel, mount it in a Dremel plunge-router base.

3

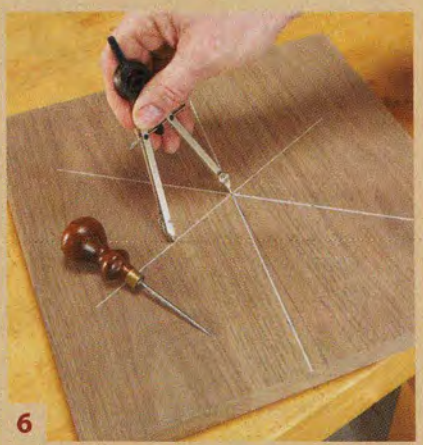
Add an adjustable fence to the base, which includes a pivoting point (a 3d nail). Adjust the distance between the bit and nail to the radius of the arc that your design requires.

4

Adjust the bit to make a cut 1/32" deep. Make a shallow hole with an awl. Hammer the nail into the hole, and make a test pass.

5

Set a compass or divider to the exact distance between the pivot point and the groove's center.

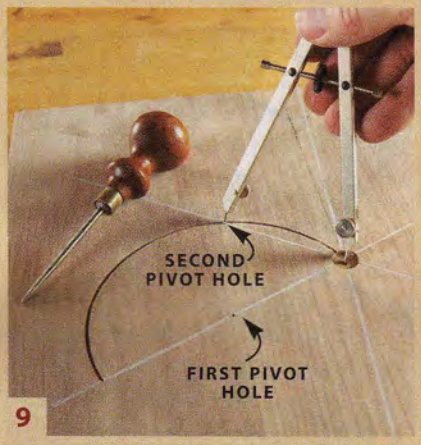


6

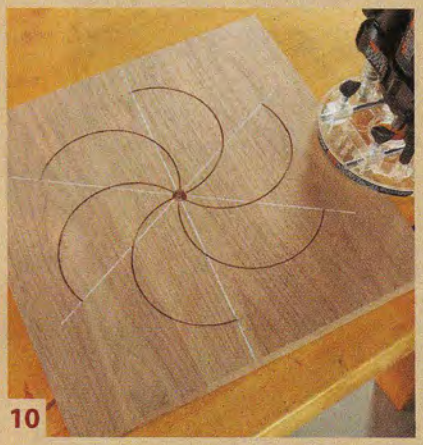
Mark one of the lines with the divider. Make a small hole at this point with an awl.

Drill a 1/2" dia. hole at the center of the design to create a convenient starting point for routing. This hole will also receive a large berry.

Rout a semicircle. Begin by positioning the bit in the center hole, then hammer the fence's nail into the pivot hole–the one you made with the awl.

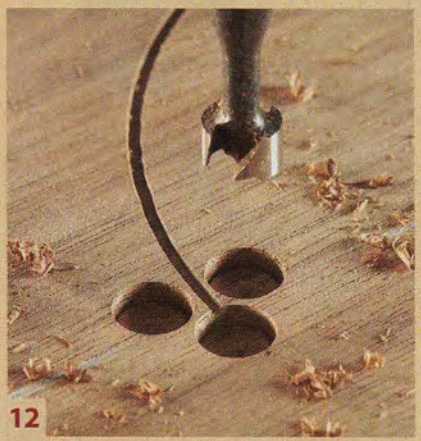


Use the dividers to locate the next pivot hole. It should be in the middle of the groove and fall on a centering line.



Move the router to the new pivot point and rout another arc. Continue your way around the circle, making a total of six arcs.

Lay out 3/8" dia. holes for the berry clusters with a circle template. Mark the holes' centers by tapping on a Forstner bit. Guide the bit using a piece of plexiglass with a single hole drilled through it.



Drill the holes using a Forstner bit. Position the first hole at the end of the groove, then drill the remaining two holes.

side cutter works well to pry it up from the fence.

To locate the pivot point for the next semicircle, use the divider to mark a point in the center of the groove you just routed **(Photo 9)**. This point should fall on one of the centering lines, but if it's off by just a hair, don't worry. The line is approximate; the divider is exact. Make another hole for the nail at this point (a 3d nail is slightly less than 1/16" dia., so the hole it makes won't mar the groove).

Rout another semicircle. Lay out the next pivot point in the same manner, and continue around the circle (**Photo 10**). The last groove should go right through the first nail hole you made. No nail holes will be visible when you're done, because they'll be covered with the stringing. Most line and berry inlay was designed using this technique; the pivot points were located inside a groove or berry.

Lay out the berries

Precision is important in laying out and drilling the berries, too. Use a circle template to mark the location of each berry (Fig. B and **Photo 11**). To locate the center of each circle, drill a hole through a piece of plexiglass, position the plexiglass over the circle, insert a Forstner bit in the hole, and tap the bit with a hammer. Mark all the holes at the end of each groove first, then drill them.

Mark the remaining holes, being careful to maintain 1/32" gaps between the holes and the groove–the plexiglass allows you to perfectly sight the gaps. Drill the holes (**Photo 12**). Make the berries by using a plug cutter (**Photo 13**).

Gluing and clean up

Start with the stringing. It's flexible enough to bend at this radius without breaking. Place a long piece of stringing in the groove (**Photo 14**) and mark where it crosses the center of the middle circle. Remove the stringing and cut it at this point with a chisel.

Run a thin bead of glue in the groove and insert the stringing, starting at the three-berry end. Push in the stringing along its entire length with your finger, then rub hard on the stringing with a smooth-faced hammer to make sure it's completely seated. Remove the glue squeeze-out with a putty knife. Trim the end of the inlay in the center of the design with a small carving gouge, making a concave end to match the edge of the circle. Glue all the stringing, then add the berries (**Photo 15**).

Level the stringing and berries so they're barely proud of the surface by using a very sharp block plane. Scrape and sand to make everything perfectly flush (**Photo 16**).

SOURCES

- Dremel, www.dremel.com, (800) 437-3635, 300 Series Rotary Tool, $63; Dremel Plunge Router Attachment, #335-01, $27; 1/16" Carbide Grout Removal Bit, #569, $10.
- Inlay Banding, www.inlaybanding.com, (704) 221-2147, 1/16" Holly Stringing, 90 cents per ft.; 1/8" solid holly, call for quote.

Al Hudson builds traditional furniture in Knoxville, Tennessee.

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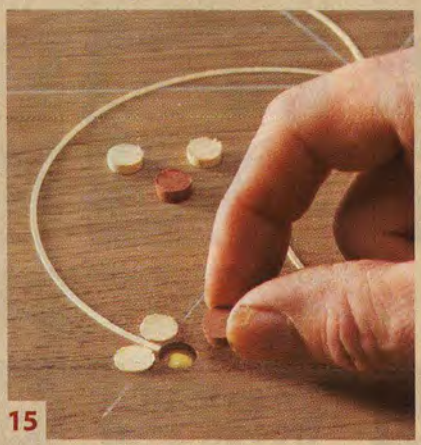
Make the berries from holly and a contrasting wood, such as this aromatic red-cedar, using a 3/8" dia. plug cutter.

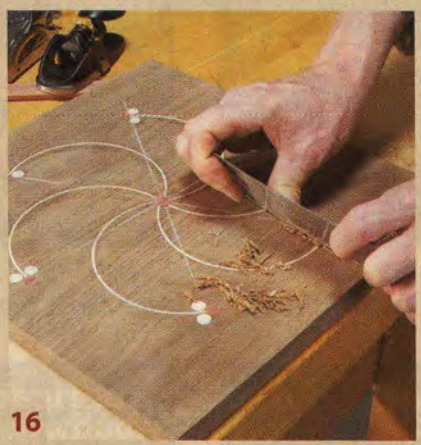
14

Place a piece of stringing into an arc and mark its length. Cut it extra-long and glue it in the groove. Trim the end using a carving gouge.



15

Glue the berries into the holes.



16

Level the stringing and berries with a plane, scraper and sandpaper.

Fig. A Laying Out the Design's Axis

First, draw a centerline on the workpiece. Next, measure up from the center by the diameter of one semicircle (A). Move over by the diameter of one small berry (B). Make the same measurements at the bottom of the centerline and connect the dots to draw the design's axis.

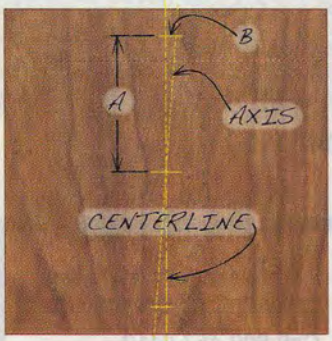
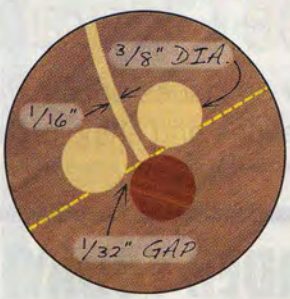
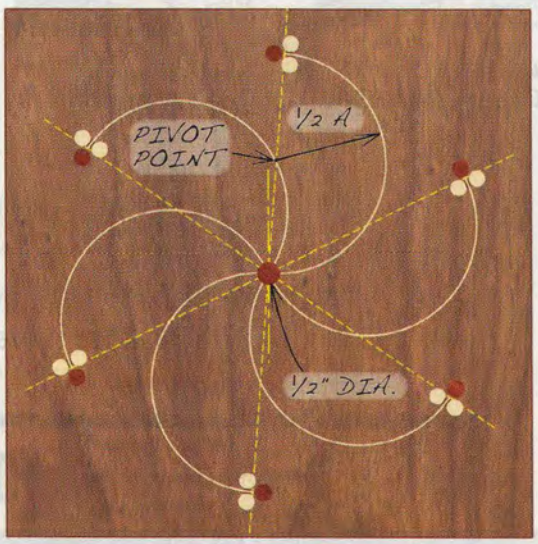


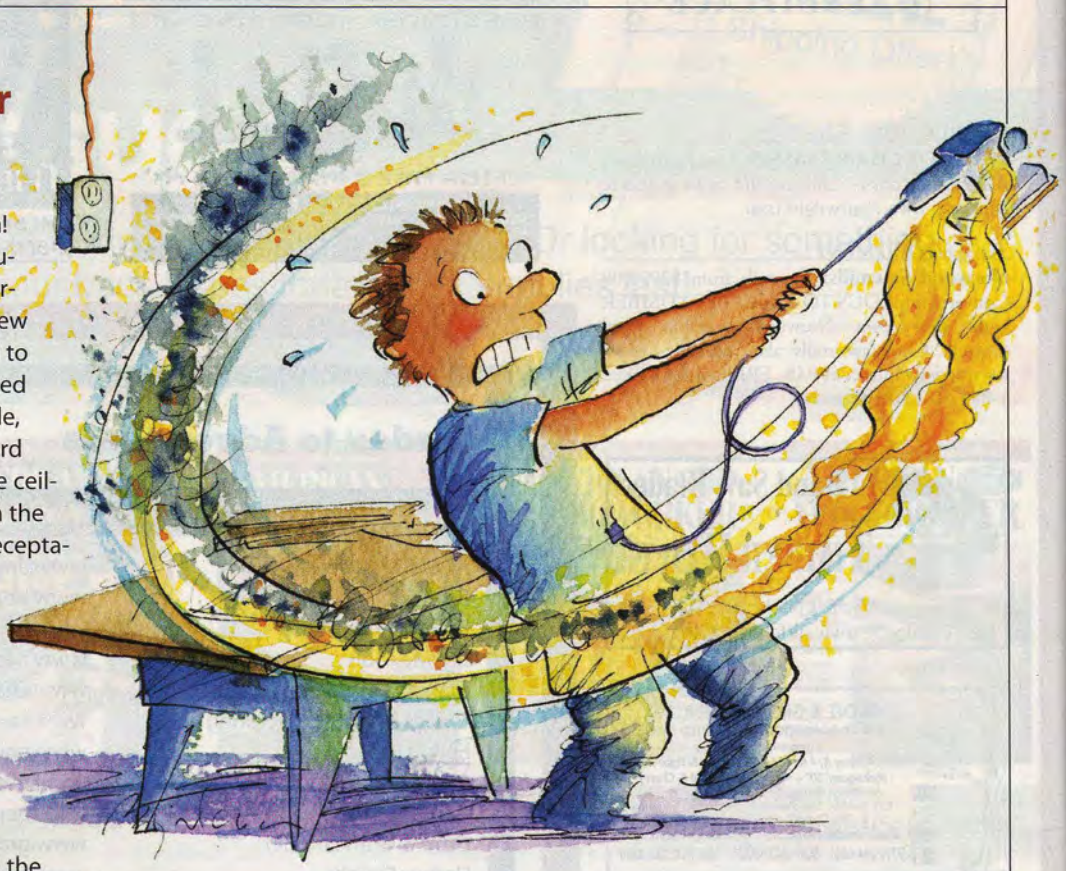
Fig. B
The Design's Geometry

This line and berry design is based on six centering lines spaced 60° apart. The center of each semicircle falls on one of these lines.





Flaming Sander



AFTER YEARS OF HARD USE, my tablesaw's 120 volt motor finally expired. Eureka! This was the perfect opportunity to acquire a more powerful machine. I purchased a new 240 volt saw and proceeded to rewire the circuit that supplied power to the saw's receptacle, which was mounted on a cord that dropped down from the ceiling. The plug that came with the new saw didn't match the receptacle. No problem—I simply swapped the new plug with an old one I had that did match. I plugged in my new saw and went to work. I couldn't believe how effortlessly it cut all the pieces for the project I was building.

When it was time to sand the pieces, I covered the saw with a sheet of plywood, so I could use it as a sanding table, as I had always done in the past. I plugged my sander into the hanging receptacle, as usual, and went to work. Wow! The sander seemed to work better than ever. But after a couple minutes, smoke and flames started shooting out of it. Yikes! In a single, panicked motion, I unplugged the flaming sander and threw it lasso-style out an open window.

Needless to say, I now have a new sander. I've also hired a licensed electrician to correctly wire my new saw and its 240 volt circuit.

Bobby Smith

Like an Arrow

MY TABLESAW SAT IN THE LIVING ROOM of the house I was renovating, because it was too rainy to work outside, and the house had no garage. In order to rip the 10' long oak boards that I was using to make wainscoting, I had to position the saw so my backside faced a picture window. Of course, as I was ripping the last board, it moved, pinched, and kicked back. A long sliver of oak flashed under my right arm—fortunately, I wasn't standing directly behind the blade.

The sliver shot through the picture window, leaving a neat, round hole, similar to the one it left in the windshield of my pick-up, which was parked in the driveway in front of the house. The shaft protruded through the windshield, looking very much like, well, an arrow. I peered inside the cab; the splinter had also pierced the back of the leather seat, as well the digital readout on my level, which was stored behind the seat.

When I called to ask if my insurance would cover the damages, my agent said no, because it was an Act of God. I guess that makes it official: God is a woodworker.

Tom Daleson

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