

TAUNTON'S

Fine Woodworking

Refine your
edges, p. 56



Shaker built-in uses space wisely

Best ways to handle
curved joinery

Quick doors on
the router table

Buying lumber:
Learn the lingo

Why you need
a benchtop sander

Fine finish
from a spray can

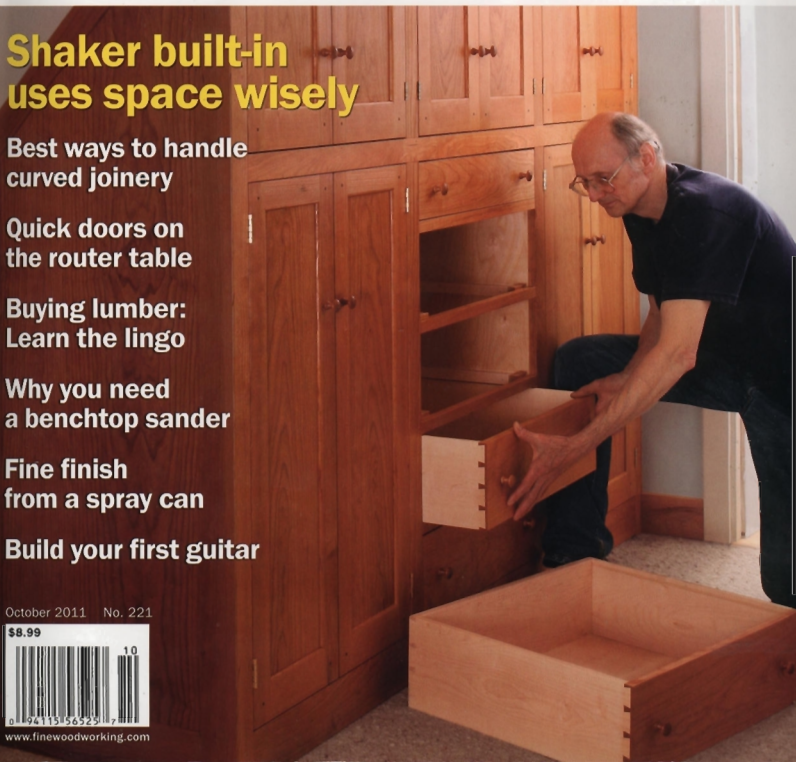
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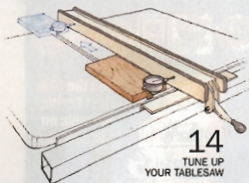
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14
TUNE UP
YOUR TABLESAW

up front

6 On the Web

8 Contributors

10 Letters

14 Methods of Work

- Simple jig aligns table saw
- Extra clamp pressure for dovetail joints

18 Tools & Materials

- Revolutionary router kit
- Improve your dust collector

22 Fundamentals

The language of the lumberyard

26 Handwork

4 chisel tricks

18
BEST ROUTER
COMBO KIT



features

32

COVER
STORY

Beautify Your Home with a Shaker Built-in

Build it in place, and the work goes surprisingly quickly

BY CHRISTIAN BECKSVÖÖRT

40

Why You Need a Benchtop Sander

They tackle trimming and smoothing quicker than hand tools do—with no sharpening required

BY ROLAND JOHNSON

46

Straightforward Joinery for Curved Work

Three basic techniques are the bridge to more beautiful furniture

BY JEFF MILLER

52

Don't Overlook Aerosols

Why these disposable spray guns belong in every woodworker's finishing kit

BY TERI MASASCHI

56

Take the Edge Off

How you break the edges can make or break your projects

BY GARRETT HACK

60

A Study in Squares

Gridwork side table is a unique take on Arts and Crafts

BY KEVIN RÖDEL

68

Cope-and-Stick Tricks

Make perfect raised-panel doors with matched router-bit sets

BY RICHARD BABBITT

72

Your First Guitar

Good kits make great guitars and offer plenty of real woodworking

BY STEVE SCOTT



46 JOINERY FOR
CURVED PARTS



40 CHOOSE THE RIGHT
BENCHTOP SANDER



68 EASY DOORS ON
THE ROUTER TABLE



60 GRIDWORK
SIDE TABLE

in the back

76 Readers Gallery

80 Q & A

- Some router bits need an offset fence
- Plane both faces equally when thicknessing by hand

84 Master Class

Dress up your furniture with surface carving

90 Finish Line

Accentuate carving with color

98 How They Did It

The back cover explained

Back Cover

Pursuit of Perfection



The Taunton Press
Inspiration for hands-on living*

on the web

THIS MONTH ON **FineWoodworking.com/extras**

Visit our Web site to access free Web tie-ins, available July 28. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.



VIDEO: Flawless Finish from a Can

For an off-the-gun finish on small projects, try an off-the-shelf aerosol can (pp. 52-55). Learn how to achieve a glass-smooth finish without investing in a high-priced spray rig.

AUDIO SLIDE SHOW: A Woodworker Is Born

From publisher to woodworker—find out how furniture maker Peter Shepard (back cover) managed to trade in his pencil and paper for a handplane and chisel.



VIDEO: Simple Cope and Stick

Master the basics of cope-and-stick joinery (pp. 68-71) with simplified doors that are perfect for built-in cabinetry.

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VIDEO

Guitar-Building Basics

See every step of a guitar project (pp. 72-75) in detail, with a new video workshop that walks you through the entire kit-building process.



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contributors

Contributing Editor **Garrett Hack** ("Take the Edge Off") says his early memories of sawing and hammering as a child are probably why he became a furniture maker. First, however, he pursued civil engineering and architecture at Princeton in the early 1970s. Later, study at Boston University's Program in Artisanry influenced his style of contemporary designs based on classic forms. His work (and his Federal-inspired brick shop) have been featured in numerous books and magazines.

Most exciting piece you've built recently? "My wife and I are building a piece together. It's a tall three-sided cabinet on legs. The facade is partially painted with patterns inspired by our trip to Vienna. And some gold leaf! It's topped by a 'tiara' of mother of pearl."



There are two sides to **Michael Cullen** (*Master Class and Finish Line*): His artistic flair is demonstrated each time he creates a piece with a uniquely carved surface. He also has a degree in mechanical engineering and worked for several years in machine design before deciding to pursue a career making studio furniture. The patterns he carves draw on both aspects: They are both abstract and precise.

If not a woodworker, you'd be: "Either a sculptor or doing something involving math and science."



A self-taught woodworker who went pro in 1986, **Kevin Rodel** (*"A Study in Squares"*) still loves what he does because there is always something new to learn. While cutting dovetails by hand doesn't hold the romance it once did, he still gets excited by the design process and creating new furniture. When he's not in his shop, you can catch him teaching at the Center for Furniture Craftsmanship in Rockport, Maine, and the Connecticut Valley School of Woodworking in Manchester, Conn.
Favorite tool? "A well-written book."

Custom furniture maker and teacher **Jeff Miller** (*"Straightforward Joinery for Curved Work"*) trained originally as a classical musician. His first foray into woodworking was making Renaissance musical instruments—cornettos, krumphorns, and flutes. Ultimately, he said, furniture making proved more satisfying than either making music or making instruments.

Something I love about my shop: "I love the way the afternoon light comes in through the windows, and—perversely—the way it shows up the little imperfections in my work."



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From the Editors

KNOW WHEN TO LET IT GO

One of the best lessons I've learned over 20 years of woodworking is when to give up on a workpiece. So I should have known better when I recently cut mortises in the wrong spot on the sides of a cabinet.

Having spent a half-day dovetailing the case parts, I was looking for an opportunity to save time. So I stacked the two sides and cut the three sets of mortises for the shelves all at once on my mortiser. Pretty smart, until I realized I had flipped one of the pieces in the stack.

I stared at the parts for a half-hour and then had a brilliant idea: I would double up the number of shelves in the piece, making use of both sets of misaligned mortises! I spent another hour cutting the new mortises before admitting to myself that I didn't really like the cabinet I was building. Then I had another bad/brilliant idea: a patch. I'd run grooves along the length of the sides and glue perfectly matched strips of wood over the offending mortises for an invisible repair. Not so invisible, it turned out. Looking at the racing stripes on my cabinet sides, it was obvious that it was time to start over completely. By the way, this fresh start also gave me a chance to rethink the original design.

So why did I hold on so long? It had nothing to do with the wood. It was a small project and I had plenty of white oak on hand. It was those darned dovetails. I didn't want to let go of the effort I had invested.

I should have known better. When I was a novice, I fell into this trap all the time, spending as much time and energy fixing mistakes as actually building a piece. As you acquire more tools and skills, tasks like milling and squaring a board, or cutting a mortise, aren't such a big deal, so it is easier to scrap

a part or two when something goes wrong. But as a beginner, every step is hard-earned and each workpiece a treasure not easily parted with.

Sure, a lot of mistakes can be fixed, and you'll learn lots of great ways to do that. But knowing when to let go is one of the best lessons. I'm still learning it.

So how do I (normally) decide when it's time to cut my losses and move on? I ask myself a few questions: First, will a repair be completely invisible? Will it take longer to fix than it would to mill a new part? How expensive/special was the wood?

Take a hard look before starting on that next fix. Think about chalking it up to a lesson learned, and starting fresh. It's more fun and more rewarding working with clean stock than fussing with a repair. And chances are you won't make that same mistake twice.



MICHAEL PEKOVICH
Art Director

Pencil vs. mouse

I agree fully with Michael Fortune ("Put Your Designs in Perspective," *FWW* #220) on why pencil and paper still beat the computer. I've tried several drafting/CAD programs on my Mac, met with aggravation and frustration, and always reverted to pencil and paper. I start all my designs on sketch paper and then move to my old, reliable Mayline drafting board to produce all plan, elevation, and detail drawings. I've found that tracing paper is too thin so I work on vellum, which is much less likely to wrinkle, tear, or change shape with high humidity. And it can take a beating from an eraser. The Lawson perspective charts Fortune describes would definitely aid those not schooled in technical drafting/illustration. Normally I use a push pin to locate my vanishing points on the Mayline board and work my drawings from there.

—JON HUTCHINSON, Deland, Fla.

Fortune's article would have been fine in, say, 1985, when computers were in their infancy. But these days, with Google SketchUp being used by an ever-larger number of woodworkers, I don't see how you can say that "pencil and paper still beat the computer." Tim Killen and Dave Richards, the "Design.Click.Build" bloggers on FineWoodworking.com, have done yeoman's work in fostering the growth of SketchUp and showing how it makes a woodworker's life easier.

Traditional drafting techniques have their place, and probably always will. But so does SketchUp, a wonderfully intuitive application. Anyone can pick up the basics in about an hour and produce nicely finished drawings in half a day. A single SketchUp drawing contains every single bit of information needed to build



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the piece: dimensions, joinery details, curves, and so on. Mouldings, turnings, carvings, and hardware can be rendered quickly and precisely. There's no need to make separate plan and elevation drawings. That vastly reduces the amount of inaccuracy inevitable in even the most careful pencil-and-paper drafting. And SketchUp is free, which puts it \$38 ahead of the perspective charts.

—DAVID HEIM, Oxford, Conn.

Your advice on purchasing the perspective charts seemed so good I went straight to Amazon.com as suggested. What I found are folded charts of non-durable paper.

It seems like yours are different than what is available from Amazon.

—GORDON MEFFERT, Waunakee, Wis.

Michael Fortune replies: *Those are the charts I have. A number of readers have been concerned about the wrinkles and bumps. Ironing them and storing them in a tube will take care of the problem. I also had mine laminated at an office-supply store, since I use them so much.*

Chessboard tips

After reading Craig Thibodeau's article ("A Chessboard Made Easy," FWW #219), I wanted to add a few more tips. To size the squares, take the base diameter of the largest piece (usually the king) and multiply it by 1.25 or 1.30. Also, it looks better if the grain runs from player to player as opposed to perpendicular. And finally, make sure that the row closest to each player begins with a dark square on the left.

—DANIEL MacGREGOR, Brentwood, Calif.



About your safety

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't perform operations you learn about here

(or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.

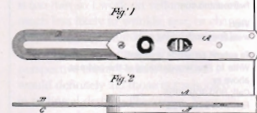
New hand tool inspired by an old one

The Vesper Tools Sliding Bevel you recently reviewed ("Tools & Materials," FWW #219) is indeed a beautiful tool, but it seems to be an exact replica of the St. Johnsbury Tool Company's Locking Sliding Bevel, manufactured in St. Johnsbury, Vt., where I live. I own one, manufactured in 1878. The tool was invented by Isaiah J. Robinson, and patented several times by him. The St. Johnsbury Tool Company is still operating, though it now makes electronics, not hand tools. Please give the credit for a "perfect tool" where the credit is due.

—JOHN G. PERRY, St. Johnsbury, Vt.

The manufacturer replies: *My sliding bevels are not exact replicas of the St. Johnsbury Tool Company's tools. Although I had studied photos of them online before I designed and built my own, that is not the same as having one in hand to measure and copy. While I don't promote the fact that my bevels are similar to St. Johnsbury's, I don't hide*

Heart of a champion. *Although he didn't have the antique tool in hand, Australian Chris Vesper was inspired by the 1873 patent drawings of St. Johnsbury Company's sliding bevels (below) when he designed his own (above).*



it either. At woodworking shows, I often mention the original patent and the fact that the St. Johnsbury bevels were the best in their time. If they were still making them, there would be no need for me to make my own.

—CHRIS VESPER, Australia (vespertools.com)

Cyclones now more affordable

In the last couple of years, quite a few companies have come to market with smaller, often portable cyclone dust collectors suitable for the small shops used by most of your readers. It's time for a head-to-head comparison of these units.

—MARK HOCHSTEIN, Parkton, Md.

Editor replies: *We agree. There is no better way to collect dust than a cyclone, which separates most of the material from the airflow before it has a chance to hit the impeller and clog the filter, keeping the suction power at a maximum. We are testing some of these new compact cyclones right now, and we'll publish the results soon.*

Problems spraying water-based lacquer

Like Teri Masaschi ("Switch to Spraying Water-Based Finishes," FWW #219), I decided to "go green" and use water-based lacquer. It was a disaster. I sprayed the lacquer on oak cabinet doors, first priming them with Zinssers' SealCoat as the article recommends. After a few months, black spots appeared in the doors, due to the water's reaction with the tannins in the oak.

—F. BEN KAUTZ, Whitehall, Mich.

Teri Masaschi replies: *I suspect that the shellac was put on too thin, allowing the water to get through to the oak. Also, if you used steel wool to scuff the shellac, bits of it could have been become embedded in the open-pored wood, adding to the reaction.*

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Best Tip



Brian Grella is a chemist during the week and enjoys building furniture on the weekend in his two-car garage. He says he gets a lot of satisfaction from building his own jigs and shop tools. He also likes to share what he learns with others at his woodworking website, garagewoodworks.com.

Simple jig aligns tablesaw

You can't cut cleanly or safely on the tablesaw if the blade is not aligned with the miter slot and fence. However, with a shopmade jig and an inexpensive dial-caliper gauge, you can check both alignments precisely.

Make the jig from a piece of hardwood. Center a hardwood runner on the bottom of the jig using countersunk screws, making sure it fits snugly into the miter-gauge slot.

Screw a dial-indicator gauge to the front of the jig. Locate the gauge so that when the jig is riding in the left miter slot, the side of the blade depresses the dial-indicator plunger about 1/8 in.

Elevate the blade to its maximum height, and place the plunger in contact with a tooth at the front of the blade. Check the indicator. Now rotate the blade until the same tooth is at the back of the blade, and take another reading. They should be the same. If they aren't, the miter gauge is not parallel to the blade and you will need to either adjust the tabletop (most cabinet saws) or adjust the trunnions (most contractor saws).

Once the blade is parallel to the miter slot, you can align the fence to the blade. Place the jig in the left-hand slot and slide the fence over until it just depresses the plunger. Zero the dial, then slide the jig to the back of the slot and take a second reading. Adjust the fence until the two readings are the same. Now the fence is parallel to the blade.

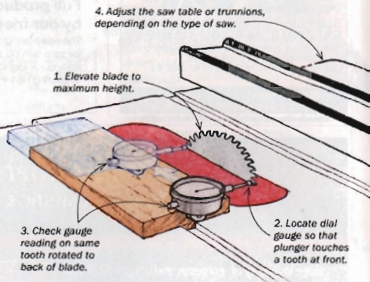
—BRIAN GRELLA, High Point, N.C.

A Reward for the Best Tip

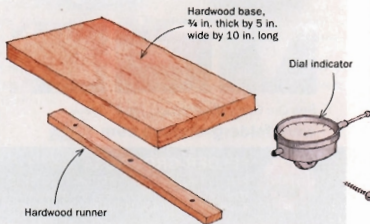
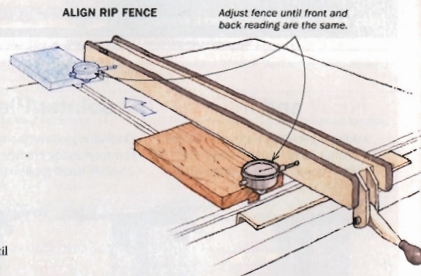
Send your original tips to *Methods of Work*, Fine Woodworking, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. We pay for every tip we publish; the best tip also wins a router-bit set from Infinity Cutting Tools.



ALIGN BLADE WITH MITER SLOTS



ALIGN RIP FENCE

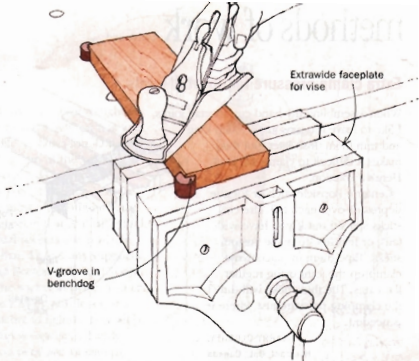


Clamping system for cross-grain planing

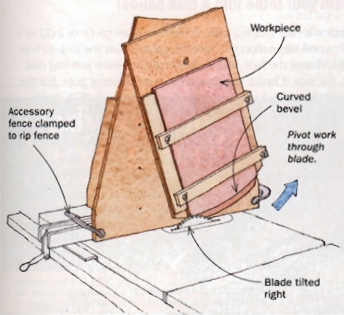
I do not have a planer or jointer, and most of my projects start with rough lumber. This means I do lots of handplaning across the grain to set the initial stock thickness. The problem with cross-grain planing is that the typical benchdog setup holds the stock firmly when you are planing with the grain, but allows the stock to slip out of the dogs when you plane across the grain.

To deal with this problem, I altered a pair of wooden benchdogs by cutting a V-groove along their length. I can clamp the board between dogs in the traditional way and at the same time have stops behind the long edge that allow me to plane across the grain.

—ALEJANDRO BALBIS, Longueuil, Que., Canada



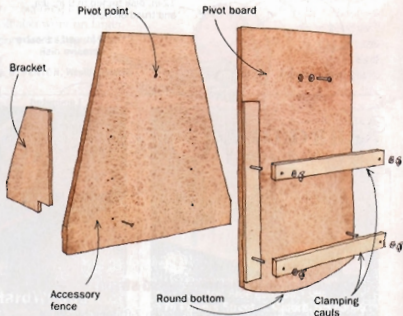
Another way to bevel curved panels



Here is an alternative to the jig Geoffrey Carson constructed for his article "Curved Bevels Made Easy" (*FWW* #217). My jig is easier to make and use, and is adjustable. It pivots the stock and allows you to make continuous curved beveled panels that require little sanding, rather than segmented ones.

Note the direction your blade tilts. If it tilts to the right, the jig will look like the one in the drawing. If it tilts to the left, it will be a mirror image and attach to the left side of the fence.

First, build a tall accessory fence from $\frac{3}{4}$ -in. plywood or MDF. To stabilize the jig, add brackets to the back that straddle the rip fence. For a one-time-use jig, measure from the bottom and mark the center of the radius of the arc you wish to bevel and drill a $\frac{1}{4}$ -in. bolt hole. Drill a matching counterbored hole in another board (the pivot board) whose bottom end has been



rounded an inch short on the bandsaw. Join the two boards with a carriage bolt, washer, and nut. Tighten the nut until the boards mate, but can still pivot. Add a side stop and clamping cauls to the pivot board to position and hold the work securely.

You can make the jig adjustable for different radii by making a series of matching holes in both boards spaced along the vertical axis, or you can add a sliding pivot strip to each piece.

Before using the jig, cut the workpiece to size and round the end to the desired radius. Now clamp the beveling jig to the saw's rip fence so the pivot is centered over the blade arbor. Set the blade height and tilt and the fence spacing. Swing the pivot board toward you and away from the blade arc and clamp the work to it. Finally, carefully pivot the work through the blade.

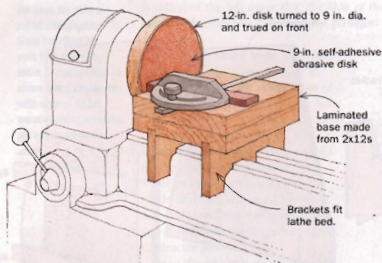
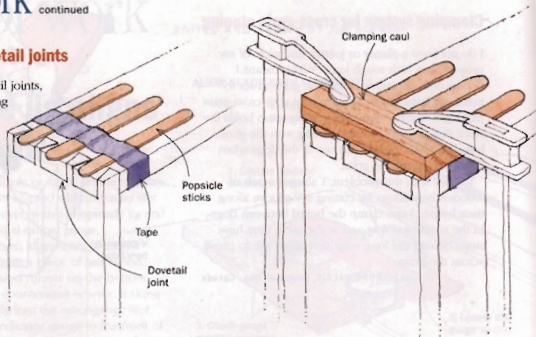
—ALAN SHAFFTER, Washington, N.C.

Extra clamp pressure for dovetail joints

When assembling my hand-cut dovetail joints, I like to leave the pins just a touch long and trim them flush later. But this makes it difficult to clamp the joint. Here's a solution.

Center a Popsicle stick or tongue depressor over each tail. Use two sticks spaced out if you have wide tails, or feel free to make custom sticks. Tape them in place. Now clamp up the joint using regular flat cauls. The thin sticks will direct the clamping pressure just where it is needed.

—LARRY CLUCHEY,
Neustadt, Ont., Canada



Turn your lathe into a disk sander

Start with the sanding disk. Mount a square piece of 2x12 or a plywood lamination to a steel faceplate. Turn the disk to 9-in. dia., flatten the face, and mount a self-adhesive sanding disk to the face. I make up several disks in different grits. For the multiple disks, I use 3-in. steel faceplates from W.B. Noble (wb-noble.com), which are large nuts welded to 3-in. washers.

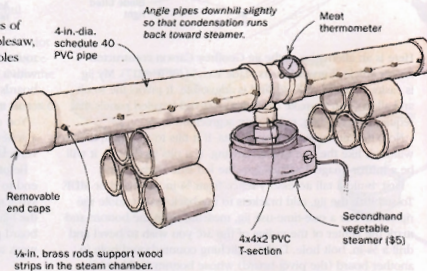
To make the base, laminate two pieces of 2x12. The length is based on the size of your lathe and your preference. Mine is 9 in. wide by 13 in. long by 3 in. tall. Cut two $\frac{3}{4}$ -in. grooves on the bottom (for the plywood brackets) and one on the top (for a miter gauge). Glue up the brackets to the base while on the lathe bed to make sure everything is aligned.

—BRUCE BARNETT, Troy, N.Y.

Simple steamer for bending wood strips

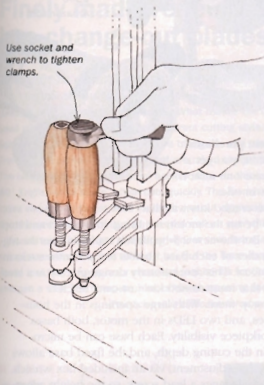
I made this inexpensive steamer out of two 2-ft.-long pieces of PVC drain pipe. Lightly score the pipe lengthwise on a tablesaw, and use the mark as a guide to drill $\frac{1}{16}$ -in.-dia. through-holes 5 in. apart, leaving about 2 in. on each end for fittings. Slide brass rods through the holes. To keep them from sliding out, I placed clear plastic tubing (Amazon.com) over each end. Glue each pipe into a T-joint using PVC cement. Tip the ends of the pipes up slightly so that condensation will run back to the steamer. Drill a hole in the T-section for a meat thermometer you'll use to verify the temperature, making the hole a bit oversize to allow some steam to escape. Slide on the end caps, and fill the steamer with water. In 15 minutes, you'll have 200° steam. With this setup, I've bent stock up to $\frac{3}{4}$ in. thick by $2\frac{1}{2}$ in. wide.

—DONNIE FAUBER, Staunton, Va.



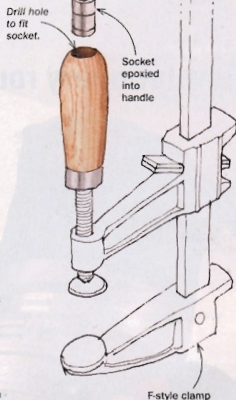
Tighten clamps in close quarters

Use socket and wrench to tighten clamps.



You can make it easier to tighten F-style or hand-screw clamps with this simple modification. Drill a hole in the end of the wooden handle to fit a 1/4-in. drive socket. A 3/16-in. socket is a good choice because most of the time it is the smallest socket that is a full cylinder (individual sockets are available for less than \$2 at many suppliers including Boston Industrial Tools). Epoxy the socket in place. You can now use a 1/4-in. nut driver or a 1/4-in. ratchet to tighten the clamp. This setup is especially handy when you need lots of clamps spaced close together, such as when clamping an edge to a tabletop or a workpiece to a bending form. This same idea will also work on larger bar clamps. Just use a larger 3/8-in. socket.

—DARRYL D. FENTON, Wasilla, Alaska



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■ POWER TOOLS

Revolutionary router kit



Trigger magic. By wiring both bases, Bosch puts the trigger at your fingertips. Other combo kits put the on-off switch on the motor, forcing you to let go with one hand to reach it.

Circle 109 on Reader Service Card

ROUTER COMBO KIT

A is one of the most versatile, economical equipment purchases a woodworker can make. With it, you get a plunge base and a fixed base that share one motor. It's like having two routers in one.

One of the downsides to combo kits was that the on/off switch had to be on the motor, requiring you to start and stop the router one-handed. But the new 2.3-hp Bosch router kit has the trigger switches in the handles of each base, thanks to connector tracks in the base and on the motor. This revolutionary design gives you a level of control and safety that most combo kits just can't reach.

Innovation didn't stop there. With large openings in the housings, clear sub bases, and two LEDs in the motor, both bases offer excellent workpiece visibility. Each base can be micro-adjusted to dial in the cutting depth, and the fixed base allows for above-the-table adjustment, via an included hex wrench.

The wrench engages a lead screw, so the height adjustment is straight up and down, ensuring accuracy.

Bosch even includes a set of extralong screws to mount the fixed base to a table.

The depth adjustment and zero system on the plunge base are simple to set. In addition to the fixed step turrets, this model features a pair of adjustable steps, which increase the accuracy and versatility of the depth stops.

In use, the router is well balanced, with comfy handles on each base that help ease maneuverability. The variable-speed, soft-start motor (15 amps) had plenty of power to shape thick hardwood (I used white oak for the test cuts) with very little vibration, leaving excellent cuts.

Switching out bases takes just 6 seconds. And each base accepts optional dust-extraction shrouds and edge guides, as well as Bosch's proprietary guide-bushing system. The router comes with 1/4-in. and 1/2-in. collets and requires two wrenches to change bits.

Finally, the router has a long (10-ft.) power cord with a nifty ball-and-socket swivel where it attaches to the motor. The design makes it easier to maneuver the tool and reduces strain on the cord.

I'm a hard-core router guy, and I give this Bosch router kit two thumbs up.

—Gregory Paolini, furniture maker, bas an addition to routers.



Bosch Combination Router Kit
Model No. MRC23EVSX
\$300
Amazon.com



■ HAND TOOLS

Finely made veneer saw has change-out blades

GRAMERCY TOOLS' NEW VENEER SAW is a different take on the traditional French-style veneer saw. Like that one, its curved blade—beveled on one side—can be used with either hand in conjunction with a wooden straightedge. What makes the Gramercy tool different is that it can be used with different blades to suit different cutting styles. I tried three blades: 60° and 90° English-style blades (where the teeth are triangular and can cut in both directions) and a bi-directional French-tooth pattern, with teeth that are raked toward the center from each end of the blade. The blades attach to a stiff steel backer plate via three screws. I'd recommend starting with the 60° English-style blade, which cuts quickly. The French blade, with its bi-directional cutting action, takes some time to get used to, but it can cut aggressively or not, depending upon how you position the saw while cutting, and it works well on everything from fragile burls to thicker veneers.

You certainly could get a cheaper veneer saw. Being a practical value hunter, I don't mind buying a less-expensive saw and tuning it up. But the Gramercy veneer saw is a well-engineered, finely made tool that comes razor sharp—a real bonus for those who don't have the tools or desire to sharpen a saw. The company also offers sharpening services.

—Paul Schürch is a woodworker who specializes in marquetry (schurchwoodwork.com).



Gramercy Tools veneer saw

\$90 (additional blades, \$30 each)
Toolsforworkingwood.com



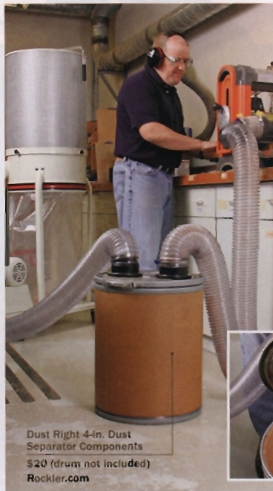
French curve. Gramercy Tools' veneer saw can be used with either hand, in either direction.

■ DUST COLLECTION

\$60 separator improves any dust collector

WHEN I BOUGHT A SINGLE-STAGE dust collector last year, it was a step toward a cleaner shop and lungs. But the system wasn't as efficient as I wanted. The collection bag filled fast, and I cringed every time I heard a chip bang the impeller.

The solution was a pair of Rockler's 4-in. dust separator components and a fiberboard drum (\$38 at [amazon](http://amazon.com)



Dust Right 4-in. Dust Separator Components
\$20 (drum not included)
Rockler.com

.com). The two sections are threaded through the drum lid and oriented to create a cyclone inside the drum.

I took a blue-collar approach to check whether the separator container worked. I cleaned out the bag on my dust collector and then planed and sawed some boards with the machines hooked up to the system. After I was finished, the collector bag had barely a layer of material at the bottom, while most of the debris had landed in the drum. This setup will reduce the times I have to empty the dust collector's bag, protect the impeller from impact, and more importantly, prevent the filter from clogging, which ultimately increases airflow and aids collection.

—Tom McKenna is senior editor.



Simple assembly. Each two-part section is threaded through the lid and oriented to create a cyclone effect in the drum.



It's in the drum, not the bag. Most of the debris lands in the drum, keeping it out of the filter, where it impedes airflow.

■ MACHINES

Benchtop mortiser has lots of power and toolless adjustments

TO TEST THE GENERAL INTERNATIONAL mortiser's mettle, I used the 1/2-in. chisel to plunge a bunch of 1 1/2-in.-deep mortises in both softwoods and hardwoods. Then I used the other three included chisels for the same test. The machine had no problem with these jobs, and revealed a host of user-friendly features.

Large openings in the head casting on both sides of the drill chuck make it easy to use a standard-length chuck key for bit changes. The table is large and expands even more with slide-out extensions. The cast-iron fence adjusts smoothly. However, one spacer between the bottom of the fence and the T-slot nut was just a hair too thick, preventing the bolt from locking securely. The fix was easy. A few licks with a file thinned the spacer enough to get adequate clamping with the lever handles. Two rubber rollers hold stock securely against the fence while allowing it to be moved sideways.



General International 1/2-in. hollow-chisel mortiser

Model No. 75-040 MI

\$400

For local dealers, visit general.ca

Motor: 6 amps, 1/2 hp, 1,720 rpm

Bits included: 1/4 in., 3/8 in., 1/2 in., and 5/8 in.

Max. chisel stroke: 5 in.

Drill chuck runout: 0.035 in.

Chisel runout: less than 0.010 in. front to back; less than 0.005 in. side to side

Table size: 11 1/4 in. deep by 14 1/4 in. wide (32 3/4 in. with wings open)

Weight: 99 lb.

What's really cool about the mortiser is that most operations are tool-free. The chisel holder, the fence, the side covers, the stops, and the hold downs all have easy-to-grasp knobs for simple and secure operation.

I had one concern about this tool: The drill chuck runout really rattled the bits in the chisel. However, because these aren't precision drilling machines, the runout didn't compromise performance.

The General International mortiser is a good buy. It cuts fast and accurate mortises, and all the stops and hold-downs do their jobs without moving or shifting.

—Roland Johnson, an admitted tool geek, is a contributing editor.

■ ACCESSORIES

Thin benchtop mat prevents shop rash

SOMEHOW BETWEEN PLANING, SANDING, assembly, finishing, and installing hardware, projects always seem to pick up nicks and dings. "Shop rash," some of us call it. And Rockler has the solution. It is a simple mat, made of recycled rubber, with the perfect consistency for assembly and dry-fitting: soft enough to protect wood surfaces but firm enough that the hits from my dead-blow mallet can do their job. At 24 in. by 60 in., it covers the top of most benches. Funny how a thin rubber mat was the tool I was missing.

—Asa Christiana is editor of F&W.



Pound away. The bench mat will protect your work from dings and dents.

Recycled Rubber Bench Mat

\$43

Rockler.com

■ MEASURING

Best setup tool we've seen

THE BETTERLEY UNA-GAUGE is a multipurpose measuring device that can help any woodworker set up machines accurately and simply. The gauge comes with a variety of attachments that can be arranged in dozens of different configurations, allowing it to handle a variety of setup and alignment tasks around the shop.

The legs of the gauge have rare-earth magnets on the bottom and locating notches for a cross bar that supports a dial indicator. In that configuration, the gauge is used to measure blade and bit heights. With the support bar in its lowest position, you can use the gauge to measure runout on the tablesaw arbor shaft flange.

The legs also can be placed toward one end of the bar for cantilevering the indicator over an opening or onto an



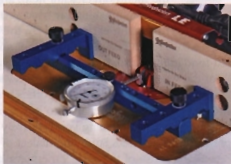
Betterley Una-Gauge
\$200
Rockler.com

Shape-shifting setup gauge. The Una-Gauge comes with a miter-slot attachment that makes it easy to check whether the tablesaw blade is parallel to the miter slots (left). The gauge also is adept at verifying bit height and projection from the fence (below), say for rabbets.

adjoining surface. A good example is setting jointer knives and then checking that the tables are coplanar at the throat. The gauge also can measure runout of spindles, collets, and drill chucks, and check blade and fence parallelism.

This is a must-have tool for machine setups (Betterleytools.com).

—R.J.



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The language of the lumberyard

BY STEVE SCOTT

Buying wood at a lumberyard is like ordering dinner in a French restaurant. For the unprepared, the choices are confusing, the menu offers scant help, and the waiter speaks a foreign language. Asking for what you want can be an intimidating and frustrating experience. On the other hand, the offerings in a French restaurant are richer and more varied than the average fast-food joint. Master a few key phrases, and you can eat like a king.

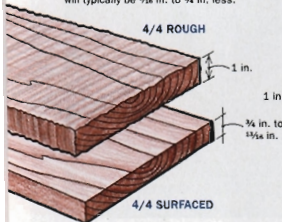
For the woodworker who usually buys stock from the home center, the lumberyard or hardwood retailer offers a similar step up in quality and variety. It gives you the chance to buy roughsawn stock and mill it to dimension yourself, freeing you creatively from the standard thicknesses of pre-surfaced material. Study the dialect of the lumberyard and you'll soon be making sense of the wide variety available there, choosing wisely and dealing confidently with the host (the person driving the forklift).

What follows is a kind of English-to-lumberyard phrase book. Study it and take it with you on your next trip to buy wood.

How it's measured

WHEN AN INCH ISN'T AN INCH

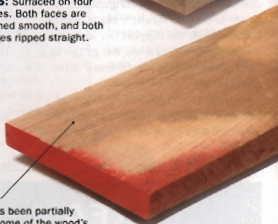
Lumberyards measure a roughsawn board's thickness in $\frac{1}{4}$ -in. increments, so $\frac{4}{4}$ (four-quarter) stock is 1 in. thick, $\frac{5}{4}$ stock is 1 in. thick, and so on. If your project calls for finished pieces 1 in. thick, you'll want to buy $\frac{5}{4}$ roughsawn stock to allow for losses as you mill them smooth. When you buy boards that have already been surfaced, the stated thickness will match the board's original roughsawn thickness. The actual thickness will typically be $\frac{1}{8}$ in. to $\frac{1}{4}$ in. less.



Roughsawn: Planks that haven't been squared or smoothed, and are still hatch-marked by the large blades at the sawmill.



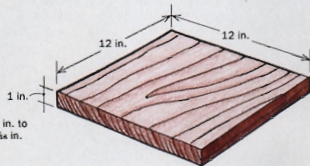
S4S: Surfaced on four sides. Both faces are planed smooth, and both edges ripped straight.



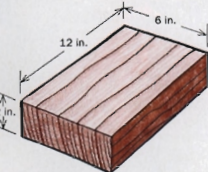
Skip-planed: A board that has been partially planed on one side to reveal some of the wood's grain and color underneath the roughsawn mill marks. Also called hit-and-miss planing.

WHEN A FOOT ISN'T A FOOT

Lumberyard operators say one of the biggest challenges new customers face is in understanding the **board foot**—the basic unit of measurement for roughsawn stock. The board foot (144 cubic in.) is confusing because it measures a board's volume, not its length. This means that a piece of stock 1 ft. long can contain more than 1 board foot of material. A good visual way to understand 1 board foot is to picture a board 1 in. thick by 12 in. wide and 12 in. long. Add an inch to the board's thickness, and you now have 2 board feet. To calculate a plank's board footage, multiply its thickness by its length and width (all in inches) and divide the result by 144. In contrast, surfaced lumber is typically sold by the linear foot, a simple measurement of a board's length. The price per foot will vary according to the board's width and thickness.



12 in. x 12 in. x 1 in. = 144 cu. in.
144 cu. in. = 1 board foot

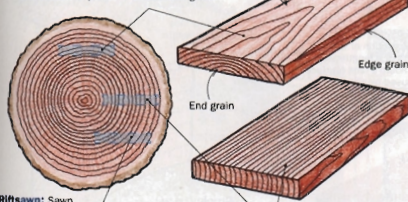


12 in. x 6 in. x 2 in. = 144 cu. in.
144 cu. in. = 1 board foot

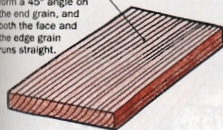
One board, many woods

A single log contains different types of wood, with very different properties and appearance, depending on how it is cut.

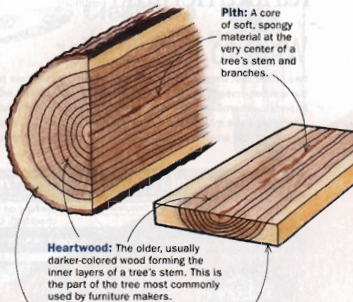
Plainsawn: Planks sawn at a tangent to the curve of the log, so that the growth rings run in a shallow curve across the end grain and form cathedral patterns on the face grain.



Riftsawn: Sawn so the growth rings form a 45° angle on the end grain, and both the face and the edge grain runs straight.



Quartersawn: Sawn at a radius to the circle of the log, so that the growth rings run vertically across the end grain and straight down the length of the board. Shrinks and expands the least.



Early and late wood: A tree's annual growth takes place in two distinct stages that leave their mark on the wood the tree produces. The early season growth of an individual growth ring is called early wood, and typically is made by cells that are larger and less dense than the late wood. The visible difference between the two is more pronounced in some species than in others.



Hardwood lumber grades

Established by the National Hardwood Lumber Association, these grades are based on the percentage of clear wood, or wood that is free from certain defects like checks, knots, pitch pockets, and sticker stain (see description, opposite). The upper grades yield clear pieces that are longer and wider than those from the lower grades. Naturally, they also cost more. It's not crucial to memorize all the rules, but it helps to know which grades yield larger clear boards versus smaller ones. Knowing the lumber grades can help you figure out which pile to sort through, whether you need smaller stock for, say, a wall-hung cabinet, or larger, clear boards for a dining table.

FAS: At least 6 in. wide and 8 ft. long

FAS (First and Second): Boards must be at least 6 in. wide and 8 ft. long, and each must yield clear pieces totalling 83% of the board's face. The clear pieces must be at least 3 in. wide by 7 ft. or 4 in. wide by 5 ft. Both faces of the board must meet these requirements to be graded FAS.

F1F (FAS One Face): A step down from FAS, in which the board's better face must meet all the FAS requirements and the opposite face must meet the standards for No. 1 common.

Selects: Essentially the same as F1F except that the minimum overall board size is reduced to 4 in. wide and 6 ft. long.

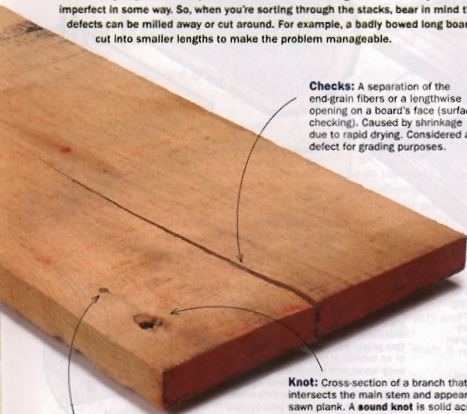
No. 1 Common: Sometimes called cabinet grade. Boards must be at least 3 in. wide and 4 ft. long, with clear pieces totalling between 66% and 83% of the board's face. The clear boards must be at least 3 in. wide by 3 ft. long or 4 in. wide by 2 ft. long. Both faces must meet these requirements to be graded No. 1 Common.

No. 2A Common: Sometimes called economy grade. Overall size requirements are the same as for No. 1 Common, but the clear cuttings need only total 50% of the original face. If either face of a board is graded as No. 2A, then the board's grade is 2A, regardless of the opposite face.



What to look out for

One of the best ways to ensure flat, square stock is to leave bad boards at the lumberyard. But a little perspective is important because, nature being what it is, every board is imperfect in some way. So, when you're sorting through the stacks, bear in mind that many defects can be milled away or cut around. For example, a badly bowed long board can be cut into smaller lengths to make the problem manageable.



Pin-knot: A sound knot with a diameter not more than $\frac{1}{4}$ in.

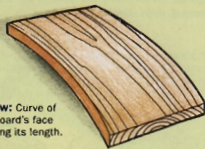
Checks: A separation of the end-grain fibers or a lengthwise opening on a board's face (surface checking). Caused by shrinkage due to rapid drying. Considered a defect for grading purposes.

Knot: Cross-section of a branch that intersects the main stem and appears in a sawn plank. A **sound knot** is solid across its face and as hard as the surrounding wood. Knots are considered defects for grading purposes.

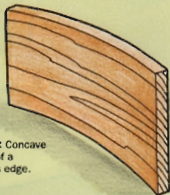
Sticker stain: A mark left on the board from a sticker, a board inserted between layers of stacked lumber for air circulation. If the stain can't be removed by milling, it's considered a defect.

Wane: Bark or the lack of wood at a board's edge caused by the round edge of the log. A defect, for grading purposes.

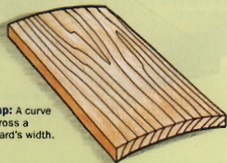
Every warp has a name



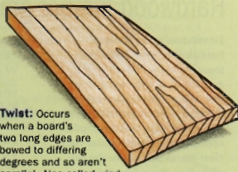
Bow: Curve of a board's face along its length.



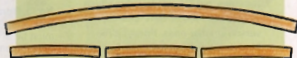
Crook: Concave curve of a board's edge.



Cup: A curve across a board's width.



Twist: Occurs when a board's two long edges are bowed to differing degrees and so aren't parallel. Also called wind (rhymes with mind).



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4 chisel tricks

BY PHILIP C. LOWE

It is often faster to make do with the tool in hand than to hunt for the perfect one and check that it is sharp and adjusted correctly. That's why I do so many things with a normal, flat bench chisel. Just a handle and a blade, the chisel is an uncomplicated tool, but wonderfully versatile, capable of both rough and refined work. Chisels are also fast and efficient.

I always have a one or two within reach. Here is why.

Quick chamfers

I chamfer the ends of tenons so they fit into their mortises more easily, and no tool does this faster than a chisel.

However, if you cut a 45° chamfer by pushing the chisel straight across the width of the tenon, you'll leave behind a rough surface and most likely will blow out the far edge. To avoid those problems, lower the handle of the chisel so that the cutting edge is skewed as it makes the cut. Then, as you reach the far edge of the tenon, slide the chisel up to cut with the grain rather than across it. That

Chamfer a tenon

Tenons fit into mortises more easily if their ends are chamfered. The quickest way to do that is with a chisel.



Skew the blade. The lower effective cutting angle produces a smoother surface (top). Lowe typically skews the chisel 45° for most woods, but goes as high as 75° or 80° on difficult woods. As he reaches the end of the tenon (above), he pushes the chisel upward to cut with the grain and avoid tearout.



Pop a chamfer on the end. After placing the chisel edge on the narrow end of the tenon, a quick hit on the handle is all it takes to form the chamfer.

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Trim a tenon

Lowe uses a chisel to quickly pare the cheeks and shoulders after sawing them close. The chisel's edge fits neatly into the scribed layout lines. He works across the grain, because if you work with the grain, the chisel dives and rises with it and the cheek goes out of square. Later, when he's ready to do the final fitting, he grabs his shoulder plane.

Start in the scribe line.
The one on the edge controls the depth of cut and the one on the end grain keeps the chisel cutting straight, resulting in a tenon with parallel cheeks perpendicular to the shoulders.



The first cut takes you halfway. Stop there, so you don't blow out the other side.



The second cut finishes the job. Turn the workpiece around and come in from the other edge, meeting the first cut in the middle.



For shoulders, work perpendicular to the tenon. Put the chisel in the scribed shoulder line and start with a narrow cut, about 1/4 in. wide.



One cut guides the next. Place the flat chisel back on the first cut, at an angle to the face of the workpiece, and then straighten the chisel as you push the blade into the waste.

TIP

ANGLED TENONS NEED A DIFFERENT APPROACH

On the high side, cut across the grain to avoid tearout, but on the low side, pare toward the tenon.



prevents tearout as the chisel leaves the cut. The edges of the tenon are a cinch. With the workpiece clamped vertically in a vise, come from beneath, so you're cutting with the grain. Skew the chisel slightly and give it a quick, firm pop with the palm of your hand.

Cut layout lines for precise paring

Nothing is faster at paring tenon cheeks and shoulders down to the layout lines than a chisel. From there, you can do the final fitting with a shoulder plane. Here's how I get it done.

First, I lay out the tenon with cutting tools: a marking knife for the shoulders and a cutting gauge for the cheeks. The crisp cut lines left behind in the wood become the perfect guides for your chisel.

Mortise a hinge

A hinge mortise needs to be a tight fit, but two chisels can handle the entire job quickly. For chopping, use one that is slightly wider than the mortise, and for paring, use one with a width that's less than the mortise's length. Remove most of the waste quickly—and in a controlled manner—with angled cuts, and then pare to the layout lines.

Get started with a perpendicular chop. Stay about 1/8 in. from each end of the layout lines.



I remove the bulk of the waste with a saw, leaving about 1/2 in. for paring, so little that it won't force the chisel into the cheek or shoulder.

For the cheeks, I use the layout lines on the edges and end grain. The bevel goes into the line on the edge and is guided by the one on the end grain. I also use two cuts to pare a cheek, working from both edges into the middle to avoid blowing out the edge grain.

I've found it easier and more accurate to pare the shoulders if I work perpendicular to the tenon cheek. I start by paring just a narrow strip on the edge of the shoulder, about 1/8 in. wide. I then use that strip as a guide for my next cut by resting the corner of the bevel on it, which puts the chisel at an angle to the tenon. As I straighten the chisel, I push it into the cut and down to the tenon. I repeat that process across the width of



Then work from an angle. Lowe holds the chisel at 45° with the bevel up. Strike the handle with a mallet, but use quick, controlled taps.



Clear the chips with a single swipe. Keep the chisel flat on the workpiece all the way through.



Clean up the bottom. Again, the scribe line is your friend. Put the bevel in the line and push in. Last, chop the ends right at the scribe line, and clean up those corners.

the shoulder and end up with a shoulder that's even across its width and pared precisely to the layout line.

Angle the chisel to control chopping cuts

Mortising for a hinge involves two chisel techniques: paring and chopping. I lay out the mortise like I do a tenon, with a marking knife and cutting gauge, so I can use the layout lines to guide my chisel during paring. But first, I have to remove the waste from the mortise, which I do by chopping it with a bench chisel.

The hardest part of chopping is controlling how deeply the chisel cuts with every strike from a mallet. The best way to do that is by angling the chisel 45°. Here's how that works for a hinge mortise.

After laying out the mortise, I make a cut at both ends with the chisel perpendicular to the workpiece. Then, starting at one

Shape curved parts

Refining the shape of a cabriole leg can be a time-consuming affair. Lowe speeds up the job by using a chisel to remove most of the waste.



Start with layout lines. Lowe draws a center-line and two quarter lines on all four faces, so he'll know how much material to remove.

end, I make a series of "feather" cuts with the chisel angled at 45°. Angling the chisel prevents it from chasing the grain and cutting too deeply. Also, when the blade reaches the previous cut, it stops and won't cut any deeper. After reaching the other end of the mortise, I lay the chisel flat on the workpiece and pull it back across the cuts I've just made. Because the cuts were angled, there is very little material left holding the waste in place, and they come out easily. You're left with a mortise that is almost the exact depth required. To clean it up, just pare using the layout lines to guide the chisel.

Go bevel down on concave curves

As a period furniture maker, I've made a lot of cabriole legs. I've found that a chisel is the quickest way to go from the rough bandsawn shape to one that can be refined with a spokeshave.

As there are both concave and convex curves on a cabriole leg, there are two chisel techniques to use. For concave curves, use the chisel with the bevel down, so you follow its contours and keep the handle out of the way. Also, always work downhill, taking short "shoveling" cuts. That prevents the chisel from cutting too deeply and gives you better control.

Turn the chisel over, with the bevel up, for convex surfaces. By having the flat of the chisel on the work surface, you'll be able to cut facets as you work your way toward the rounded shape. □

Philip Lowe is director of The Furniture Institute of Massachusetts.



Go bevel down on concave surfaces. Like the short sole of a spokeshave, the bevel has no trouble following the curve.



Stay in control with short cuts. They prevent the chisel from cutting too deeply and causing tearout.



It's bevel up for convex curves. This enables you to make faceted cuts more easily.



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Beautify Your Home with a Shaker Built-in

Build it in place, and the work goes surprisingly quickly

BY CHRISTIAN BECKSVOORT

I've grown used to the pleasure of working solid wood at the workbench, so it takes some persuasion to get me to leave the shop, haul sheets of plywood, and get on my knees to scribe along crooked walls. But in my younger days, I built my fair share of kitchen cabinets, commercial fixtures, and built-ins. And recently, my most discerning client, my wife, convinced me that we needed a built-in. So out of the shop I went.

Early homes tended to lack closets and storage space, so wardrobes and built-ins were common. The Shakers added built-ins wherever possible and turned them into an art form. Most, if not all, the built-ins made by the Shakers were constructed in place. I did the same, except I used plywood partitions and shelves where the Shakers used solid pine (or poplar in the South). I used solid cherry for the face frames, doors, and drawers.

The best part of a built-in is its versatility. You can design it to function for your particular situation. Mine has a middle bottom section for drawers. The right bottom section has a closet rod, while the left bottom section has adjustable shelves.

In our case, the location was under a roof and knee wall next to a doorway. A lot of homes have areas where a slanted ceiling

makes the space unsuitable for almost anything else. I started with a rough sketch, consisting of three sections of doors and drawers that would be built in place into a single unit. This built-in navigates the knee wall, but the techniques and order of operations is exactly the same as for a straight built-in. The keys to success are keeping everything plumb and level and having a lot of patience while you go back and forth between the site and the shop.

Troubleshoot the site

The more sound, plumb, and level the location, the easier your built-in construction and installation will be. The first thing to do is survey the site. Note where the walls aren't plumb and the floors slope. If your walls and floors are old, warped, sloped, and out of square, then make leveling frames to fit the wall and the floor. Anything more than $\frac{1}{8}$ in. is too much out of whack and you should correct for it. It takes some time and patience to get things just right, but the effort will be repaid with an easier construction and a straight and square finished product.

Mark the locations of your wall studs and use a level and shims to make sure the frame is plumb and flat. A stack of cedar shingles



START IN THE SHOP

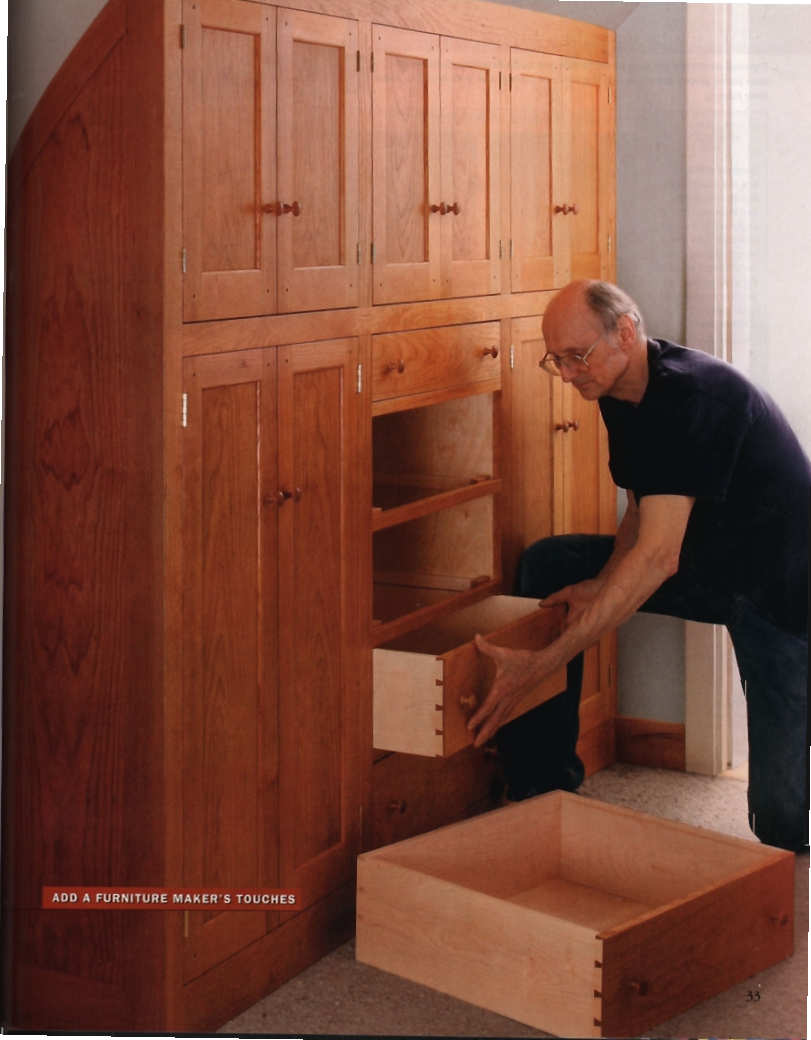
Assemble as much as possible in the shop (above) before moving on site (right). Then install it one piece at a time.



BUILD IT IN PLACE

Solid-wood face-frame pieces are nailed in place. Then inset doors and dovetailed drawers turn the cabinet into furniture.

Photos, except where noted: Anissa Kapalec; opposite page: Michael Pekovich



ADD A FURNITURE MAKER'S TOUCHES

ANATOMY OF A SHAKER BUILT-IN

Plywood partitions are easy to cut to size and quick to install. Solid-wood face frame pieces are scribed to the wall and ceiling, and then dry-fit to mark their joinery.

PLYWOOD MAKES FOR QUICK CONSTRUCTION

Vertical dividers are the backbone. Rip them to width, and then cut the 45° angle at the top using a circular saw and a simple cutting guide (left). Ledger strips are the connectors. Secure them to the same measurement on all the dividers (right).



Frame for a flat, level wall

Outer stiles, 1/4 in. thick by 2 1/2 in. wide, scribed to fit wall

Top rail, 1/4 in. thick by 3 1/2 in. wide

DETAIL

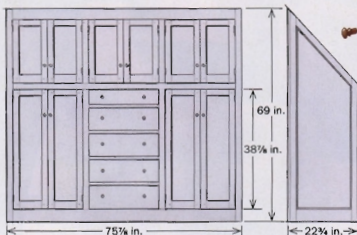
All door-frame parts are 1/4 in. thick; stiles and top rails are 2 in. wide.

Flat panel

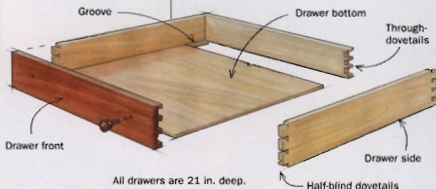
Bottom rails are 2 1/4 in. wide.

1/4-in. quarter-round molding

Bottom rail, 1/4 in. thick by 4 in. wide



DETAIL

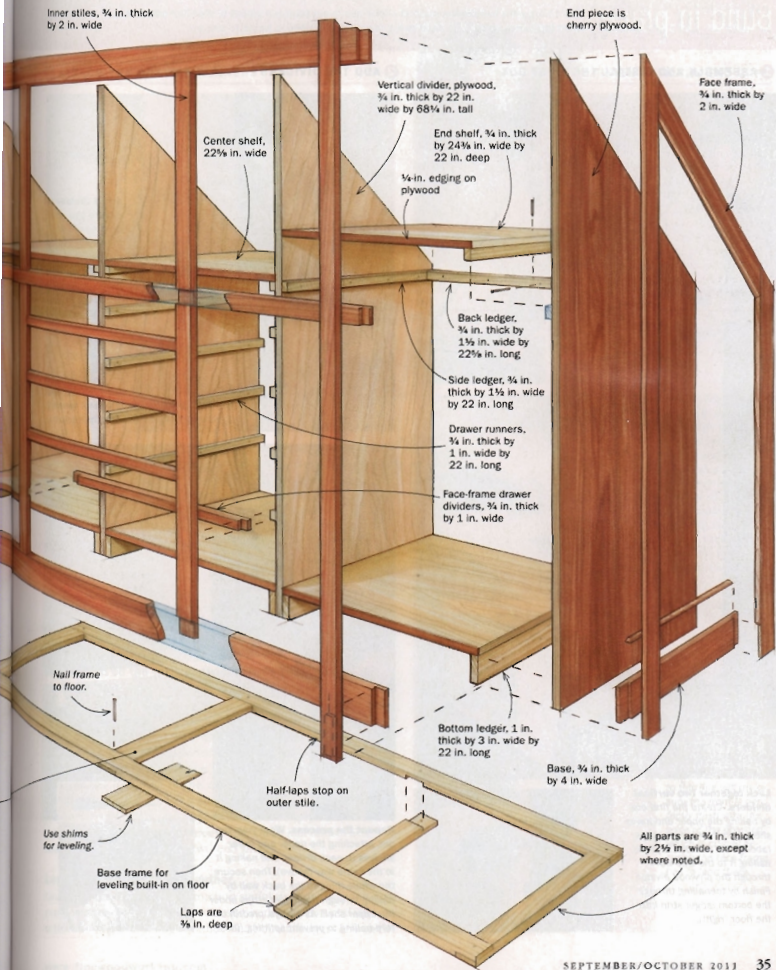


All drawers are 21 in. deep.

START LEVEL AND SQUARE



Create a foundation. To correct for wavy walls or crooked floors, make quick and easy frames out of cheap 1x3 furring strips. Shim behind or under the frames to create flat, level, and plumb surfaces for the built-in.



Build in place

This smart, easy installation method allows you to cut separate pieces in the shop and lock them into place on site. No need to lug cumbersome plywood boxes to and fro.

1 ASSEMBLE AND INSTALL THE FIRST BOX



Lock together two vertical dividers. Create the first box by nailing the upper and lower shelves to their ledger strips (above). Set this box in place, nailing it to the side wall through the plywood divider. Finish by toenailing through the bottom ledger strip into the floor (right).



2 ADD THE DIVIDERS



Add a divider to create the next box. Again, nail the shelves to the ledger strips to hold it all together. As with the first box, the final step is to toenail through the bottom ledger strip into the floor.



Repeat the process. Work your way out, attaching the upper and lower shelves to each divider, and nailing it in the same way (above). Then secure the whole thing to the back wall by nailing through the ledger strips under the upper shelf. As always, predrill before nailing to prevent splitting (Inset).



3 ATTACH THE DRAWER RUNNERS



Spacer keeps them aligned. Rest the drawer runners on a simple spacing template as you nail them in place.

and a box of screws will allow you to shim those areas not making contact with the frame, all the while checking with the level. The same applies to the frame on the floor: It needs to be flat, level, and at 90° to the wall. Again, shim and screw as needed. Remember, as you build the case you'll be toenailing the vertical dividers into the floor or floor frame, so you should strategically place the frame members to anticipate the locations of the dividers.

It's somewhat unconventional, but I installed my built-in over the carpeting. I prefer this to cutting out the carpet and padding under the built-in because cutting out a section and leaving the edges without a carpet strip holding them down could lead to buckling over time. The built-in is secured to the walls as well as the floor and the thin, firm carpet is a non-issue.

Get started on the vertical dividers

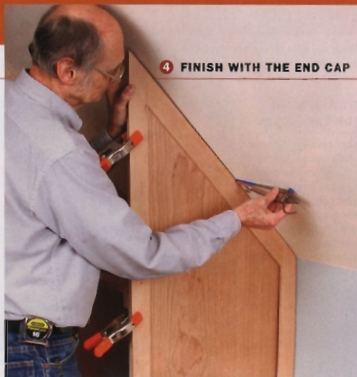
From my drawings, I knew I needed three sheets of 3/4-in. birch plywood for the three walls, fixed shelves, bottoms, and sliding shelves, and one sheet of cherry plywood for the visible exterior wall on the right. This wall will blend with all the solid-cherry door frames and the solid-cherry face frames.

I measured the height of the knee wall, located the wall studs, laid out the locations of the dividers, and drew the profile of the divider on the far left wall. With this information in hand, I returned to the shop and ripped the sheets of plywood in half. I cut one of the cherry and three of the birch half-sheets at 45° to make the two dividers and two end pieces.

Ledger strips keep it all together

Ledger strips make the construction straightforward, serving dual purposes: They give me a place to secure the bottoms and shelves, while locking everything together. The bottom ledgers rest on the

4 FINISH WITH THE END CAP



Scribe, fit, and glue it in place. To correct the small gaps on the end cap, Becksvoort runs a compass along the surface of the ceiling (above), transferring the undulations to the frame stock. Then he uses a block plane to shape the frame to that line (left).



Fit the front edge too. Once the wall side of the frame is profiled, set it in place and use the plywood divider to run a line along the back side of the end cap. Cutting to this line will make sure the front is perfectly flush with the edge of the plywood, which is crucial because the face frame has to land there.

Add the face frame

There are a lot of intersecting pieces to keep track of in this phase of the project. Becksvoort tacks all the pieces in place, marks them for location and joinery, cuts the joints, and then nails them on.

FIT AND MARK FOR THE JOINTS

After beveling the edge of the top rail, set the rail in place, making sure it is level. With a pencil on a block of wood, scribe along the ceiling onto the rail, and then trim to that line with a scrub plane or drawknife.



Work your way down. Starting with the top rail, tack the parts in place with brads as you go. Move on to the frame stiles and drawer dividers. Tack the stiles on top of the rails. The far right stile is flush with the end cap. The center two are flush with the inside walls of the center box, and the far left stile is flush with the wall and may need scribing. Slide the drawer dividers behind the stiles and clamp them to the drawer runners.

floor or leveling frame and support the bottoms of the cabinets, while the upper ones hold the fixed shelf at the top of the knee wall. You'll nail through the bottom ledgers and leveling frame to lock the built-in to the floor.

From the leftover plywood, I cut three bottoms and three fixed shelves. All six pieces got $\frac{1}{4}$ -in. cherry face strips glued to the front edge. On the undersides of the back of the three shelves, glued and screwed ledger strips, allowing exactly $\frac{7}{8}$ in. on both sides of the strip to leave room for the intersecting ledgers on the vertical dividers.

The installation begins with two types of frames

Although this is one large unit, I divided it in thirds and worked left to right, creating the first box and adding the shelf dividers to the box, then repeating the process for the next two sections.

With the entire unit firmly anchored to the floor and back wall, I moved on to the face frames, but only after installing the drawer runners, which are just strips of solid wood. I used a plywood spacer block to make sure they are level and even on both sides.

It's the cherry exterior and solid-wood face frames, doors, and drawer faces that give this large plywood box its beauty and handcrafted look. The face frames are scribed to fit exactly into position, they also blend the transition from the walls, floor, and ceilings to the built-in. The right side of my built-in is exposed, so I needed to build a face frame and apply it to the plywood there. I also needed face frames around the front of the boxes. These cover the plywood and frame the doors and drawers.

An end cap on the end panel—Back in the shop, I made a cherry frame to go on the outside of the cherry end panel. The back and top portions of the frame are $\frac{1}{4}$ in. wider, with a back bevel, to be scribed to the ceiling and knee wall. To mimic the moldings on the doors, the interior edges of the end frame have $\frac{1}{4}$ -in. quarter-round cherry moldings applied. While making up that molding, I routed and cut quarter-round moldings for all 10



Mark all the intersections. Use a square and a marking knife to mark the intersections where you'll cut the lap joints. On ending intersections there will be four tick marks, and on crossings there will be eight tick marks.

LAP JOINTS MAKE JOINERY SIMPLE



Saw and rout the lap joints. Becksvoort cuts the shoulders with a handsaw, and then uses a router to waste away the rest of the joint, working right up to the handsaw lines.



Assemble as much as possible in the shop. If you can move the frame to its location fully assembled, that's the best bet. But if low ceilings, staircases, and turning corridors prohibit that, assemble as much as you can in the shop and add the rest on site.

doors (see "Frame-and-Panel Doors Made Easier," *FWW* #218) yet to be built. When this end cap was built and scribed and planed to fit, I attached it. I glued the frame onto the end panel.

A real frame on the front—When the glue was dry on the end cap, I started on the face frames on the front edges of the built-in. These were milled to width and depth in the shop but left long. On site, I tacked them in place and marked them. The trick to a successful face frame is the order of operations and staying organized. Once everything is tacked in place, I make sure to mark the position of everything so I won't lose track of it.

With everything tacked in place, I used a sharp knife to make a tick mark where each member intersects, on both pieces. These tick marks indicate the locations of the lap joints. Then I took them back to the shop and cut the lap joints.

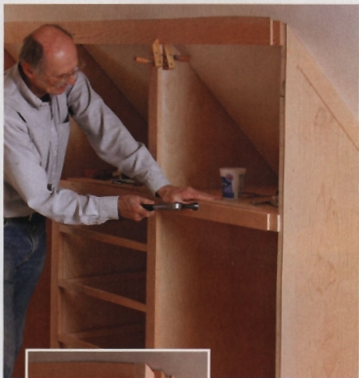
A versatile interior

After the built-in was constructed and before I finished it, I used a simple plywood jig to locate holes for shelf pegs, and drilled them with a cordless drill.

The last step is to make and fit the 10 doors and five drawers (see "Shaker Chest of Drawers," *FWW* #206). I make traditional dovetailed drawers and run them on wooden runners, not commercial slides. I kept the face frames flush to the sides of the middle section with the drawers so I wouldn't have to block out for the drawers. The frame-and-panel doors are mounted with standard butt hinges, but I mortised them into the doors only. The hinges are surface-mounted to the frames.

Once the drawers are made and fitted and the doors are made, fitted and hung, the entire piece can be finished. I used a mixture of Tried & True Varnish oil and spar varnish. □

Christian Becksvoort is a contributing editor.



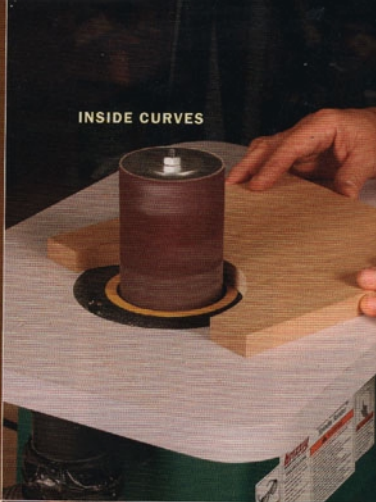
Nail the face frame in place. Rouse the nail holes from when you tacked up the frames. Start with any preassembled sections, and then add the individual pieces. Becksvoort fills the nail holes with a commercial putty (Wunderfil medium brown).

Why You Need a Benchtop Sander

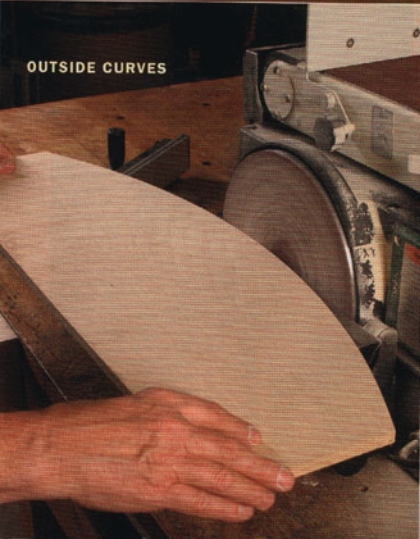
They tackle trimming
and smoothing quicker than
hand tools do—with no
sharpening required

BY ROLAND JOHNSON

INSIDE CURVES



OUTSIDE CURVES



FLUSH-TRIMMING



A benchtop sander will never be the star of the shop, but there are a handful of jobs that it handles better than any other tool. I'll reveal a few of these tasks here, but once you have a disk, belt, or spindle sander, you'll discover many more odd jobs for it—and soon you'll wonder how you got along without one or more of these units. What's more, many of these versatile machines can be had for around \$100 to \$450.

There are a lot of benchtop sanding machines out there, but I'll focus on the types best suited to furniture makers: disk sanders, combination belt-disk sanders, and oscillating spindle sanders. These tools will have even more appeal to those who favor power tools over hand tools, as the sanders can step in to do jobs normally reserved for rasps, files, spokeshaves, and handplanes.

But remember that these machines are not the last word on surface prep. They all are very aggressive, and any surface that will be visible will require some final hand-sanding to perfect it. Also, these sanders require a light touch, or you risk sanding over the line—quickly and deeply.

Last, these sanders spew lots of fine dust, even when connected to a dust collector or shop vacuum. That means you need to wear a high-quality dust mask when using these machines.

Now let's take a look at the most basic of the bunch, disk sanders.

Disk sanders: Useful, but limited

Most disk sanders come with a 12-in.-dia. disk, a table to support the workpiece, and a miter gauge. This sander is very adept at shaping or trimming end grain, like when you need to take a bit off the end of a tenon—a job normally reserved for a sharp handplane—or when you need to quickly chamfer the ends of a tenon or dowel.

Disk sanders also can be used to clean up and fair convex curves on templates to create a perfect path for a router to follow. The downward sanding motion is your friend here, making it easy to control the workpiece. You also can use this machine to smooth handsawn convex curves on actual furniture parts, but because the disk cuts across the workpiece, you'll have obvious scratch marks to remove with a hand-sanding block.

The disk sander has its limits. It cannot sand inside a concave curve and it's not great for sanding long, straight edges. The big problem there is that the disk cuts in two directions along the support table, up off the table on the right side and down on the left, making it hard to control the workpiece and to use the full face of the disk. Also, very small parts can be tough to shape, because they can be grabbed and pulled into the gap between



Disk sander ROUGH AND READY

Disk sanders are capable of trimming parts and smoothing templates in a jiffy. But their PSA-backed disks can be tough to remove, so it's best to keep a coarse grit on the disk and dedicate the tool to aggressive jobs.



Quick trim. A disk sander trims tenons quickly. Use the miter gauge to keep the workpiece square to the disk.



Different approach. With the miter gauge angled, you can chamfer dowels and through-tenons. Just use a light touch.

GETTING UNSTUCK



The PSA-backed sanding disks often require a fair amount of scraping to get the paper off, and leave a bit of residue behind. You can remove any adhesive residue with a solvent, such as naphtha.



Belt sander

WHO NEEDS A HANDPLANE?

With a combination belt-disk machine, you can keep an aggressive grit on the disk and use the belt sander for jobs that require you to sand through various grits, from 60 up to 220. With this tool you can handle almost any flush-trimming job, and more.



Some come with a disk. Along with a belt sander, a combination machine includes a disk for sanding curved templates and for trimming parts (see p. 41).

the table and disk. And disk changes can be a bear, because they all use PSA (pressure sensitive adhesive)-backed disks, which can be tough to remove. The disks also cannot be reused.

If you're interested in this type of machine, look for a model that has a 12-in. disk and a large table to support different-size workpieces. Expect to spend anywhere from \$150 to nearly \$400. A more economical and versatile approach may be to buy a combination belt-disk sander.

Belt-disk sanders: A versatile combination

Many woodworkers come up with creative ways to hold their handheld belt sander so they can take a workpiece to the belt. It's much more convenient to use a benchtop belt sander, and a combination belt-disk sander gives you two machines for the price of one. These sanders typically have either 6-in.- or 10-in.-dia. disks, with 4-in. by 36-in. or 6-in. by 48-in. belts, respectively, and come in a wide range of prices (from about \$150 to more than \$500), depending on the size of the belt and disk.

The belt increases the tool's versatility. It will flush-trim door and drawer parts quickly. It's also handy for boxmakers, making it easy to trim miter splines or dovetails flush. And it will chamfer dowels, refine door and drawer pulls, and facet the end of through-tenons in a flash. It can be used on outside, convex curves of course, but it can also reach into concave curves (see photos, opposite page). Be careful with small parts, as they can easily be grabbed and pulled into the gap between the belt and the table.

Although the disks are PSA-backed and harder to remove, the belts are easily changed, so it's easy to sand from rough to finer grits. Keep an aggressive grit on the disk and use the belt sander when you need to sand through various grits, from 60 up to 220. Again, these machines are

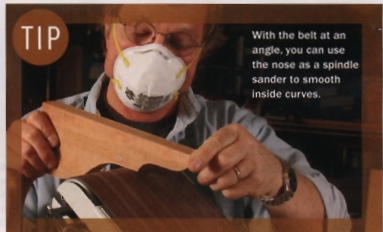
BELT CHANGES ARE A SNAP

You flip a tension lever to release the belt. Once you have the new belt on, re-tension the lever and then adjust the belt tracking so it remains centered.





Down or up. On many sanders, the belt can be used either horizontally or vertically. The horizontal position (left) is great for sanding long edges, such as for trimming door parts flush. For this job, use the support table to keep the piece square to the platen. Orient the belt vertically, and use the support table to sand small workpieces, like boxes (above).



TIP

With the belt at an angle, you can use the nose as a spindle sander to smooth inside curves.

Narrow-belt sanders are special-purpose tools



You can buy belt sanders with a narrow belt (1 in. to 2 in.) as stand-alone tools or as combination belt-disk sanders. These tools offer less-robust sanding options for furniture makers, but they can be handy in the shop for sanding complex scrollsawn profiles (without the platen). With the appropriate-grit belt, these machines also

can be used to sharpen turning tools, such as gouges, and for rough grinding tasks.



Spindle sander INSIDE CURVES AND MORE



Oscillating spindle sanders offer plenty of versatility in a small package. This is the best sander for inside curves and, if you add a shopmade fence, it works like a belt sander for straight runs.



aggressive, so use a light touch. And you'll still need to remove the sanding marks by hand, using finer grits.

The 6-in. belt width provides a 6-in. by 16-in. sanding surface at the platen; the sanding surface for the 4-in. belt is about 4 in. by 12 in. at the platen. Among these combination machines, I'd recommend buying the bigger belt and disk, which offers more sanding area and typically has larger tables and more mass, which helps reduce vibration.

Spindle sanders: Not just for curves

My first spindle sander was a drum-sanding kit that chucked into my drill press. Like the inverted belt-sander setup mentioned before, this worked fine in a pinch. But there's no easy



Match the spindle to the curve. Use larger spindles for smoother results on wide curves, like that on the base of this Shaker stool (above). Narrower spindles fit tighter curves, like the finger pull on this shop drawer (right).



TIP

You can extend the life of abrasives and get better performance with any of the sanders in this article by using a sanding-belt cleaning stick (\$5 to \$11).



NO-FUSS SLEEVE CHANGES



To change grits, loosen the nut and washer on top of the drum and remove the old sleeve. Then just slip on a new one and give the nut a twist, which expands the drum so it grabs the inside of the sleeve.





Outside curves, too. To avoid a lumpy surface on outside curves, pass the work across the spindle quickly with light pressure and long strokes, and have a definite line to sand to. With a tilting table, you can handle beveled edges, too.



Jig for straight edges. To smooth straight edges, clamp a shop-made fence, at least 1½ in. thick, around the spindle. The sanding drum should protrude only enough to contact the workpiece. Any farther, and you can get a lumpy surface.

tioned before, this worked fine in a pinch. But there's no easy way to collect dust, and because the drum is stationary, it's hard to use the entire abrasive without tedious readjustments of the drill-press table. A better option is to buy a dedicated oscillating spindle sander, which ranges in price from around \$130 to \$450.

Of all the power sanders in my shop, the oscillating spindle sander sees the most use. It is the best tool for smoothing the concave areas on router templates, and you can always find another way to smooth outside curves: block plane, spokeshave, or sanding block. I also use this sander to smooth ornamental brackets, pulls, bandsawn boxes, and all sorts of curved parts. The oscillating action helps keep the abrasive cool and clean and allows use of a larger area of the drum, extending the life of the abrasive. It also makes for smoother results, with no deep, continuous scratch marks.

The tool isn't just for curves, either. You can fit a shopmade fence around the spindle and sand straight edges, too, just as you would use a belt sander.

The drums are available in a wide variety of diameters, typically from ¼ in. to 2 in., depending on the machine you buy. Swapping out the drums is easy, allowing you to match the drum size to the curve. Also, changing abrasive sleeves is a breeze, so you can sand through from rough to finer grits. But, as with all the other benchtop sanders mentioned here, you'll need to fine-tune the surface with hand-sanding to remove deep scratches before finishing. □

Roland Johnson is a contributing editor.

Only sander you need?

The Ridgid benchtop sander is both spindle sander and belt sander. It oscillates in both modes, which makes sanding more efficient and lets you use almost the entire width of the paper. It's available at The Home Depot for \$200, making it a great value.



Two ways to sand. The Ridgid works well both as a belt sander and as a spindle sander. The oscillating action prevents deep, continuous scratches on a workpiece, which makes the final hand-sanding process less labor-intensive.

QUICK CHANGEOVER, TOO



Switching from belt to spindle mode, or vice versa, takes less than a minute. The sanding drums fit over the spindle shaft and are held in place with a thumbscrew.

Straightforward

Three basic techniques
are the bridge
to more beautiful furniture

BY JEFF MILLER

My first saw was a bandsaw, so from the very beginning of my woodworking career, I found myself working with curves. If you've only been a straight-shooter until now, you'll find that curves not only open up a world of design possibilities, but they also offer plenty of chances to expand your repertoire of woodworking skills: from laying out eye-pleasing shapes to cutting and smoothing those shapes, or even bending them (with steam or by lamination).

What stops most people, however, is the prospect of cutting and fitting joinery on these curved parts. I'll show you three techniques that I've used over the years with great success. There's nothing exotic or difficult about them, and once you see them in action, you'll soon be adding graceful curves to your own work.

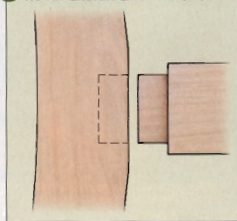
Creating a flat spot on the curve

The simplest way to join two pieces when one of them is curved is by leaving or creating a flat area on the curved work where the mortise is to be cut.

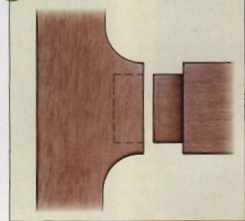
If you are cutting the curved piece out of square stock, it's easiest to locate and cut the mortise while the workpiece is still



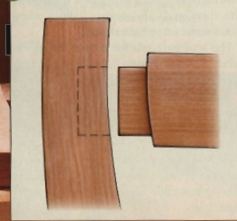
1 CREATE A SUBTLE FLAT AS AN EASIER LANDING SPOT

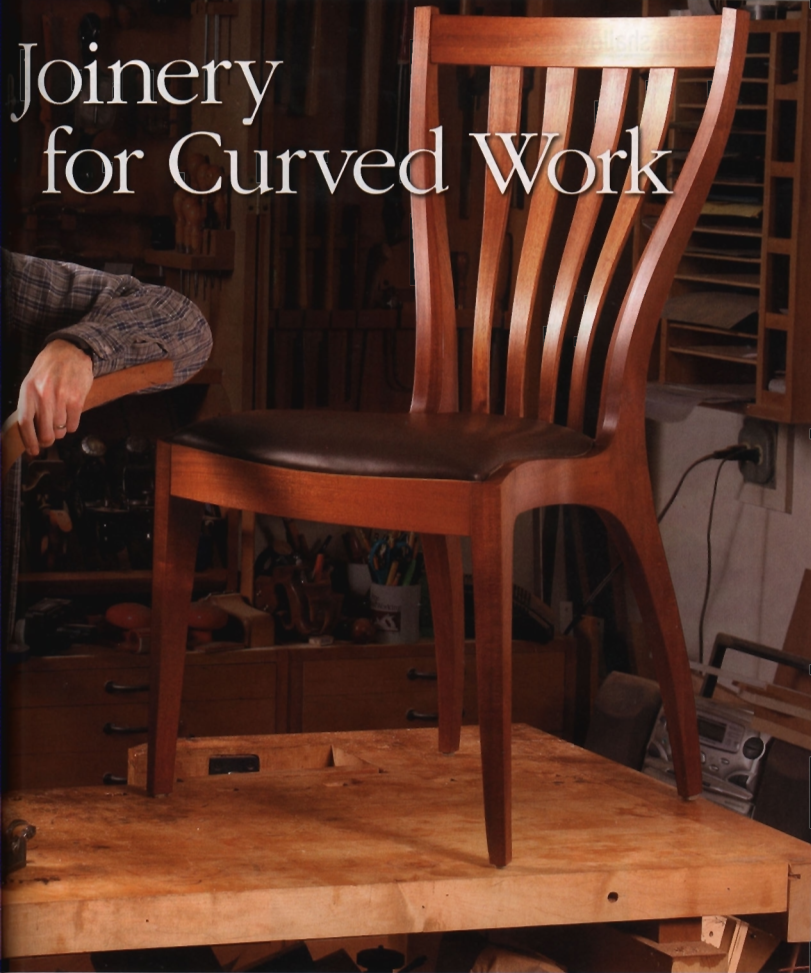


2 MAKE THE FLAT STAND OUT FOR A CURVED TRANSITION

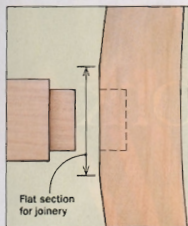


3 FOR INSIDE CURVES, SCRIBE THE TENON SHOULDERS





Joinery for Curved Work



This works best with shallow curves so the flat spot won't stand out. It's good for joining straight rails to curved posts on a chair or bed, or straight aprons to curved legs on a table.



LEAVE A FLAT SECTION IF YOU CAN...



The easiest flat. Leave a section of the stock's square edge intact when cutting the workpiece to shape. Mark the flat's boundaries on the pattern and let that section hang over the stock's edge when tracing the layout.

Saw the piece to shape. But before bringing the work to the bandsaw, go ahead and cut the mortise—a task that's much easier while the stock is still square.



square. Then you can leave the area around the joint flat when cutting the curve. The tenon on the mating rail can then be cut and fitted just as for any other mortise-and-tenon joint. When creating the flat, be sure to extend it $\frac{1}{8}$ in. or so beyond the rail both above and below the joint to accommodate any expansion across the width of the rail. When the piece is glued up, you can sand lightly to ease the transition from flat to curve, leaving about $\frac{1}{16}$ in. flat.

Things get more challenging if you're cutting several identical parts from square stock. If you want to minimize waste, you'll need to "nest" the layout of the parts and cut them all out before doing anything else. This means you'll then have to create the flat—and cut the mortise—in an already curved part. To do this, I make a simple jig that holds the work while I create the flat spot and then cut the mortise.

Clamp the curved piece into the jig so that the area to be flattened projects above the jig's fence. Now you can create the flat spot, using a handplane to remove the projecting material and bring the part flush with the top of the fence. To use the jig with a router, screw on a top plate to support the router. Use a spiral upcut bit or a straight bit, set to cut flush with the top of the jig's fence. The first cut should be a clockwise pass around the area to be flattened; this is a climb cut to avoid tearout.

To mortise with the same setup, equip a plunge router with a fence that will ride along the back of the jig. Adjust the fence to locate the mortise on the thickness of the workpiece. Rout between the layout lines in shallow passes (perhaps $\frac{1}{32}$ in. of added depth per pass) until you reach the desired depth.

Create a flat that stands proud

Some designs call for seamless curves that flow from one part to the next, regardless of whether the parts themselves are curved.

In these cases, don't shape the curve, or much of it anyway, on the end of the tenoned piece. The outer tips of the curved ends will consist of very fragile short-grained stock. Instead, leave a raised area on the mortised part, and form the transitional curves there. Just rough them

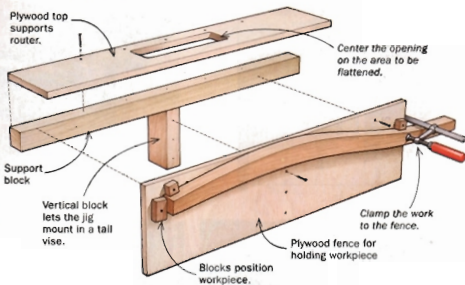
...OR ROUT A FLAT ON NESTED PARTS



"Nesting" curved parts saves material. However, it also makes it impossible to leave a precise flat when sawing each part. So Miller uses a simple jig to shape the flat afterward.

SIMPLE JIG CAN FLATTEN AND MORTISE

The assembly is based on a piece of thick, wide stock screwed to a vertical plywood fence so the mating edges are flush.

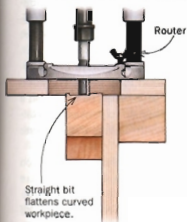


Hold the jig in a bench vise. The workpiece clamps to the jig's fence. Three hardwood stops locate the workpiece so that the section to be milled protrudes above the fence.



Add a top plate to support the router. Use 1/2-in. plywood and make the plate opening larger than the desired flat by 1 1/2 in. in each direction.

1. ROUT THE FLAT

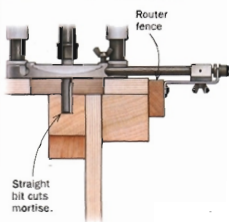


Route the workpiece flush. Set the bit depth even with the top of the jig's fence.



The same jig lets you mortise, too. Attach the router's fence to guide it and locate the mortise.

2. ROUT THE MORTISE



For curves that flow into each other, there is a right way and a wrong way. This table by Chicago furniture maker Chris Bach shows how it should be done.

Cut the raised pad when sawing out the workpiece.



AVOID SHORT GRAIN

STRONG DESIGN

Protruding pad is strong.

WEAK DESIGN

Short grain is fragile.



Cut the joint while the stock is square. Then saw the shape as shown, making sure that the flat surface is 1/4 in. or so wider than the rail.

in, and then refine the transitions after gluing the joint together. A well-known example of this technique can be seen on the leg-to-rocker joints of a Sam Maloof rocking chair.

By the way, another excellent solution to this problem is the gunstock joint used by Kevin Kauffinger in his hall table ("A Graceful Hall Table," *FWW* #212).

Here's a final point to consider when using this type of joinery: It makes a lot of sense to use quartersawn wood for the rail. This is because, after the joint has been smoothed to seamlessly flow together, seasonal expansion and contraction of the rail across its width could create minor misalignment between the parts. Quartersawn stock, which moves less across its width than flatsawn material, will minimize this problem.

Match the shoulders to the curve

When you're joining a tenoned part like a chair's crest rail or a table apron to a concave section of curve, it won't work to create a flat spot on the curve. The simplest approach is to scribe the tenon shoulders on one piece to exactly match the curve of the adjoining piece. By the way, this is another instance where a quartersawn rail is a good idea. Excessive wood movement can cause gaps to appear in a scribed joint, because expansion or contraction will actually change the curvature of the shoulder.

The task of cutting the mortise and tenon is roughly the same as before. You can use the jig again to cut the mortise, although you may need to use a curved offset as a brace between the jig and the

Finish by hand. After the joint is glued, remove the excess material and create a smooth transition using a round or half-round wood rasp (above), followed by a card scraper (right).



**OPTION
THREE****Inside curve? Scribe a shoulder**

workpiece to help hold the work squarely when clamping.

The real trick in this technique lies in shaping the tenon shoulders to tightly hug the curve of the mating part and create a gap-free joint. This process will be simpler if, when cutting the tenon, you angle the tenon shoulder so that it generally follows the direction of the curve to which you'll be scribing. You can do this with a tablesaw tenoning jig, clamping the workpiece in the jig against a precut wedge. Cut the tenon to normal length to fit in the mortise.

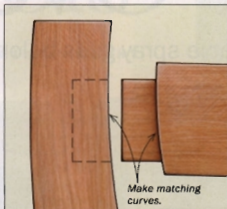
Start the scribing process by inserting the tenon fully into the mortise. Next, use a marking knife to ride along the curved workpiece and scribe a line into the shoulder of the mating part. It's ideal if the scribed line is made with a single-bevel knife so that the straight side of the cut is toward the shoulder—this will leave a very crisp edge to pare toward. Facing the knife that way often will create the offset you need to transfer the full curve to the shoulder, while ultimately shortening the tenoned part as little as possible. But you can use a shim of some kind (an automotive feeler gauge or a small scrap of wood) to increase the scribing offset for deeper curves.

The paring requires a very sharp chisel with a flat back. Nibble a little bit away at a time, until you are just one or two paring cuts away from the scribe line. Now put the chisel's edge right in the scribed line and pare down. The easiest way to keep the cut perfectly on your line is to make each cut after the first one with only the leading quarter of the chisel, registering the rest of the chisel against the existing shoulder. A gentle twist of the chisel, applying a little extra force against the existing shoulder, should keep you from inadvertently crossing the line. It also helps to undercut the shoulder a little. Just be careful not to do that at the corners, where undercutting from one side will leave unsightly gaps on the adjacent face.

As you trim back the shoulders, you might also need to trim the tenon length back so the final depth is about $\frac{1}{32}$ in. less than the depth of the mortise. This leaves room for excess glue. □

Jeff Miller is a frequent Fine Woodworking contributor who teaches woodworking at his studio in Chicago and around the country.

This technique creates tight joints between two pieces when one of them is a concave curve.



A curved shoulder starts on an angle. When cutting the tenon, angle the shoulders to follow the arc of the curved mating piece. Aim for a close fit to minimize the paring.



Mark the shoulder. An automotive feeler gauge hugs the curve when transferring the layout to the shoulder. Use a wood scrap for a wider gap.



Pare to the scribe line. Nibble away most of the waste, then seat the chisel in the scribe line and pare straight down. Use overlapping cuts, advancing only a quarter of the blade with each new stroke.



Bring the joint home. You may need to shorten the tenon slightly to allow the shoulder to seat completely. With the shoulder pared carefully, the joint should come together with no gaps.

Don't Overlook

Why these disposable spray guns belong in every woodworker's



TOP FIVE TYPES, IN ORDER

There is an amazing variety of aerosols on the shelves of home centers and hardware stores. To help narrow your choice, here are five types of finish ranked in order of usefulness.

DEWAXED SHELLAC

If you buy only a single aerosol finish, pick this one. You can use it throughout the finishing process from sealing bare wood to isolating individual finishing steps such as dyeing or glazing, and finally as a clear topcoat. As with any dewaxed shellac, it is compatible with all other finishes.



NITROCELLULOSE LACQUER

This clear topcoat is more durable than shellac and dries faster. Unlike shellac, it is available in matte, satin, and gloss. There are many brands and it is widely available. The strong odor is a drawback.



OIL-BASED POLYURETHANE

It's best used as a topcoat over brushed-on coats of polyurethane, combining a smooth topcoat with thick-film durability. It is available in satin, semigloss, and gloss.



SPAR URETHANE

Since aerosol spray can only be applied as a thin coat, the three coats recommended on the can will not provide exterior durability. You'll need to apply eight to 10 coats for resistance to the harsh outdoors of any climate.

Online Extra

For a video demonstration of the right spraying technique, go to FineWoodworking.com/extras.

Aerosols

finishing kit

BY TERI MASASCHI

Is there anyone who hasn't picked up an aerosol for some reason? Also known as rattle cans or spray bombs, they're used for everything from air freshener to knocking out wasps' nests. Yet when I tell woodworkers that I'm a frequent user of aerosols for finishing wood, most of them assume I'm either a bad finisher or somehow I'm cheating.

When finishing small projects such as boxes and picture frames, the canned convenience of aerosols is irresistible. It simply isn't worth getting a brush dirty or filling a spray gun—the cleanup alone will take more time than the finishing. Also, if you aren't set up to spray, aerosols are a cheap way to get a topcoat for finishing wood, most of them assume I'm either a bad finisher or somehow I'm cheating.

How to get the best from an aerosol

An aerosol can't compete with a spray gun in terms of flexibility, power, or endurance. However, if you select your projects carefully, you can get a flawless finish with an aerosol at a fraction of the cost of a spray gun and in a fraction of the time of a wipe-on finish.

You just need to understand an aerosol's limitations. Whether brushing or spraying, you must apply a strip of finish while the adjacent one is still wet so that the two flow together. But aerosols apply finish fairly slowly; when combined with thin, fast-evaporating finishes, this makes keeping a wet edge almost impossible when you have to do long strokes across a very large surface. If you try, you're very likely to get a striped effect where wet finish was laid down next to finish that had already dried. The top for a night stand is about the limit for fast-drying finishes such as shellac, solvent lacquer, and water-based

TIP

AVOID THE STRIPED EFFECT



PROBLEM

Because aerosols lay down a narrow band of finish, it is more difficult to overlap adjacent strokes, but failure to do so leaves a striped effect on the surface.

90° TO THE SURFACE



Narrow band



SOLUTION

Holding the can at around 45° to the surface creates a wider spray fan on the workpiece. This helps overlap strokes to achieve an even coating, but you need to move the aerosol more slowly.

45° TO THE SURFACE



Wider band

STAINS AND TONERS

These aerosol colors are great for touchups and repairs where the color can be blended in. Just don't try to get even coverage over a large surface.

Get a handle on it

Using an aerosol for any length of time can leave you with a nasty case of "spray finger," a painful digit locked in a cramped curve. The solution is a can handle, which gives the aerosol more of a spray-gun feel. There are various models on the market for \$3 to \$5 and any of them will work on most spray cans.



finishes. You could probably finish a small coffee table if you use an oil-based polyurethane.

Some finishers recommend spraying across the grain and then immediately with the grain, a method known as cross-hatching, as a way of ensuring even coverage. I've found that unless you are working on a tiny surface, this technique will leave a checkerboard pattern when the finish dries. Instead, spray with the grain but overlap each stroke by 25% to let the wet edges blend together. Use back lighting to help you see this overlap clearly. You want to keep the can's nozzle an even 6 in. to 8 in. from the workpiece. Don't swing the can in an arc by pivoting from your shoulder or wrist; instead, move the can parallel to the

4 great uses for spray cans

SMALL PROJECTS



Seal with shellac. It is a good idea to seal bare wood with a coat of dewaxed shellac. To avoid having to touch the piece or walk around it, place it on painter's pyramids that rest on a lazy Susan.

Sand the sealer.

The first coat almost always causes some raised grain, so lightly scuff-sand it with some P320-grit sandpaper and then remove the dust.



A durable topcoat. For lightly handled objects, three or four coats of solvent lacquer give plenty of protection and the finish can be done in a day. Spray the inside of the box first and the outside last. In this way, any overspray is on the less-visible surfaces.

INTRICATE OBJECTS



Don't fear the network. Finishing mils pierced corbel with a cloth or an artist's brush would be tedious. But an aerosol gives a flawless finish in no time at all.



Highlight carved surfaces. Using a brush to finish carved surfaces can leave pools of finish in recesses. Aerosols give an even finish.

workpiece, keeping your wrist stiff. I can't give you an exact speed to spray at because different brands spray different volumes. Instead, go slow enough to just get an even, wet, shiny surface but fast enough to avoid puddles or runs.

If you don't have any kind of spray booth, it is a good idea to have a fan adjacent to you set on low to push overspray away from the project. It is also a good idea to cover any surface within about 8 ft. of the workpiece to protect it from overspray.

Top off a table or finish off a box

A good example where selective use of an aerosol can be really helpful is a bedside table. While a low-build, wipe-on finish is fine for most of the piece, the top should have a more durable coating. On this area, brush on three coats of a durable film finish such as lacquer or polyurethane, sand away any brush marks or dust nibs, and then use an aerosol to add three or four flawless coats to the tabletop. If you can't detach the tabletop, mask off the rest of the table. Be sure to use the same product line for brushing and spraying, such as Deft brushing lacquer and then Deft aerosol lacquer, or the two versions of Minwax's oil-based polyurethane.

If an aerosol coat ends up a mess, sand it with P320-grit sandpaper, remove all the dust, and then try again.

For many small projects or components, an aerosol finish is ideal. A small box, for example, doesn't need much finish so cost isn't a factor, and keeping a wet edge is no problem. Handling such a piece while brushing or wiping a finish is awkward, but with an aerosol you simply place the box on a nail board or painter's pyramids and walk around the piece as you spray. Better still, use

SEALING IN COLOR

Don't ruin your dye job. Wiping on a sealer coat of shellac can reactivate and remove some of the dye you are trying to protect.



Perfectly protected. You can spray a sealer coat of shellac over even an alcohol-soluble dye and not cause any blotching.



a lazy Susan. These fast-drying finishes aren't a magnet for dust and debris, and you can apply two or three coats in a day. Just don't try to apply one fat coat, or all you'll get are drips and runs.

Other handy uses

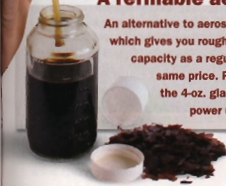
Another use for aerosols is to seal the surface during a multi-step finishing process. Sprayed shellac seals or "sets" the color without smearing it. Later, if the surface has been glazed, a spray coat of shellac or lacquer seals the color work before topcoating.

To clean up, simply invert the can and squeeze the trigger for a couple of seconds to clear finish from the nozzle. There's no brush or spray gun to clean laboriously, and no oily cloths to worry about. □

Teri Masaschi is a professional finisher near Albuquerque, N.M.

A refillable aerosol

An alternative to aerosols is a system made by Preval, which gives you roughly four times the spraying capacity as a regular aerosol can for about the same price. Pour any thinned material into the 4-oz. glass jar, screw it to a replaceable power unit, and then start spraying.



INVISIBLE REPAIRS



Apply the ground color, then seal it in. Wipe on a dye that closely matches the predominant color of the undamaged areas (left). Spray on a coat of shellac to isolate the base color (right).



Fine-tune the tone, and add a topcoat. Use an aerosol toner to blend the color of the repair into the rest of the piece (left). Spray on a clear topcoat to complete the repair (right). Aerosol clear finishes come in different sheens. Apply the color and the clear coat in light bursts while holding the can farther from the surface to blend in the repair.

The power unit can spray at least 16 oz. before it needs to be replaced. The reusable jar can also be capped and the material stored for another time. The spray isn't as fine as a typical aerosol, but it's good for sealer coats. You can also spray a greater range of finishes such as custom-tinted clear finishes or darker grades of shellac.

Take the Edge Off

How you break the edges can make or break your projects

BY
GARRETT HACK



JUST RIGHT
OR OVERCOOKED?



A nicely worked edge is crisp to the eye yet friendly to the touch. And all it takes is simple tools and a systematic approach. On the other hand, if you overdo it, your furniture will look factory-made.

Some tasks in woodworking are so basic and crucial that they apply to virtually every piece of wood in a project. Basic milling and surface preparation come to mind, but for me, breaking edges is just as vital. I use sandpaper or a block plane to relieve every edge of just about every part of my furniture. It's quick work, but it needs to be done systematically. Do too little, and your furniture won't look or feel finished. Overdo it, and your heavily rounded edges will look like unskilled factory work.

Not all furniture should get the same edge treatment, however. Contemporary furniture, for example, usually wants crisp edges, which work fine if relieved adequately. Arts and Crafts goes to the other extreme with rectangular parts broken with sensible—sometimes bold—chamfers.

The process calls for two skills that take a little practice but aren't at all hard to master: the cleanly planed chamfer and the lightly sanded roundover.

Chamfers create a strong visual impression

I like the visual effect of chamfers so much that I typically cut a light chamfer into all the visible edges of a piece. I do this with a block plane rather than a router because this is light work; to effectively break an edge, a chamfer doesn't need to be more than about 1/32 in. wide. The block plane is also easy to maneuver one-handed, works well in tight quarters, and leaves an attractive flat and polished cut.

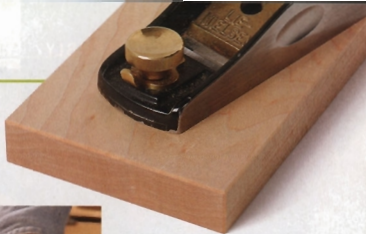
Set up the plane for a light cut, with a narrow throat opening. A well-tuned plane will often chamfer an edge flawlessly, regardless of grain direction, but if you're getting resistance or small tearouts, turn around.

Align the plane's body lengthwise with the corner you're chamfering. Tilt the body with the blade centered on the workpiece edge. Keep a standard grip on the plane but, if possible, ride a knuckle or the tip of your thumb on the stock to help maintain a consistent chamfer angle. Skewing the plane, on the other hand, lets you cut cleaner chamfers in end grain and work deeper into inside corners.

Break most edges before assembly—On almost any project, you can simplify the task of breaking edges by doing some of the work before assembly. On a table, for example, all the edges can be worked beforehand. This includes the legs and the

HOW TO CUT CLEAN CHAMFERS

Even the lightest flat chamfer will catch light and give life to an edge.



For long chamfers, guide the plane with both hands. Align the plane's body roughly lengthwise with the corner you're chamfering. Ride a knuckle on the stock to help steady the plane at a consistent angle.

TIP



A block with a V-shaped notch helps support square work at a convenient angle for breaking edges.

Get the right angle on end grain. Skewing the iron to the plane's line of travel lowers the cutting angle and pushes the fibers downward, creating a cleaner chamfer at the end of a piece.

BEFORE OR AFTER ASSEMBLY?



Most edges are easiest to access and work before assembly, but some must wait. Also, be sure to complete surface preparation before breaking edges, as sanding and smoothing can erode the chamfers you've created.



Advance work. The bottom edges of a table apron are easily chamfered before glue-up (left), as are the table's legs. Assemble the leg and apron after cutting the chamfers. Cutting these chamfers after assembly would be next to impossible because the adjoining parts obstruct the work (above).

DOORS ARE TRICKIER

The easiest way to chamfer the edges on a door frame is to treat the inside edges before assembly. But you'll need to finish off the inside corners after the frame is glued up. The outside edges must wait until the door is assembled, trimmed, and sanded.



Mark the stiles. With the frame dry-fitted, mark the stile at the point where the mating rail will meet it.



Don't go too far. If the chamfer on the stile goes beyond your reference line, it will create a gap in the joint with the rail.



The rails are easier. Because the rails die into the adjoining stiles, the chamfers can continue to the end of the workpiece.



Finish after assembly. Use a chisel to carry the chamfer into the corner on the inside of the stile.

bottom edges of the aprons, inside and out. The tabletop edges can be done before or after assembly, but you'll find them easier to work as long as you can run around all four edges at once. Even with an underbeveled edge, you'll need to break the edges on this bevel with sandpaper or a light chamfer.

A frame-and-panel door is another good example. I chamfer the inside edges of the stiles and rails before putting the frame together. These edges are harder to reach once the panel is in place. To avoid creating a gap at the end of the rails, be sure to stop well short of the joinery when chamfering the inside edges of the stiles. After glue-up, use a paring chisel and a rabbit plane to carry these chamfers into the corners. Now chamfer the outer edges.

Work carefully on the top and bottom areas where the long grain of the rails joins the cross grain of the stiles. Giving the plane a healthy skew as you come onto the cross grain should leave a polished facet there. Finally, give the inside of the closing stile an extra pass or two, to ease this area of potential wear.

Rounded edges are quick and comfortable

The simplest way to break an edge is to round over the corner with fine sandpaper (P220-grit, then P320). This technique is quick and effective. And it's perfect for preserving wood's wonderful tactile quality, softening sharp, sometimes fragile corners and making them easier to handle for builder and user alike.

I tend to use the roundover technique primarily on less-visible parts like drawer

ROUND-OVERS ARE FRIENDLY TO THE HAND

Some woodworkers prefer light roundovers throughout their projects. Sandpaper is quick and effective, but it needs some kind of backer for consistent results.



sides (guides and runners, too) and the inside edges of table aprons. Out of sight as they are, these areas still get handled and require protection from wear and tear.

Sanding freehand can make it challenging to get a consistent shape on all of your edges, especially when working into corners. You'll improve your results by supporting the sandpaper with some type of backing that gives a little and lets you control the shape you're creating. Woodworking suppliers sell foam or cork sanding blocks, but I find it simple and effective to attach sandpaper to a narrow scrap of 1/4-in.-thick softwood or a scrap of leather.

The sandpaper also makes it simple to control the size of the roundover you're creating. If a few passes aren't enough, keep going. Stop when the edge feels comfortable and fits your design.

Again, some of this work is easier done before the piece comes together. On a drawer, for example, I lightly round the inside edges of the drawer sides and both top edges of the back before assembly. I do the rest after the drawer is together, using a file or chisel to hit the corners on the back of the drawer front. I use a block plane to chamfer the visible front edges of the drawer front. □

Garrett Hack, a contributing editor, builds furniture and breaks edges in his shop in Thetford Center, Vt.



Out of sight but not out of hand. Hack uses a gentle roundover on parts like drawer sides that will be handled but not often seen (left). He supports the paper with thick leather. Use a common mill file to get into tight corners (above), skewing it as you push it along the edge.



HEAVIER ROUND-OVERS

A heavier roundover is great for edges that are prone to damage, such as tabletops or the top edges of drawer sides. Another example is the bottom inside edge of table aprons, where you'll grip when moving the table.



Start with a block plane. When you want edges more rounded than you can achieve quickly with sandpaper alone, start with a block plane (above left) and use sandpaper to turn the facets into a roundover.

A Study in Squares

Gridwork side table
is a unique take
on Arts and Crafts

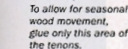
BY KEVIN RODEL



I came across the original version of this table while doing research for *Arts & Crafts Furniture: From Classic to Contemporary* (The Taunton Press, 2003), the book I co-authored with Jon Binzen. Josef Hoffmann of Vienna designed that table in 1903. For my own version, I made just a few changes: to the size, the construction of the top, and the finish (fumed white oak). The biggest difference between mine

and the original (which had a blackened finish) is the top. The original didn't have a pinwheel top. Instead, it had four mitered pieces that were glued together with a contrasting center piece.

Designed over 100 years ago, this table remains quite avant-garde. It pushes design boundaries with interesting twists on the legs, aprons, and top that all work well together. It is a simple yet very strong de-



SEPTEMBER/OCTOBER 2011 61

UNIQUE LEG CONSTRUCTION FOR A CUTTING-EDGE DESIGN

Unlike most legs that taper toward the bottom, these legs get narrower at the top. They also have grooves that hold the gridwork aprons, instead of mortises, and inlaid cuffs at the bottom.

MAKE THE REVERSE-TAPERED LEG

Two outside faces are tapered from 1½ in. at top to 1¼ in. at bottom (before rabbeting for cuff)

Two inside faces are straight and square for easy joinery.

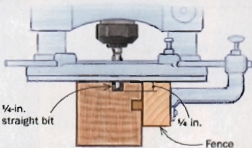
Stopped groove (cut before leg is tapered), ¼ in. wide by ¼ in. deep by 10 in. long, ½ in. from inside edge

ADD THE CUFF

Ebony cuffs, ¾ in. thick by ½ in. wide

Rabbet, ½ in. deep

Start by cutting the grooves. A straight bit and a plunge router with a fence make it easy to cut the stopped grooves in the two inside faces of the legs (right). Rodel uses a chisel to square the end of the groove (far right).

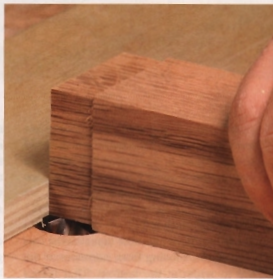
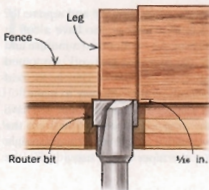


deal of gluing surface with the legs. The grid structure is simply a series of carefully placed half-lap joints, and there is more than one way to make them. I have found that the quickest and cleanest approach is to cut a series of dados across a wide piece of stock first and then rip this stock into the strips. This quickly gives you grid sticks with the half-laps in exactly the same location. What makes the joinery layout a bit trickier is the thicker piece at the top

of the grid. That is designed to drop the grid down a bit below the overhang of the top, so it looks uniform to the viewer. It also provides a wider place to attach the corner blocks that reinforce the base and provide a place to attach the top.

Start with wide stock—For each of the grids, you should have two pieces of stock that you can cut into at least five narrow-

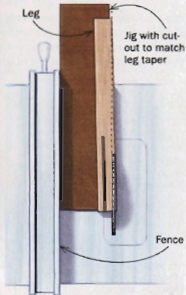
A shallow rabbet for the cuffs. Rodel uses a router table to rabbet the bottom of the legs. The rabbet should be slightly shallower than the thickness of the cuff stock. The slight taper on the legs will affect the rabbets where the inlays join, but Rodel compensates for that when gluing in the first two cuffs and fitting the second two between them.





Backward taper is next. Rodel uses a simple L-shaped jig to cut the taper on the leg. Make sure your saw has its splitter in place (left).

SIMPLE JIG CUTS THE TAPER



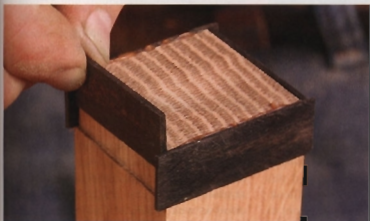
er strips each, plus the thick piece at the top, and a test piece of the same thickness for setting the depth of the cuts. With a dado set in your tablesaw, use the test piece to set the depth of cut a hair

less than halfway through the stock. Doing this allows the pieces to protrude from one another slightly and helps with clamp pressure. Also, I start with stock that is $\frac{1}{4}$ in. too long. This way, the intersecting pieces end up a bit proud, and then I trim all four grids to the same size.

It's important to keep track of the five pieces of vertical grid stock and the five pieces of horizontal grid stock and keep them separated, because the layouts are slightly different and executed on the opposite faces. Lay out the dado locations on one set of the grid stock. You'll set up everything to those lines and cut all the pieces at the same time, so you don't need to mark dados on everything. You do need to mark whether they are verticals or horizontal and add a triangle to reorient them once they are cut into strips. Keep in mind that the dados on the horizontal stock are on the inner faces and the dados on the vertical stock are on the outer faces.

Also note that along the top and bottom of the vertical pieces and sides of the horizontal ones there are rabbets (they are open on one side), not dados. Cut those first, starting with the sides of the horizontal and the bottoms of the verticals because they are all the same dimension. Then cut the thicker rabbet at the top of the verticals before moving on to the dados.

When cutting the rabbets, move the rip fence right up to the dado blade but leave a small space so as not to nick the fence. That will leave a sliver of waste at the end of the rabbet, but you can knock that off



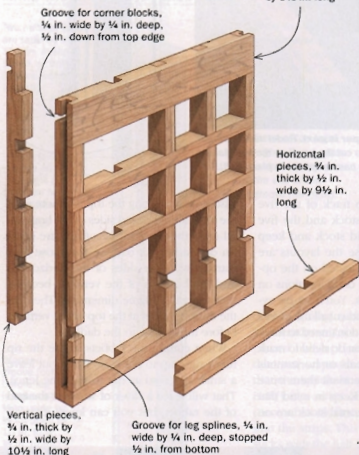
Glue the cuff stock in place. Rodel clamps two opposite sides at a time, leaving the first pair long and cutting the second pair to fit between those. Once the glue is dry, he trims the ends and sands the cuffs flush to the legs.



PERFECT GRIDS, STEP BY STEP

The hard part is making sure all the half-laps are right on. By cutting the dados in wider stock and then ripping those into thinner strips, Rodel ensures all the half-laps on the grids meet up perfectly. Keeping track of all the parts is the key to success.

HALF-LAP GRID



easily with another pass. When cutting the dados, work on all the horizontals and then all the verticals. With the fence as a stop, work to the layout lines on the first piece, and then cut all those dados before moving the fence to cut the next dado.

Rip and joint your way to precise fitting grid strips—When you have cut all of the dados, it's time to rip the wide stock into strips. To rip the strips to the perfect width, I use the tablesaw in conjunction with the jointer. Set the jointer to make a light cleanup cut and do not change it. With a good rip blade, set the saw's rip fence to a heavy 1/2-in. cut. Now, using a test piece, rip off a strip, joint the ripped edge, and test the fit in a dado. If the fit is too tight or loose, make the necessary adjustments to the rip fence. When your test piece fits snugly with hand pressure, rip all of

the grid stock into strips. Remember, after each ripcut, joint the edge of the grid stock before ripping another strip. When all of the grid stock has been ripped, joint the ripped face of all the strips, and you're ready to assemble the grids.

Assemble and groove the grids—Because each intersection needs a clamp, this glue-up can be fussy. But it's not difficult. I always dry-fit beforehand and try not to use too much glue so I don't have a lot of squeeze-out to clean up.

Once the grids are glued together, I pass them through a thickness sander and level



Cut rabbets and dados in wide stock. Use a test piece for setups, setting the blade height just shy of halfway. Rodel cuts the outside rabbets on each end of the horizontal stock pieces and the bottom of the vertical stock and then moves the fence to cut the rabbet at the top of the vertical stock, which is wider than the others. Then he repositions the rip fence twice more to cut the remaining dados in the grid stock.



Rip the dadoed stock into narrow strips. Rodel rips all the strips (left), jointing the wide stock between each ripcut (below left), and then jointing the opposite face after it has been ripped. He keeps all the stock marked with triangles and letters so he can keep track of them through this process.



the surfaces while bringing them to final thickness. I rent time on a local wide-belt sander, but a belt sander followed by a random-orbit sander could get the job done as well. Just take care to keep everything flat and on the same plane.

To clean up the edges of the grids, I joint two adjoining edges and rip the opposite sides to the final dimension.



Putting the grids together. Glue and clamp the entire grid at the same time, joining the center pieces first and then moving outward (above). To avoid crashing clamps, use a vise to hold the grid and apply clamping pressure to part of it, and add clamps to the rest of the intersections (right).

The next step on the grids is to cut a groove on the vertical edges, which corresponds to the groove in the legs. I do this on the tablesaw with a dado blade, stopping the groove before it runs out the bottom edge of the grid.

For added strength and a place to secure the top, I add corner blocks to the inside of the base. The corner blocks have a tongue that sits in a notch in the top of the grid. Although I don't add the blocks yet, I groove the top of the grid now.

Attach grids to legs

Now you can assemble the base. The legs attach to the grids with splines in the grooves. There is plenty of strength with the 10½ in. of long-grain to long-grain glue surface at these joints, but the splines make the glue-up easier, keeping the grids from sliding around and guaranteeing that all alignments are the same. Glue two sub-assemblies: one grid to two legs for each assembly. When they dry, glue them together with the remaining two grids.

While you're waiting for the first parts of the base assembly to dry, make up the corner blocks. First, drill the four top hold-down holes on the drill press. Next, cut the blocks from the stock and use the tablesaw to rabbet the two just-cut edges to make a tongue that fits snugly into the groove in the top edge of the grids. When the base is fully assembled, glue in the corner blocks.

A pinwheel top

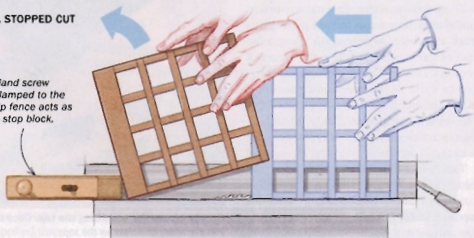
The top construction is unconventional but that's what I like about it, and it works very



Grooves for splines and corner blocks. Use the same setup, a dado blade on the tablesaw, to cut the grooves for the spline and the corner blocks. The corner-block groove can go through, but the spline groove is stopped, so set a stop block on the rip fence and pivot the work up when you hit it. Square up the end with a chisel.

A STOPPED CUT

Hand screw clamped to the rip fence acts as a stop block.



THE BASE IS EASY TO ASSEMBLE

Glue-ups don't get any easier. Splines align the grid aprons with the legs, and the grids provide a perfect place for clamps to rest.



Two legs and an apron. Start by creating two sub-assemblies of two legs and a grid (above). Let those dry, and then add those two assemblies to the two remaining grids (right). The splines keep the grids aligned on the legs. You just have to flush everything up at the top.

well with this design. The four identical parts that make up the top should come from the same long, wide board, but if you don't have a long board that wide you could glue up two boards. When the four parts are cut out, lay them out in a spiral pattern and mark the edges that get a mortise and the ends that get tenoned. Lay out and cut the mortises. I use a mortising machine, but you could use a plunge router with a fence and straight bit. I cut the tenons on the tablesaw with two cuts and test-fit the joints. Then cut the 30° under-bevel on the ends opposite the tenons.

There will be some seasonal expansion and contraction across the 8½ in. width of each top piece, so only apply glue to the half of the mortise closest to the center of the top. This will allow each piece of the top to move as needed around the outer edge and maintain a constant tight fit in the center. Rather than gluing up all four pieces at once, it is best to do two at a time and then join them.

The last item on the top is the center block. I chose a black Motawi tile (motawi.com) to relate to the ebony cuffs, but your options are unlimited. Whether it is a tile on an insert, a leather pad, or whatever



Corner blocks for attaching the top. Once the base is dry, glue the corner blocks in place, and you are ready to screw on the top.

TACKLE THE TOP LAST

A spiral top with a tile insert adds to the drama of this table.

Two pieces at a time. To leave the right-size hole in the center of the table, leave the mortises a little long, leaving some wiggle room for aligning the edge of the tenoned piece with a pencil mark on the mortised piece (3 in. from the shoulder). When each of these sub-assemblies has dried, glue them together, again aligning the edges with the pencil marks. You should have an exact 3-in.-square opening.



Slight bevel is a subtle detail. After the top is assembled and sanded, Rodel uses a straightedge and a small V-cutter in a router to carefully cut a shallow groove between the pieces, which extends into the center square. This accentuates the pinwheel arrangement.



Screw the center block into the rabbet. The center block, a tile silicone-glued to a wood insert, goes in from the underside of the top and sits just below the surface. Rodel uses TEC, a flexible grout, on the top side in the space between the wood top and the tile.

you may imagine, the center block goes in from the underside of the top and sits in a rabbet that stops it just below the surface. To cut the rabbet, I use a plunge router and bearing-guided rabbeting bit. This leaves the corners rounded, but I square them with a chisel. The depth of the rabbet is determined by the thickness of the mate-

rial that you wish to display. For example, if you choose to insert a $\frac{3}{8}$ -in.-thick tile, be sure to leave a lip around the center opening that is about $\frac{1}{32}$ in. more than $\frac{3}{8}$ in. Again, the insert should sit just below the surface of the wood top.

Attaching the top to the corner blocks is a breeze. With the completed top upside down, center the base over it. With an awl, mark through the four screw locations for the corner blocks for the four screw locations, remove the base, and drill these pilot holes. To complete the center insert, make up a baseplate from any stock and cut it to fit the opening in the underside of the top. Drill two small screw holes in two opposite edges. Now fix the insert to the baseplate with an appropriate adhesive.

Fuming and finishing

I recommend disassembling the top from the base and taking out the insert for finishing. Before I applied three or four coats of Tri-

& True Varnish Oil, I fumed the parts. See my article, "Fuming with Ammonia" in *FWW* #126, for detailed instructions on how to darken white oak with this very simple, traditional technique. □

Kevin Rodel makes furniture in Brunswick, Maine.

Design options

Rodel played with contrast on this set by using a two-part wood bleach on one and an ebonizing process on the other, with a checkerboard inlay in both.





House of doors.
Babbitt made all the raised-panel doors for his kitchen, bathrooms, and entertainment center using the methods in this article.

Cope-and-Stick

Make perfect raised-panel doors
with matched router-bit sets

BY RICHARD BABBITT

STILE BIT

This bit has the bearing on the top and cuts the decorative inside profile on all four parts of the frame. It also cuts the slot that holds the panel and houses the stub tenons.



PANEL-RAISING BIT

If you are just using a flat panel, you won't need this bit. And there are other ways to raise a panel. But this bit cuts into the front and back of the panel so it fits the groove perfectly.



COPE BIT

Also known as the rail bit, this is the small bit with the bearing in the middle. It cuts stub tenons and a coped profile on the end of the rails.



GOOD PREPARATION IS ESSENTIAL

These techniques will only work if all your stock is an even thickness, both rails and both stiles are the same length, and all the cuts are at 90°. Besides the four parts of the frame, you also will need a fifth piece for setup. Make this piece the same width and thickness as the frame, and about 8 in. long.

Tricks

Rail-and-stile router-bit sets, also called cope-and-stick bits, work great—once you've spent a few hours dialing in the height of each bit and creating a pile of test cuts in the process. And since they don't have long, traditional tenons, gluing these frame-and-panel assemblies exactly square is no picnic either. Faced with the task of making frame-and-panel doors for our kitchen, bathrooms, and entertainment

center, I developed an easy way to remove the trial-and-error from both operations.

My system needs only one extra rail, which is used to set the height of all three cope-and-stick router bits precisely. There are no further test cuts, no multiple setup blocks, and no fancy jigs. Likewise, once you know where to position the clamps, and in what sequence to use them, you get perfectly square frame-and-panel doors every time, in my case 89 times and counting.

Richard Babbitt is an amateur woodworker on San Juan Island, Wash.

START WITH THE COPE BIT

Everything cues off this end-grain cut, so proper setup is important. Here's how to do it without test cuts.



Set the height first. Use a straightedge or a strip of hardwood just less than $\frac{1}{4}$ in. thick to set the height of the bit. Lay the edge on the router table and lower the bit until the profile portion just touches it.



Then set the fence. Place the straightedge against the cope bit's bearing and then lock the fence in the same plane. Keep the opening around the bit as small as possible.



Cut the ends of both rails plus one extra. You don't need a fancy sled to hold the rails square to the bit. Instead, cut a push block out of plywood or MDF with the corner nearest the router bit exactly 90°. Holding the rail stock facedown and tightly against both the fence and the push block, mill both ends of the rails and one extra setup piece for later.

Online Extra

Watch a demonstration of simple cope-and-stick joinery at FineWoodworking.com/extras.

SETUP PIECE ALIGNS THE OTHER TWO BITS

There's no need for tedious test cuts. Use the extra piece with the coped profile on it to set up the stile bit and the panel-raising bit.

STILE BIT

Set the height. Place the setup piece facedown on the router table and raise the stile bit until its slot-cutting section is exactly level with the tenon on the end of the rail.

Mill the rails and stiles. Bring the fence flush with the bearing. With the front face down, mill one edge of each stile and rail.

Template-route curved rails. If your panel has a tombstone profile, use a matching template to rout the top rail. Use a climb cut to avoid cutting against the grain, which will cause tearout.



PANEL-RAISING BIT

Modify one end of the setup piece. On the bandsaw, cut away the section behind the ogee profile as shown.

Set the bit height. The setup piece now fits under the back cutter of the panel-raising bit without hitting the main cutters. Lower the bit until the bottom of the back cutter just touches the rail's tenon. Save the setup piece for future use.

Profile the panel. It is better not to cut the profile in one pass, as this may strain the router and leave a rough surface. Instead, make the first one or two passes with the fence proud of the bearing and then align it flush for the final pass.

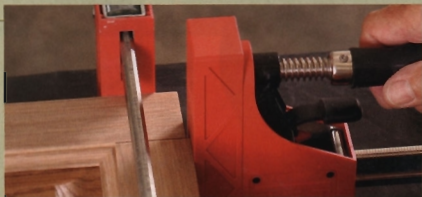
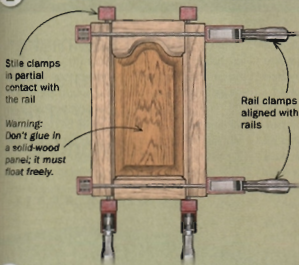
TIP REMOVE BURN MARKS

If you get burn marks on the profile, sand the edge with 60-grit paper and make another pass with the bit.

Tips for assembly, too

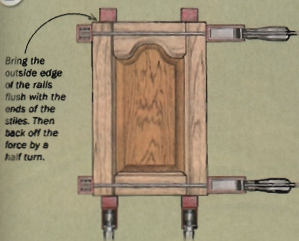
With four parallel-jaw clamps, tightened in the right order, your frame and panel will come together perfectly. But before assembling it, apply at least one coat of finish to the panel. This way when the seasons change and the panel shrinks, you won't see a strip of unfinished wood. By the way, place the handles of each pair of clamps on the same side of the assembly.

1 POSITION THE CLAMPS



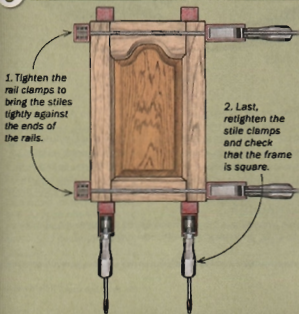
Do a dry run first. Place the frame and panel inside the jaws of the stile clamps with the rails proud of the stiles by $\frac{1}{4}$ in. to $\frac{1}{2}$ in. Leave a small gap between the end of the rails and the stile; this will prevent glue from being pushed toward the panel later. Align the stile clamps so that all but $\frac{1}{4}$ in. of each jaw is against the end of a stile. This will pull the rail perfectly flush with the ends of the stiles. Now place the rail clamps on top of the frame with the jaws aligned with the rails.

2 TIGHTEN THE STILE CLAMPS



First tighten both stile clamps simultaneously and uniformly. This will flush up the rails to the stiles. Next, back off both clamps a half-turn so that they are just snug.

3 FINISH TIGHTENING AND CHECK FOR SQUARE



Tighten the clamps in sequence. Tighten both rail clamps simultaneously and uniformly (left), then re-tighten the stile clamps. To see if the frame is square, measure it diagonally. When you have gotten the hang of this method, apply glue to just the ends of the rails. This way, surplus glue will be pushed to the outside of the frame and not to the inside, where it might stop the panel from floating.





Your

Good kits make great guitars and offer plenty of real woodworking

BY STEVE SCOTT

SOURCES OF SUPPLY

We sampled four kits for dreadnought-style, steel-string guitars with spruce tops. All but one have rosewood backs and sides, and on most you can choose either a dovetailed neck or one that bolts to the body. The kits all remove at least two of the biggest lutherie pitfalls. First, the guitar sides are already bent to shape. Second, the fretboards come slotted in the proper places. Misplace a fret by even a small fraction and you'll hear the mistake every time you play. Regardless of price, look for a kit with thorough instructions (Stew-Mac's kits are

champs at this). Three of these kits offer all solid-wood construction, but price leader U.S. Guitar is the exception. Guitar-making instructor George Vondriska also likes a kit from Grizzly with a plywood back and sides that sells for \$85. "A great project to do with a kid," he says.

VIDEO WORKSHOP

To see George Vondriska's 19-part video series on building a guitar from a kit, become a member of FineWoodworking.com.

First Guitar

There are many functional and beautiful things that you can make as a woodworker, but perhaps none combines function and beauty as fully as an acoustic guitar.

The curved sides, inlaid top, and carefully fitted neck all pose satisfying challenges for the woodworker. And the finished piece is uniquely satisfying as well—as beautiful as fine furniture, but made to create music.

Still, many woodworkers who might otherwise try building a guitar are put off the project, thinking they'll need a host of specialized tools and new skills.

Enter the guitar kit. Several companies make kits that include all the components, materials, and instructions you need. The kits vary in their simplicity, but all of them remove some of the obstacles that might trip up the average woodworker.

In many

kits, for example, the guitar's sides are already bent, so there's no need to create large bending forms or a hot-pipe bending rig.

Guitar players especially might wonder whether a kit-build can match the fit, finish, and sound of a professionally built guitar. Devotees of kit-built guitars swear by the tone and playability of their instruments, even their flawed first efforts. And the building experience, they say, is addictive.

There's more to building from a kit than just gluing together pre-made parts, as I found out when I visited guitar-making instructor George Vondriska at his school outside Minneapolis (aboutwildearth.com). A kit builder must carefully handle a wide range of tasks, including setting the angle of the guitar's neck, locating and installing the bridge, adjusting the nut to set the height of the strings, and setting the inlaid binding around the guitar's top.

Tackle these tasks with patience and care and, when you're done, you'll have a beautiful musical instrument. And you might find you like guitar-making so much that you are ready to build one from scratch. It's not a long leap once you have a kit under your belt. This article will give you a taste of the process and offer some pointers on where to learn more.

Steve Scott is an associate editor.

Make music in your shop. Patient, careful work can transform a kit of parts like the one from Luthiers Mercantile (far left) into a handsome finished instrument like this sample from U.S. Guitar.



C.F. MARTIN & CO. **martinguitar.com**

Back is not glued up. Headstock is veneered, but not drilled. Features a pair of index pins to locate and secure the fretboard to the neck when gluing. Lightly illustrated instructions come in a 20-page book that wisely urges builders to seek additional sources of guidance. \$458.

LUTHIERS MERCANTILE INTERNATIONAL **lml.com**

Bracing material is left as raw stock for builder to cut and shape. Good instructions and video. Company offers lots of à la carte options, including kits that let you carve your own neck, bend your own sides, etc. \$591.

STEW-MAC **stewmac.com**

Kit includes pre-cut cardboard molds to help simplify glue-up. Top is pre-routed for application of rosette. Kit yields "a very fine finished instrument," Vondriska says. 36 pages of instructions, full-size plan, 71-minute DVD video. \$489.

U.S. GUITAR

usguitarkits.com
Laminated sapele back and sides are pre-assembled. Bracing is shaped and pre-installed on top and back. Solid 39-page instruction booklet. "Good value for the dollar," Vondriska says. \$300.

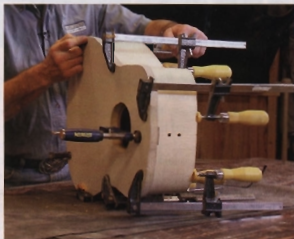
How a woodworker handles the process

Any woodworker can build a kit guitar, Vondriska says. The keys are reading the instructions and taking your time. Vondriska demonstrated some important steps in the process using kits from U.S. Guitar.



SOUND BOX

Use a chisel to create great sound. A crucial step in "voicing" a guitar is to trim the softwood braces underneath the soundboard. Thinning the braces in a traditional scalloped pattern lets the soundboard resonate more freely. Some kits include templates to simplify this task.



How to avoid specialty clamps. Gluing up the sound box typically requires 25 to 30 luthier's spool clamps for even pressure around the top. Vondriska uses a few ordinary bar clamps and a guitar-shaped caul to distribute pressure.



SHOPMADE FENCE

Single rounded point follows guitar's curves and creates a perfect rabbet.



The tools are familiar. After using a router to trim the top flush with the sides, clamp on a shopmade fence (above) and use a straight bit to cut a very shallow rabbet in the guitar's side. Next, use multipurpose household glue (Ducol cement by Devcon; \$5) to attach the plastic binding that protects and hides the joinery. Blue painter's tape clamps the binding into the rabbet (below). When the glue dries, trim the binding flush with a card scraper (right).



Starting from scratch is more rewarding

As a guitar-making instructor, I understand why a kit seems attractive to a first-time builder. A kit can help you avoid many of the steps and operations and can take dozens of hours off the time commitment.

But here's the trade-off: A kit's simplicity can limit your learning and sense of accomplishment. And, especially if you guide your project with the kit's instructions alone, the rewards won't be nearly as great.

If you're serious about building a guitar, I'd urge you to start from scratch. You may find the task to be the ultimate woodworking challenge, but it is definitely within your reach. I don't know who the world's best guitar-maker is, but I'm pretty sure he or she is working alone somewhere in a shop half the size of your garage.

Whether you build from scratch or from a kit, learn as much as you can about how to make a guitar play well. A great book that's helped many luthiers get started is *Guitarmaking Tradition and Technology* by William Cumplano and Jonathan Natelson (Chronicle Books, 1994). It will guide you through important choices like soundboard thickness and the shaping of the neck.

Above all, remember this: Traditional guitar makers do not have or need a lot of tools or equipment. They have and need a lot of patience, determination, and woodworking chops.

In the end, the ultimate challenge offers the ultimate reward—a handsome, playable instrument that you built from start to finish.

Jack Stone is a woodworking instructor at Palomar College in San Marcos, Calif.

NECK AND FRETBOARD

Don't fret. The spacing between frets is crucial to the guitar's sound, and especially easy to get wrong. So, even in advanced kits, the fingerboard is pre-slotted. Use a light dead-blow hammer to seat the frets.



Tip for attaching the fretboard.

With the neck temporarily attached, Vondriska uses a length of elastic from an old inner tube as a clamp when gluing the fingerboard in place.



A crucial joint simplified, but only a little. In many kits, the neck attaches to the body with a couple of bolts instead of a dovetailed key. The dovetailed key is more traditional, but many makers use a bolt-on neck for ease of construction and repair. You may need to carefully sand the neck's heel to adjust the fit and ensure that the neck meets the body at the correct angle.



readers gallery

MATTHEW BUNNELL

Kenwood, Calif.

Inspired by James Krenov's Pagoda Cabinet, Bunnell built this hutch around a claro walnut board that he found in a local lumberyard. The board had just been sold back to the lumberyard after 30 years because the original owner didn't feel he could do it justice. Bunnell hopes he has. He also used eastern black walnut and madrone in the hutch, which is 13 in. deep by 25 in. wide by 73 in. tall. The finish is Liberon finishing oil.

PHOTO: DAVID WELTER



JOE TRIPPI

Northville, Mich.

Trippi blended two different styles in this table. The form is strictly Hepplewhite, but the veneer species and patterns are based on Art Deco furniture. The table, 17 in. deep by 37 in. wide by 29 in. tall, is made from solid mahogany and veneer. The other veneers are sapele, ebony, bloodwood, narra, anigre, and ebonized poplar. The tabletop is finished with waterborne lacquer, and the base with shellac.



Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For submission instructions and an entry form, go to FineWoodworking.com.

SALVATION

The New Orleans-based Green Project (thegreenproject.org) operates a warehouse store and lumberyard to sell building materials that otherwise would go into local landfills. Their mission is to create a culture of creative reuse, salvaging materials from the waste stream, water supply, and wetlands. To promote that mission, the Green Project holds an annual, juried furniture exhibition and auction, The Salvations Salvaged Furniture Design Competition. The pieces must be made from reclaimed materials.

DAVID BERGERON

Thibodaux, La.

Bergeron calls this piece "Books or Booze" because of its storage versatility. The cabinet (16 in. deep by 36 in. wide by 32 in. tall) is built from salvaged cypress siding and beadboard, and the pine base is made from porch spindles. The interior paint was purchased from the Green Project, and the clear finish is polyurethane.



WILLIAM ROBERTS

New Orleans

A landscape architect, Roberts takes design cues from nature. This bench, 18 in. deep by 72 in. wide by 18 in. tall, was inspired by a bird's skeleton—delicate, durable, and lightweight. Using reclaimed plywood, Roberts knows he fell short on the lightweight part but designed the bench to look airy. The finish is polyurethane.



JOHN ROBERT PORTMAN

New Orleans

Working as an electrician in New Orleans after Hurricane Katrina, Portman started to save the lath that was being thrown out when walls were demolished. When he learned about the Salvations contest, he decided to make a table out of the strips. This table (26 in. deep by 45 in. wide by 35 in. tall) has more than 125 pieces of pine lath laminated together. The top panel is plaster with a lime wash finish, and the image transfer was made from a photograph he took of New Orleans oak trees. The finish is Pratt & Lambert Varmor, a urethane finish that Portman bought from the Green Project for \$1.



MATT THIBODEAU

Marine on St. Croix, Minn.

Thibodeau wanted this large curly cherry credenza (24 in. deep by 56 in. wide by 30 in. tall) to appear light, so he floated the case in the framework. Since the piece was destined for a friend's home office, Thibodeau used Blum Tandem drawer runners with Tip-On mechanical openers instead of pulls, so a soft push opens the drawer. The finished is hand-rubbed oil. PHOTO: ADAM GEISS



ED PIRNIK

Stamford, Conn.

While visiting family in Cuba, Pirnik bought some paintings at an art fair, and he also bought unassembled frames for them. Upon his return, he realized the frames were Spanish cedar, grown on the island. The woodworker in him knew the best use of wood from cigar country was not in a frame, but rather to line a humidor. The rest of the box is Honduran mahogany with rosewood veneer and wenge and holly edge-banding. It is 9 in. deep by 1½ in. wide by 5 in. tall, sealed with shellac and finished with lacquer and wax.



Online Extra

Watch Pirnik give highlights on how to build, line, and humidify a humidor in a video at FineWoodworking.com/extras.



PETE MICHELINIE

Portland, Ore.

This mahogany and poplar desk (20½ in. deep by 36½ in. wide by 32¼ in. tall) is a reproduction of a Newport block-front kneehole bureau attributed to Edmund Townsend (1736-1811). Michelinie considers the box his tour de force from two years at North Bennet Street School. It took about 500 hours to complete. The finish is linseed oil, shellac, and wax. PHOTO: LANCE K. PATTERSON

SETH KIEDAISCH

Andover, N.H.

THE BUTTERFLY KEY REBORN

When a client asked Kiedaisch to design a table with "those butterfly things and that ragged edge," he decided to have some fun. Instead of the typical slab-top table with traditional butterfly keys and an angular base, he built a very organic, curved base out of walnut. He did a lot of lumberyard sleuthing to find the bird's-eye maple slab top, and he played with the size and shape of the keys, curving them to mirror the base. Finished with oil and wax, the table is 20 in. deep by 50 in. wide by 15 in. tall.

PHOTOS: CHARLEY FRIEBERG (RIGHT);
SETH KIEDAISCH (BELOW)



HOW TO INLAY FREE-FORM KEYS



Design and cut the keys. Kiedaisch draws the keys on the tabletop, factoring in the lines of the crack he's reinforcing, the grain, and the overall shape of the table. Once he's settled on a layout, he traces the design and transfers it to the key stock with carbon paper. Then he cuts the keys on a fretsaw and cleans them up with a sharp knife.

Transfer and rout. Place the keys (as a general rule, the keys should be about one-third of the thickness of the top) on the tabletop and scribe around them with a sharp knife. Rout freehand close to the line, and clean to the line with a knife and chisel. Then glue in the key and flush it to the top.



LYNDDY McCaffery

Niwot, Colo.

This tiny scale (1/4 in. = 1 ft.) model of the Borgund Stave Church in Norway is one of three boxwood and applewood architectural models built by McCaffery. This one is an exact replica of the original, with all the joinery (mostly mortise-and-tenon and half-laps) and details reproduced exactly. The front and one side (left) are finished to show the completed architecture, while the back and other side (right) are left open to show the construction. The model is 8 in. deep by 6 in. wide by 6 in. tall, and the finish is polyurethane.



Some router bits need an offset fence

Q: I have a pair of edge-banding router bits (eagleamerica.com, No. 190-2075), but whenever I use them I get snipe at the trailing end of my plywood panels and the solid-wood edge-banding. What am I doing wrong and how can I fix it?

—MICHAEL BOURG, Weaverville, Calif.

A: THE BIT THAT CUTS THE PLYWOOD PANEL profiles the entire edge, leaving none of the original surface riding the fence. This creates a gap between the panel and the router fence on the outfeed side of the bit. So near the end of the cut, when the workpiece clears the infeed fence, it is free to plunge deeper into the bit, removing more from the trailing end than the rest of the workpiece.

The solution is to make an offset fence, where the outfeed side sticks out just a bit extra to make up for the wood you are removing from the edge. An easy (and temporary) way to do this is to tape a shim to the outfeed side that fills the gap between the panel and fence.

—Asa Christiana is
Fine Woodworking's editor.

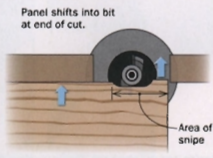
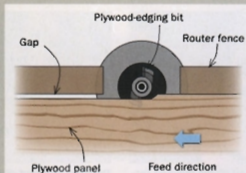
Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

The culprits. Some profiling bits remove wood from the entire edge, causing problems in the way the workpiece rides the fence on a router table.

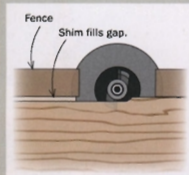
SNIPES HAPPEN AT THE ROUTER TABLE, TOO

These plywood-edging router bits cut a full-height profile on the edge of a panel, so the panel gets slightly narrower on the outfeed side. This creates a gap between the panel and router fence.



CORRECT IT BY SHIMMING THE OUTFEED SIDE

Because the workpiece is narrower, the fence needs to stick out more on the outfeed side. Use double-sided tape to add a temporary shim.



Smooth ride. The panel is supported after it leaves the bit, so you get a perfect cut the whole way.

Camellia oil outscores other rust preventers

Q: I've heard lots of FWW authors mention putting camellia oil on their chisels, plane irons, and such. Is that necessary for all hand tools? And what is special about that oil?

—JEFF KING,
Birmingham, Ala.

A: NOTHING WORKS BETTER AT PREVENTING RUST on woodworking tools than camellia oil. I became convinced of its effectiveness after working as the ship's carpenter on a 150-ft.-tall sailing ship for nine months. I knew the salt of the sea and my sweaty hands would corrode my tools quickly if I didn't protect them. So, I took some camellia oil and cans of 3-in-One household oil, WD-40 spray oil, and LPS-1 and LPS-2 lubricants. I tested all of them on my tools. Not only did the camellia oil protect them best of all, but the other oils also turned sticky and smelly on my tools.

I apply it to each of my hand tools when I'm done using it. Before I use it again, I wipe it down quickly with a rag so it isn't slippery, but there usually isn't too much left on the surface. Camellia oil seems to sink right into the grain of the metal, leaving behind little to no residue.

—Paul Schürch (schurchwoodwork.com)
is a furniture maker and marquetry specialist in Santa Barbara, Calif.



Sources of Supply

Camellia oil is available from many online retailers, such as woodcraft.com, lie-nielsen.com, and highlandwoodworking.com.

Camellia oil busts rust. Put to the test for nine months at sea, it did a better job than all of other products Schürch brought along. Use it after sharpening, especially if you use waterstones. Apply the oil after drying the tool.

Better dust collection for the bandsaw

Q: I'd like to add a dust-collection port to the door covering the lower wheel of my bandsaw. Where on the door should I put it?

—TOM MCGREEVY,
North Plains, Ore.

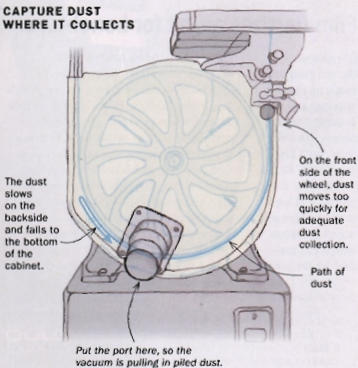
A: PUT THE PORT IN THE LOWER LEFT-HAND SIDE of the door, where the dust accumulates. I've found that it's easier to collect dust after it has settled than when it's still airborne. The lower wheel on a bandsaw turns clockwise, pulling the dust along with it. The dust has enough velocity to make it around the bottom, but as the wheel turns upward, it slows and falls to the bottom left-hand side of the cabinet.

—Michael Fortune is a contributing editor and bandsaw wizard.

Let gravity do its work. Dust typically collects in the lower left side of the bandsaw wheel housing.



CAPTURE DUST WHERE IT COLLECTS



Plane both faces equally when thickening by hand

Q: When using a power planer to thickness a board, it is common to remove wood from both sides of the board to minimize warping. But when doing it by hand, isn't more wood removed from one side than the other? Won't that cause warping?

—JOHN LEKO,
Huntsville, Ala.

A: **WHETHER YOU DO IT WITH HAND TOOLS OR POWER TOOLS**, if you remove more material from one side of the board than the other, it can cup. But the problem tends to take care of itself. Here's why.

First, start with a board that's close to the final thickness you need. For example, use a 4/4 board to get one 3/4 in. thick. Use a scrub plane to quickly remove any cup, twist, or bow. Follow up with a jack plane to level the surface and a jointer to straighten it. I've found that at this point about 1/8 in. of material has been removed from a typical board. When scribing a line on all four edges to mark the board's final thickness, you'll find you are removing about 1/8 in. from the other side, too. Flip it over and plane the board down to the line. If you need a board thinner than 3/4 in., begin to flip the board over, taking an equal amount from both sides until you reach the final thickness.

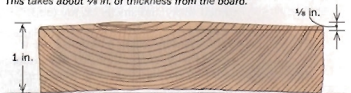
—Philip Lowe is a professional furniture maker and runs the Furniture Institute of Massachusetts in Beverly, Mass.



Go over the hump first. Flatten the convex side. On most boards, that removes about 1/8 in. Then put your planes to work on the concave side.

TO PREVENT CUP, HANDPLANE EQUALLY ON BOTH FACES OF A BOARD

1. Start on the convex side and remove the hump. This takes about 1/8 in. of thickness from the board.



2. Flip the board over and work the concave side. This also removes about 1/8 in. of thickness, leaving a 3/4-in.-thick board.



Film finishes aren't for benchtops

Q: I enjoyed Michael Pekovich's article on wiping varnishes and Waterlox ("Wiping Varnish: The Only Finish You'll Ever Need," *FWW* #218). I am building a bench out of hard maple. Is there any reason not to use Waterlox as the finish on the bench?

—KEITH
BIBELHAUSEN,
Duquesne, Iowa

A: **WATERLOX IS FINE FOR THE BASE**, but don't use it on the top. It's a film finish, which can cause problems on the benchtop. It can be slick, causing parts to slide around when you're working on them. And the benchtop needs to be occasionally flattened and it would be a pain to remove a film finish before doing that. Also, I scrape the top often to remove glue and dried finish and it's not good to scrape through a film finish in spots.

A penetrating finish, like linseed or Danish oil, is a better choice. I keep a can of Watco Danish oil around that I slop on and wipe off when I scrape through the finish. It never really builds a film, but it does prevent some moisture transfer and makes glue cleanup easy.

—Michael Pekovich is Fine Woodworking's art director.



Danish oil is easier to maintain. After flattening the top or scraping away dried glue, the finish needs to be repaired. A thick film finish would make that unnecessarily difficult, because you'd have to redo the entire top every time. Penetrating oils are the best choice. They're easy to apply and it's no problem to repair a small area.

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Dress up your furniture with surface carving

BY MICHAEL CULLEN



Surface carving adds depth and richness to any piece. But what intrigues and excites me most is repetitive patterns and texture, and the dynamic quality they bring to furniture. Walk past a piece with carving, and light dances on and off the carved surface, creating highlights and shadows that are in motion from every vantage point. Although this may sound dramatic, the effect tends to be subtle: It intrigues and suggests, inviting the eye to further inspect and enjoy the piece.

What draws me to this particular style of carving, as opposed to more traditional period designs, is the informality of both the execution and the product. Surface carving is simultaneously irregular and regular. Inconsistency is apparent in the individual cuts and yet the overall pattern is predictable and consistent. I'll take you through my process, from design to finishing. I'll cover a clear finish in this article, and you can turn to *Finish Line* (pp. 90-93), to learn how I enhance the carvings with milk paint.

A good design is simple but not perfect

My inspiration comes from observing everything in the environment: an old fence, the bark on a tree, even the pattern in a box of nails. Beyond inspiration is whether the pattern will translate well to surface carving. Simple patterns are best because the repetition is easily discerned. If a pattern is overly complex or "muddy," the eye becomes confused.

Another aspect of a successful pattern is a combination of irregularity and regularity. Inspect a pine cone, and you'll

see that the shapes of the individual segments and the spaces between them are unique, yet the whole pattern appears uniform, with both flow and life.

The right tools and materials

Good carving woods are those that render crisp lines, don't tear out, and hold together under the force of the gouge. Avoid open-grain woods such as oak and ash since that characteristic can compete with the pattern.

Whether you intend to paint or add clear finish to a carving plays a role in wood selection: Woods best suited for clear finish have even color and little grain. Pear, maple, mahogany, and many of the exotic woods are excellent candidates.

If you'll be adding milk paint to the carving, mahogany and walnut are at the top of the list. Both carve well in all directions and the grain is almost nonexistent. I choose hard woods such as maple or some of the exotics when the pattern has fine details or tightly curved cuts that push the strength of the material to the limit. On soft woods, such as cedars and some

CLEAN CUTS NEED SHARP TOOLS



Sharpen both edges. Cullen uses an Arkansas slip stone to refine both the inside and outside of a gouge.



Honing secret. Cullen has a great trick for final honing. Use the gouge to cut its own groove in MDF, put honing or buffing compound in the groove, and then pull the gouge through it backward.





Power and precision. When carving, your feet should be spaced wide apart for stability and your entire upper body should be applying power to the gouge. Place a hand close to the tip of the gouge and rest an arm on the workpiece to direct and control the gouge.

Get the basics down



The right angle. Each gouge has a correct angle that will produce a long curling chip, leaving a groove that is consistent in depth and width. Holding the handle too low will cause the tool to rise out of the workpiece, while holding the handle too high makes the gouge go deep until eventually the tips cause tearout on the surface. Give the tool only small taps with the mallet.

of the pines, carving is almost effortless but the tools need to be razor-sharp or the results will be poor. Basswood is a bit soft for furniture, so best confined to smaller items.

You can encounter strange grain in even the best carving woods, so always do a carving sample before committing to a large canvas of wood that may turn out to be extremely difficult and frustrating to carve.

Get started with a basic pattern

Before you begin carving, handplane or sand the surface to remove all machine marks. Sanding afterward dulls a carving's crisp lines. Make sure you remove all the sanding particles with a vacuum or compressed air to avoid dulling the tools.

My most basic pattern is the ripple because it reminds me of the small patterns water leaves on the beach. Although I use all sorts of gouge sizes to create variations on this theme, the most common is a #8/13mm gouge. The 8 refers to the sweep or curve of the tool, and the 13 to the width across the front edge in millimeters.

Subsequent cuts are made parallel to the first, paying particular attention to the proximity of the past cut and to creating a complementary depth. After half a dozen grooves, the pattern will begin to appear; the slight variations between cuts will impart a rhythm to the whole.

It's easier with a mallet—

There are two reasons for driving the gouge with a mallet: greater



By hand alone. In the less dense hardwoods, you can dispense with a mallet and apply power just by hand. This tends to produce a cleaner cut and is quicker, but it also requires more control. To avoid blowout, cut the last part of the groove from the far side (left).

Ripples on the sand. A series of grooves perpendicular to the grain was inspired by the patterns on a beach left by the tide.



Intricate leaf pattern works well on smaller surfaces

Work from the center. With a #12/6mm or similar V-parting tool, begin carving the "leaves" that overlay the others and work from each center toward the outside.



Central groove adds texture. Use a double-beveled knife to create a stop cut down the middle of the leaf (left). Then use a #9/3mm gouge to make relief cuts (above) creating a V-shaped, textured groove.



Complementary. The leaves carved in the pearwood sides of this jewelry box work well with the tiger maple drawer fronts.

ease when cutting through dense woods, and more control in all woods. In denser material, the mallet becomes important because it gives absolute control over how fast or slow the gouge cuts.

However, while heavy hits with the mallet create long cuts, they leave evidence of where the stroke begins and ends. It is better to make quick, light taps that drive the gouge more delicately and with more continuity through the material. The cut should appear as if the gouge simply swept through the wood unimpeded.

It's faster by hand—When carving without a mallet, the hand gripping the tool in the forward position (straddling the handle and the steel) plays the part of the brake, while the hand at the back is the driving force. It requires practice and a high level of coordination between both hands to avoid disaster. Once you're comfortable with a mallet you can try switching to hand power, but begin with narrow tools and shallow cuts.

Carving concentric circles

One of my favorite patterns is Spring Rain (see p. 88), a pattern I developed after watching raindrops on puddles outside my workshop window. Years ago, I spent a great deal of time laying out the concentric circles with a compass. As I learned to love the slight irregularities found in nature, I abandoned the compass for free-drawn circles, which brought immediate spontaneity and life to the pattern.

I carve this pattern using a V-gouge (#12/6mm). Carving circles takes practice and is best done with the aid of a mallet. The tool should move almost effortlessly through the wood, creating a V-groove of uniform depth and width. Gently walk around the piece while tapping and guiding the gouge to create one seamless circle. Slight variations between the freshly cut circles are desirable, but avoid obvious straight sections or wild cuts off course because these create a disquieting effect in the overall pattern. Avoid going back to fix a cut that may appear slightly off or not deep enough. It's better to leave the minor imperfection than to risk increasing the problem.

A variation on this pattern is one I call the Thousand Suns (see p. 88). After completing the Spring Rain pattern, use a #8/7mm gouge and a mallet to dish the surface between the V-grooves. This is a challenging cut, loaded with risk, so practice before attempting the final piece. Controlling the gouge as the grain changes direction around the circle is crucial. More than likely you'll need to make the cut from several directions to avoid tearout.

Texture adds subtle support

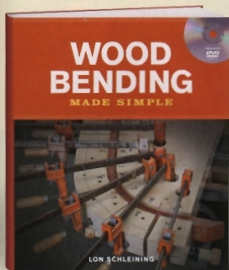
If pattern is the lead actor in surface design, texture typically plays a supporting role, adding details that set off the carving.

The pattern called Fields (see p. 88) combines a straight version of the Thousand Suns with some texturing. After laying out the pattern and cutting the V-groove and furrowed sections, I texture the uncarved sections using a small gouge (#9/3mm). Don't use a mallet—you need a light touch and

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Concentric circles look best on large surfaces

Top to bottom. As with all overlapping patterns, start by cutting the top elements first (in this case, the small "raindrops" that fell most recently) and then the larger background ones.



Sun spots. A variation on Cullen's "Spring Rain" (far left) is "Thousand Suns," (near left) where he cuts a shallow furrow between the grooves using a #9/5mm gouge.

careful cuts to create an overall uniform texture. The trick to making clean cuts is to roll the gouge as it cuts through the fibers. When the texturing is complete, note how it recedes in comparison to the adjacent patterns.

Selecting a finish: color or clear?

Unpainted carvings can be both stunning and understated, imparting a subtle beauty and elegance that is unmatched. I seal the wood with Danish oil or preferably a thin coat of shellac. Finishes that build quickly tend to pool in the grooves, leaving unsightly shiny spots. You also want to avoid sanding because it can easily eliminate details in the carving. Typically, after sealing, I apply a light coat of wax with 0000 steel wool to burnish the surface and even out the luster.

Michael Cullen's studio furniture can be seen at michaelcullendesign.com. His work also was featured on the back cover of FWW #184.



Combine texture and patterns



Extra texture. In Cullen's Fields pattern, cutting lines of small hollows adds interesting texture to the surface.



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BURNISHED

Accentuate carving with color

CREATIVE USE OF MILK PAINT GIVES TEXTURED SURFACES A NEW DIMENSION

BY MICHAEL CULLEN

The majority of my carving ends up under several coats of milk paint. This may seem strange to woodworkers used to “bringing out the natural beauty of the wood,” but adding color to a carving is one of best ways to highlight the design and to define the pattern (see Master Class, p. 84).

Because wood grain is a pattern in itself, there is always the potential for it either to compete with the carved pattern or to wholly overwhelm it. What I like best about milk paint is how it combines with the wood to form more of a patina than an

opaque coating. It doesn't obliterate the grain; it merely tones it down so that the carved pattern can take center stage.

In addition, the paint and my method of burnishing the high points add a sense of depth to the carving, creating subtle highlights in the piece with the changes of hue between the surface and background.

Several coats of one color and a clear topcoat

Make sure the carving is free of dust and that any non-carved surface due to be painted is well-prepped. The paint tends to

highlight imperfections, so remove any machine marks. I buy my paint from The Old Fashioned Milk Paint Company (milkpaint.com). The color selection, inspired by colonial New England, is excellent and foolproof. It's virtually impossible to create a bad combination.

Use inexpensive brushes because the lime in the paint is hard on bristles.

Begin applying the paint in line with the carving, in this case along the grooves of the ripple pattern, making sure the paint is getting down into the grain and that there are no missed spots.

The trick with milk paint is to always maintain a wet edge. If you add wet paint next to dry, the colors will not match, leaving evidence of where you stopped and resumed painting. Touch-

MIX UP A BATCH

Combine water and paint powder in the ratio recommended on the packet. Let it stand for 10 minutes and then adjust the viscosity to that of heavy cream. The quick-drying paint will stay usable for 24 hours, allowing you to apply multiple coats.



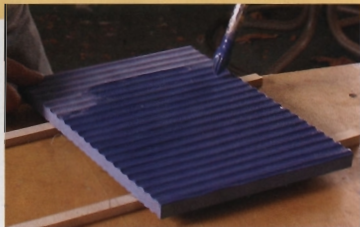
SELECTIVE SANDING



The basic burnished look



Apply coats thinly. Work the first coat into the wood. Aim for a thin, even coating but don't expect to cover all the wood.



Build the paint. Sand the surface only if there are brush filaments or chunks of paint stuck in it. Apply the second coat like the first.



Burnish the high points. After two or three coats of paint, rub the dry surface with 0000 steel wool. This will burnish the paint, smooth the ridges, and reveal some wood on corners.



Clear-coat the paint. A thin coat of shellac is Cullen's favorite for sealing surfaces that will be handled only lightly. Tabletops can receive a more durable finish such as polyurethane.



Wax finishes the finish. To lower the shellac's sheen, apply paste wax with 0000 steel wool and then polish the surface with a soft cloth.

Sand the high spots to create two shades from one color



Selective sanding. After the last coat of paint has dried (but before any clear coat), smooth the high points of the surface with P320-grit sandpaper.



Burnish the ridges. Stretch some 0000 steel wool tightly in your hand and move it briskly across the surface, going perpendicular to the grooves. Create a contrast between the darker, burnished ridges and the paler, unaltered milk paint in the grooves.



Finish the ridges. Apply finish just to the flat surfaces and not in the grooves, using a French polishing-style pad.

ups should be avoided for the same reason—it's safer to repaint the entire surface than to risk highlighting a mistake.

When you've finished the whole piece, let the paint dry for an hour or so. At this point, the painted surface should be dull and chalky to the touch. If there are any nibs or bristles embedded in the paint, remove them with a light sanding with P320-grit sandpaper. Add one or two more coats until the surface is thoroughly covered and appears rich and opaque.

With the color complete, I rub with 0000 steel wool in the direction of the grooves. The objective is to burnish the entire

surface and to create an accent of wood peeking through at the carved edges. The burnished paint should appear rich like polished stone and without any cloudiness. As for the exposed wood, lime in the milk paint affects tannins, so mahogany, for example, should appear deep red. If you remove too much paint, leaving too much wood showing through, recoat and repeat the rubbing-out process.

Now apply a clear finish to protect the paint from stains and general dirt. It's important to note that after a clear finish is on, applying more milk paint is no longer an option (milk paint

Layers of contrasting color add interest and character

Contrasting colors. Brush on a couple of thin coats of the base color. Don't aim to get total coverage (right). Once the first color is dry, brush on two coats of a contrasting color (far right).



Reveal the color underneath. Sand the surface with P320-grit sandpaper and then rub the surface with 0000 steel wool to cut through to the first color in places.



Color and carving combined. When a clear finish is applied, it highlights the two contrasting paint colors as well as the bare wood.

adheres only to itself or to bare wood). If the piece is not going to be handled, then just apply some wax—it's fast and the result is pleasing to the eye. Be aware that the clear coat will deepen and change the hue of the paint.

After the clear coat has dried, use steel wool and paste wax to cut the sheen and give the surface a pleasant feel.

Give one color two shades

This is a great technique because it requires only one color of paint but renders two shades. Apply two to three coats of color to the carving. Next, carefully (and I mean carefully) sand only the flat surface of the carving using P320- or P400-grit no-load sandpaper. Sand lightly to burnish the surface without removing too much paint.

Now, further burnish the surface using 0000 steel wool, making sure to touch the sanded surface only. The top surface should appear polished and the recesses (the carved areas) should appear slightly lighter in hue with a chalky appearance.

You can accentuate the color difference further by applying finish to the burnished areas only. If you get finish in the wrong area, sand it off and apply more milk paint to the carving. This technique should be used only on pieces that will be handled rarely, such as picture frames or candlesticks.

Apply one color over another

Apply two or three coats of the base color as above; then apply a contrasting color until it fully covers the previous one.

Rub the surface with steel wool until both the first color and the wood show through. The idea is to achieve balance and harmony among all the colors and not have one area appear to be worn more than the rest. When you are happy with the look, add a clear coat and wax.

Apply colors selectively

Apply two or three coats of the base color and don't rub it out. Now dab on streaks of two or more complementary or contrasting colors with a medium-size brush. Blend the colors to give a natural appearance. You can further soften the colors or even remove them by manipulating them with a wet cloth. Sand the surface with P320 or P400-grit paper and/or steel wool until it appears burnished and has the right amount of wood peeking out at the edges. Last, clearcoat and wax the carving.

Studio furniture maker Michael Cullen's work can be seen at michaelsculledesign.com.

Dab on color for a mottled look



Streaks of color.
After the base color is dry, add dashes of complementary colors to the surface. Try to be random rather than deliberate.

Soften the edges.
Before the streaks of paint fully dry, dab them with a damp cloth (below) to blend them into each other as well as the base color.



Contrasting carvings. The whole surface was finished in the same way, but the flatter surface of Spring Rain on the right retains more complementary colors, while the ridges on Thousand Suns on the left are sanded through to the wood.



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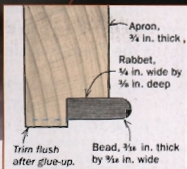
ADVERTISER	Extension	page #	ADVERTISER	Extension	page #	ADVERTISER	Extension	page #
Adria Toolworks, Inc.	5022	p. 95	Gorilla Wood Glue	5011	p. 11	Powermatic	5077	p. 31
Affinity Tool Works	5031	p. 9	Guillemot Kayaks	5007	p. 94	Pygmy Boats	5037	p. 95
Alderfer Lumber Co.		p. 95	Hearne Hardwoods, Inc.	5015	p. 7	Quality Vacuum Products		p. 3
Allard & Associates, Inc.	5051	p. 95	Heritage School of Woodworking	5016	p. 96	RadarCarve.net	5006	p. 7
Banner Hill School of Fine Arts & Woodworking	5046	p. 95	Highland Woodworking	5066	p. 9	Rare Woods USA	5049	p. 94
The Beall Tool Co.	5013	p. 95	Inside Passage School of Fine Cabinetmaking	5002	p. 7	RichLine Wood Working Machines		p. 7
Berea Hardwoods Co.		p. 17	JDS Company	5033	p. 7	Scherr's Cabinet & Doors, Inc.	5056	p. 25
Berkshire Products	5054	p. 96	The Japan Woodworker	5050	p. 31	States Industries	5041	p. 31
C.R. Muterspaus Lumber	5043	p. 95	Kay Industries	5005	p. 25	Steel City Tool Works	5047	p. 25
Cabinetparts.com	5003	p. 94	Keller & Company	5027	p. 95	Stratton Creek Wood Works	5063	p. 95
Center for Furniture Craftsmanship		p. 11	Kempston Corporation		p. 11	Taunton Store		p. 27
Certainly Wood	5032	p. 96	Kreg Tool Company	5012	p. 17	Thebond	5045	p. 7
Chicago School of Violin Making	5014	p. 94	Laguna Tools	5071	p. 21	Vacuum Laminating Technology	5062	p. 9
Clear Vue Cyclones	5073	p. 25	Laguna Tools	5070	p. 83	Vermont Woodworking School		p. 94
Connecticut Valley School of Woodworking	5052	p. 83	Lie-Nielsen Toolworks	5053	p. 3	Whitechapel, Ltd.	5068	p. 7
Contempo Living	5018	p. 95	Lignomat	5036	p. 31	Whiteside Machine Company	5028	p. 25
Cook Woods	5038	p. 94	Londonderry Brasses		p. 11	Willard Brothers Lumber	5057	p. 13
Craftsman Studio	5034	p. 94	M.L. Gordon Company	5060	p. 94	Williams & Hussey	5074	p. 17
DK Power Equipment		p. 9	North Bennet Street School	5008	p. 13	Windsor Chair Workshops	5029	p. 95
Epifanes	5023	p. 17	Northwest Woodworking Studio	5037	p. 95	Wood Stream Services		p. 95
Felder Group USA	5035	p. 13	The O'Donnell Classical Institute	5067	p. 95	Woodcraft Supply	5009	p. 2
Fine Woodworking eBooks		p. 59	Oneida Air Systems	5065	p. 3	Woodmaster Tools	5026	p. 89
Fine Woodworking Online Store		p. 87	Osborne Wood Products	5064	p. 89	Woodrats	5075	p. 13
Forrest Manufacturing	5058	p. 3	Osborne Wood Products	5010	p. 9	Woodworker's Source	5042	p. 95
Furniture Institute of Massachusetts	5055	p. 95	Peck Tool Company	5001	p. 94	Woodworker's Supply	5076	p. 13
Goby Walnut Products	5024	p. 94	Phase-A-Matic, Inc.	5004	p. 83	Woodworker's Supply	5072	p. 83
			Philadelphia Furniture Workshop	5017	p. 95			

how they did it

Curved beading along a scalloped apron

BY JONATHAN BINZEN

The curved ebony bead along the lower edge of Peter Shepard's bureau (see the back cover) punctuates the graceful scalloped apron. Shepard makes the bead in arced segments—four across the front and two on each side—by laminating strips of ebony veneer. He glues these into a rabbet on the bottom of the apron. The front apron is not structural, but is face-glued to the bottom front rail of the carcass.



1 Make the curved bead



Ebony veneer becomes a bead. Shepard glues nine strips of ebony veneer between curved cauls to make each 1/4-in.-thick segment of bead (he made both cauls at once from a single piece of MDF using a router on a long trammel arm). Once the bent-laminated bead is cured, Shepard uses a handplane inverted in a vise to joint one edge of the bead.



Shape the bead on the router table. Shepard uses a 1/4-in. radius round-over bit, running the bead stock against MDF fences cut to the same radius as the clamping cauls. He rips the beads to final width on the bandsaw.

2 Inlay the bead into the apron



The bead rests in a rabbet. Shepard creates a rabbet by first routing a scalloped groove along the maple apron, using an MDF template and bearing-guided bit (left). Then he bandsaws the waste, leaving a rabbet.



Gluing the bead. After cleaning up the rabbet with a chisel, he begins the glue-up by dry-clamping one bead segment and gluing in the one beside it.

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Pursuit of Perfection



Peter Shepard was 40 when he first used a handplane. After 15 years in publishing, he had quit his job as a book editor and was searching for something more fulfilling. With no background in woodworking beyond general carpentry, he signed up for a course in the fundamentals of the craft that was held on weekends at Boston's North Bennet Street School. "I really didn't know where it was going to lead," he says, "but woodworking seemed like a risk worth taking." That was in 1992, and since then Shepard, who lives in Harvard, Mass., with his wife and three children, has been designing and building furniture full time.

As a harried editor, he was frustrated to see his work published before he'd had time to perfect it. As a woodworker, he won't let that happen. Rather than continually designing new pieces, Shepard builds a handful of designs repeatedly, making slight improvements each time. He built this bureau—sibling to a number of other chests he's built—from a flitch of curly maple, lavishing time on the arrangement of the wood, the joinery, the ebony details, and the finish. "It's wonderful to do things as thoroughly and as well as you want to," Shepard says.

—Jonathan Binzen

How They Did It Turn to p. 98 to see how Shepard makes the curved ebony bead along the lower edge of this bureau.

Pro Portfolio For an audio slide show featuring earlier versions of this chest, plus a range of Shepard's work, go to FineWoodworking.com.

Photo: Dean Powell