

8 PROJECTS – 40 PAGES OF IN-DEPTH PLANS INSIDE!

BANISH ROUGH FINISHES FOREVER: EASY FIXES FOR 2 MISTAKES

DECEMBER 2002
ISSUE #131

Popular Woodworking

EARLY AMERICAN CORNER CABINET

**So Easy to Build –
When You Know
Our Secret**

14 Best New Tools

**Our Completely
Biased List of the
Cool Tools of 2002**

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- \$35 Rolling Clamp Cart
- Turned Bottle Stoppers



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contents

Popular Woodworking



30

TOOLS AND TECHNIQUES

22 Pegboard Problems Solved

TRICKS OF THE TRADE

Pegboard is useful – in theory. Most pegboard hangers fall to the floor when you just look at them wrong. Here finally is a cheap and easy solution. Plus, learn to center your routed mortises on your stock every time.

30 Grizzly's Great \$375 Band Saw

TOOL TEST

Somehow Grizzly has managed to build a high-quality 14" band saw loaded with features for only \$375. We take it for a spin and report the results. Also, check out our test of Lie-Nielsen's backsaws. Could they be as good as Japanese saws?

36 Clamp Caddy

INGENIOUS JIGS

This simple mobile cart holds a ton of clamps and makes them easy to grab when you need that one extra pipe clamp, C-clamp, F-clamp or handscrew.
By Nick Engler



36

40 Best New Tools of 2002

Every year we test and use dozens of new woodworking tools. This is our personal (and biased) list of the best new stuff we've seen during the last 12 months.

66 Using the Shaper

When set up and used properly, the shaper is a safe, powerful and highly productive machine. This basic class in shaper use ensures you'll make lots of moulding safely by taking the right precautions.

By Lonnie Bird



66



40

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ON THE COVER

The corner cupboard of your dreams is within your grasp thanks to the detailed plans, photos and instruction from Contributing Editor Glen Huey. The secret to success is in the shelves.

Cover photo by Al Parrish

IN EVERY ISSUE

10 **Out on a Limb**
Eight-hour Armoire?

12 **Letters**
Mail from readers

16 **Q & A**
We answer readers' most difficult questions

92 **American Woodshops**
George Reid

98 **Flexner on Finishing**
Reducing Brush Marks and Orange Peel

101 **Caption the Cartoon**
Win a Freud FJ85 jigsaw

104 **Out of the Woodwork**
Barn of the Damned by Walt Akers

PROJECTS

46 Under-the-Saw Cabinet

At last, the best way to put every single inch of valuable storage space under your table saw's wing to good use. Store blades, bits, wrenches and safety equipment on one side. The cabinet shelves on the backside are perfect for hand-held power tools.



58 Traditional Hanging Shelves

Quick, Christmas is coming and you've got no time to build those highboys you promised to your nieces. These easy and great-looking shelves will buy you some time – at least until next year.

By Troy Sexton



62 Turned Bottle Stoppers

Is turning pens getting tiresome? Professional turner Charles Turnage shows you how to set up your lathe to turn a set of nice stoppers for wine bottles.

By Charles Turnage

71 American Corner Cabinet

Do not be intimidated by the angles in this project. With our plans and photos, just about anyone can build this stunning American icon.

By Glen Huey

80 A Craftsman's First Toolbox

Give the young ones in your life an early start in woodworking with this nice set of safe wooden hand tools. They look so nice, you might want a set for your toy box (uh, toolbox), too.

By Joe Hurst-Wajszczuk

86 Mobile File Cabinet

A sleek contemporary project that can help get your bills or business files in shape. Biscuits, plywood and edge-banding make it easy to build.

By Chris Gleason



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Eight-hour Armoire?

Popular Woodworking takes on *WOOD* before a TV audience in the battle of the 'Warehouse Warriors.'

How about this for working under pressure? Challenge your biggest rival (*WOOD* magazine) to go head-to-head on a woodworking project before a nationwide television audience. Well that's what we did when the DIY Network's program "Warehouse Warriors" taped a day-long program showing each magazine's team of three staffers designing and building an armoire.

If you haven't seen the show, here's how it works: With no advance notice, each team is given the same project to build in eight hours. Teams have identical supplies and tools. Neither team knows how the other team is progressing or what design their opponent has created until time has run out. A panel of judges scores each project on design, creative use of materials, craftsmanship and level of completion.



Now if you think building an armoire in eight hours (even with three guys) sounds challenging, consider that you don't get eight hours at all. In reality, while the clock keeps ticking, you have to stop while the host asks you questions. There's no time out for lunch or bathroom breaks. In all, we had six and a half hours to conceive the project, work out the details and cutting list, then build and literally slap a finish on it.

So what did we build? The exterior was a contemporary-styled armoire from oak plywood capped with a formed metal "bonnet." On the interior, we went wild. It was no clothes closet, that's for sure.

The lower interior right-hand section featured a cabinet with a sink built into a laminate countertop. To its left was a small refrigerator. The upper section featured shelving for entertainment center equipment.

The upper and lower sections each had grain-matched overlay doors. We dubbed our wet bar/entertainment center the "Playboy After Dark" model. The only element we planned but didn't have time to install was a mirror above the countertop's back splash.

The program is relatively new and had never had pro woodworkers on as contestants, as was evident by a number of remarks by the host. For example, after the first hour and a half, we were just completing the design and cutting list. The host seemed really panicked because we hadn't started building. He didn't seem reassured when I explained that planning was the most critical phase and the project would take twice as long if we were fixing mistakes. Much later, the host seemed astonished as he said, "Wow, it

looks exactly like the design! That's never happened on the show before!"

How did the *WOOD* magazine team do? They built a nice piece, but I'll show my prejudice and say that to call it an "armoire" was a stretch. Have you ever seen an armoire that had a bench in front of it with open shelves above that? At the buzzer, they still had some work to do, although you really couldn't tell. They later admitted to planning four doors that didn't get built or hung.

And the winner? Well, check your local listings and you be the judge. The official outcome? For those of you who can't get the program, let's just say we didn't lose. **PW**

Steve Shanesy
Steve Shanesy
Editor and publisher

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SAFETY NOTE

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand. Safety First!

Tape Measures are for Southpaws?

Why Do the Numbers Read from Left to Right on Traditional Tape Measures?

Bet this question will stump you as it has me and those I've asked. First, let's assume you're right handed, as most people are. Grab a tape measure and hook the end on a piece of wood you intend to mark for a cut-off length. Do you normally grab the tape measure with your left hand, hook it on the right end and mark the measurement with your right hand? Or, do you hold the tape in your right hand, hooking it on the left end and mark where you want to cut with your left hand?

I have asked many woodworkers, hardware store employees and construction workers. Every person I've asked is right handed and pulled the tape out to the right.

Now, notice that when pulling out the tape to the right the numbers are printed upside down – not on just some tape measures, but all of them, as well as steel and wooden rulers – even the ones that have measurements on both sides. Why are the numbers always upside down? I'm guessing that there's some reason for this convention, but no one I've asked has had a clue. In fact, most people reply that they've never thought about it, or they just learned to read the measurements upside down. Several said, "Thanks a lot! Now it's going to bother me, too!"

The closest thing I've found to a tape measure having numbers on the "reading" side are those that have numbers turned sideways so that if you're holding the tape vertically, the numbers are right-side up going down the tape.

Do you have any idea why all tape measures and rulers are marked this way?

Margo A. Kanthak
St. Cloud, Minnesota

Editor's note: Curious ourselves, we asked Adam Weeks, the product manager for Lufkin's measuring tools. His response: "If I only had a nickel..." he says. "The answer is one word:

Tradition." When companies such as Lufkin (and others) have introduced tapes that read right-to-left, a curious thing happens. "All we get are returns and complaints that the blade is upside down," Weeks says. Lufkin has recently introduced a Quickread tape that runs the numbers vertically, which keeps you oriented.

However, if you want to try a tape measure with the numbers running right-to-left, you can buy one from Lee Valley Tools (800-871-8158 or www.leevalley.com).

Table Saw Tilt Has More to do With Tearout Than With Safety

I've been following everyone's "concern" over the right- vs. left-tilt table saws with more than a little curiosity. I've heard and read this discussion more times than I can count, but this is the first time that "safety" seems to be the concern. With most woodworking tasks, the operator's safety is more assured by procedure, not equipment design (though equipment design helps).

The big difference between left- and right-tilt table saws is in the way the blade cuts the work piece. When cutting a bevel with the traditional right-tilt blade, the blade exits the work piece at the thinnest point of the bevel. With some woods and wood products, this guarantees tear-out. When cutting a bevel with a left-tilt blade, the blade exits

continued on page 14

WRITE TO US

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

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LETTERS

continued from page 12

the work piece at the thickest point of the bevel, thus minimizing tearout.

With a traditional setup and a left-tilting blade, you can make accurate, clean bevel cuts on wide work pieces. The width of your work piece is severely limited if you have a right-tilting blade and move your fence to the left of the blade to make the cleaner cut.

Joe Klocek

Overland Park, Kansas

One Last Word on Radial Arm Saws

I will disagree with most of the statements Mr. Wilbert Freid of Sarasota, Fla., made in defending the radial arm saw in the June issue. Yes, a radial arm has an anti-kickback feature and a blade guard. But the majority of all new table saws have basically the same blade guard, splitter and anti-kickback features. If your table saw doesn't have these features, they are easily purchased through catalogs or tool suppliers. It is just so much safer to rip on the table saw.

Making square crosscuts cuts on the radial arm requires attention to detail. Because the saw's carriage rides on an arm projecting across the table, any slight bump of the arm will cause the blade to go out of square. It usually takes several minutes to readjust the saw. On the table saw, adjustment to the miter gauge takes only seconds.

The only real advantages the radial arm saw has are with specialty operations, such as using moulding head cutters for raised panels, or attaching a drill chuck for drum sanding. To me though, the greatest advantage the radial arm saw has is the ability to attach a dado head cutter. With this it is possible to cut dados in wide and long material without having to move the material during the cut. It is also possible to easily cut compound dados with the radial arm saw.

While radial arm saw users might love their machine, I do suggest they learn to love their table saw. The table saw is your best friend in the shop. **PW**

Jeff Freerksen

Albany, Oregon

CORRECTIONS

Popular Woodworking corrects all significant errors. For a list of corrections to the magazine (or to report one), visit our web site at: popwood.com/features/mag.html

Simple Steps to Perfect Planed Edges

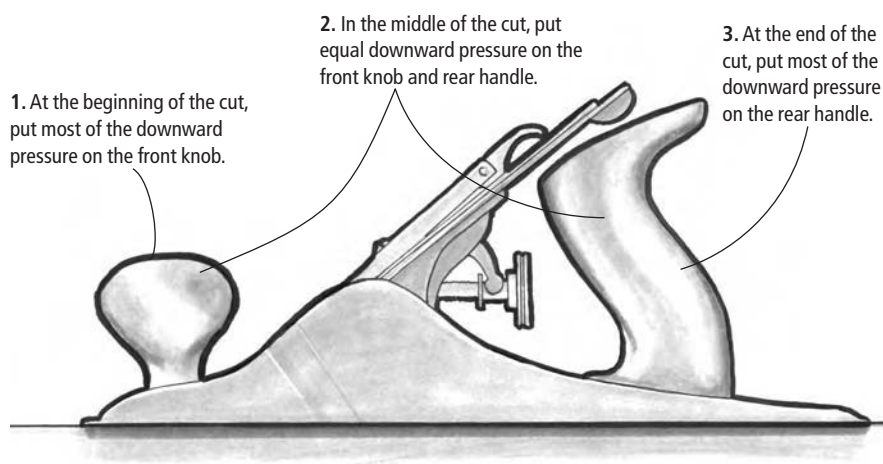


Illustration by Hayes Shaney

How To Avoid Valleys, Tapers and Rounded Edges on Hand-planed Edges

Yesterday was a milestone in the development of my hand plane skills. I managed to get two square and level edges on a 2 x 4 that I've been making into shavings.

I first squared it all up on my jointer, and then made a mark $\frac{1}{8}$ " down from the edge. The goal was to plane it down to the mark and leave it level.

Well...things took a bit longer, and the board is a bit thinner than I had anticipated. There was a definite high side and low side in the cross-section of the board.

I'm left-handed and I work from left to right. Standing next to the board at the left-hand side, the far corner was lower than the one closest to me on the left end. On the right end of the board, the opposite was true. So I flipped the board around to level it out and did it again and again and again.

Then I also noticed I was making a wonderful taper, so I worked that out and found I'd managed to dish it a little...then rounded it a little (starting to get the picture?). Finally, with quite a bit of shavings laying around I managed to get it level and square. But dang if I know exactly how I did it.

Any tips on how to not taper or dish or hump the work piece? I know your advice on the keeping the edge square: Get the Veritas magnetic jointer fence.

Russ Kinsey
via the internet

You are on your way now. The jointer fence will keep your edge square to the face sides, but eliminating tapers and dishes is a matter of checking and controlling three things:

1. Is your iron projecting squarely from the mouth? Check your lateral adjustment lever.
2. Is your plane long enough not to ride the hills and valleys of the board? Edge jointing anything longer than 30" or so with a jack plane requires skill. Longer than 30" is best with a #7.
3. Are you putting pressure in the right places at the right time? At the beginning of the cut, put most of the downward pressure on the toe. In the middle of the cut, use even pressure front and back. At the end of the cut, put pressure on the heel of the plane.

There are other things to look for, too. Is your vise holding the work perpendicular to the floor and the benchtop? Most people never check this. It can make a significant difference. You might have to shim the faces of your vise.

continued on page 18

If you're not using the Veritas jointer fence, are you skewing the plane body (10° to 15°) during the cut? Doing this will increase your accuracy. I'm not sure why, but it does. You still want to keep the entire length of the sole in contact with the edge, but skewed.

Most of all, just keep at it. Practice on wider face grain, too. It took me a while to get the hang of it. It's like riding a bicycle. You can't really describe how to balance on one, but if you do it enough you will get it. Everyone does.

— Christopher Schwarz, senior editor

German Mystery Finish is Likely a Tinted Wax

When my company sent me to Germany for a two-week training mission I discovered my Bavarian counterpart was also an enthusiastic woodworker. Touring his beautiful home and shop, I noticed most of his work had a satin natural finish to the wood. The type of finish and method of application he used was as unfamiliar as his native tongue.

The finish was a liquid called "wachsbeize," pronounced ("vox-bizuh") and is literally translated as "wax corrosion." It is applied with a soft paint brush, allowed to dry about six hours then buffed out with a special brush that resembled a shoe shine brush but with a slight difference. Interspersed with the bristles were pieces of leather about 1/4" wide, 1/8" thick and the same length as the bristles. The finish could be applied with one coat or several coats but only buffed after the final coat.

When I returned home I was unable to locate anything resembling this type of finish, so my friend has to keep me supplied from overseas. I would like to find out more about this type of finish because I like the natural luster it gives to the wood, but I am concerned with its durability.

John Hooper
via the internet

After some research, I'm almost certain the finish material is simply a wax with stain mixed in. This would also explain the final buffing with the shoe-brush-type tool.

There could be more to it than this, but probably not. Assuming I'm correct, you really aren't getting much protection for your wood from a finish such as this. Wax by itself provides the least protection of all wood finishes. Briwax

(800-527-4929) makes a sprayable tinted wax that should duplicate the German finish.

— Steve Shanessy, editor and publisher

Are Long Sleeves Unsafe in the Shop?

For some time, I have been an enthusiastic reader of your magazine. I have completed many of your fine projects and hope to continue this enjoyable activity. As a retired aerospace executive, I now have time to spend serious time on woodworking, which I love. I teach the Incra Jig and router techniques at Rockler's and have a number of apprentices in building fine furniture. Sorry about the boring personal information, but I need you to know that I am serious about safety, as I know you are.

Accordingly, I was astonished to note that on the cover of your August 2002 issue, your model is in a classically unsafe situation: namely with shirt sleeves half rolled up! Short sleeves are best; long sleeves buttoned are second-best. But half-rolled up? Never! The buttons can open and a sleeve becomes an accident waiting to happen. I never allow my students to follow this very unsafe practice. (It's curious to note that the man in the advertisement on the back cover is also making the identical mistake!) Are you unsafe cover to cover?

I know safety is vitally important to you and to all woodworkers. Please do not repeat this dangerous practice.

Ken Waltz
via the internet

Thanks for your note and we're glad to hear you like the magazine. The rule I learned at Los Angeles Trade Technical College is actually, "No Long Sleeves Down," but rolled up is OK. The editor on the cover had his sleeves rolled up to just below the elbow. You are certainly correct that short sleeves are best.

The only real textbook I know of regarding woodworking is "Cabinetmaking and Millwork" by John Feirer. It says: "Wear tight-fitting clothes with sleeves buttoned. If it is not too inconvenient, roll up your sleeves. Tuck in your shirt and when necessary, wear a shop coat or apron." Some of these "sleeve questions" may have to do with those of us living in a cold climate.

Again, thanks for your comments. **PW**

— Steve Shanessy, editor and publisher

No More Falling Pegboard Hooks

THE WINNER:

I recently made a display cabinet to hang my tools that incorporated pegboard. I never liked the metal hangers (which are prone to fall off), so I looked for an alternative.

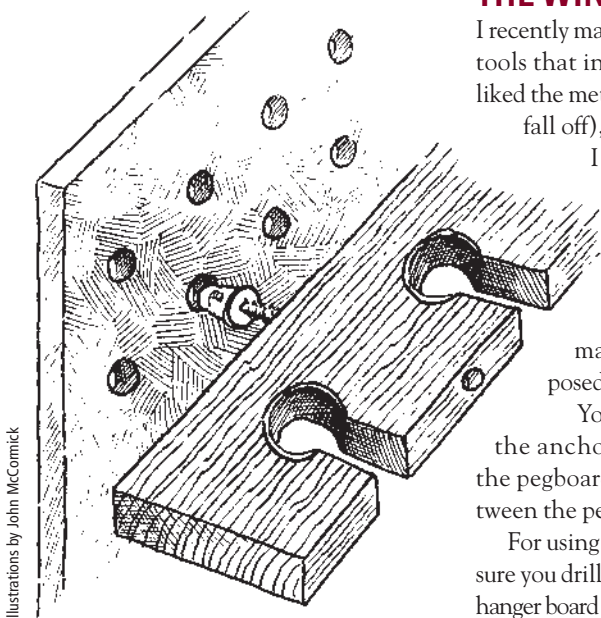
I found that 1/4" plastic drywall anchors fit perfectly into a pegboard hole. This allows me to easily mount any custom-made hanger or small shelf. You also can simply hang many of your tools from the exposed screw heads.

You might need to trim the tip of the anchor to allow clearance behind the pegboard depending on the space between the pegboard and your shop wall.

For using tool hangers as pictured, make sure you drill a recess in the back edge of the hanger board to cover the anchor head (which always sticks out from the pegboard). This way the tool hanger will mount flush.

*David Lunzman
Bainbridge, New York*

continued on page 24



Illustrations by John McCormick

CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish woodworking tips and tricks from our readers that we think are useful. We want to encourage you to share with your fellow woodworkers, as well as reward the most useful and original concepts. Porter-Cable and Oldham have agreed to lend us a hand with that. And the author of this issue's winning trick receives the Porter-Cable 7518 3 1/4 horsepower, five-speed router and a five-piece Deluxe Cabinet Door Set. This prize package is valued at more than \$600, so dust off those tricks and send them to us! The other tricks' authors will each receive a check for \$75.

To submit your tip or trick, e-mail it along with a daytime phone number to david.thiel@fwpubs.com or mail it to:

Tricks of the Trade
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PORTER-CABLE



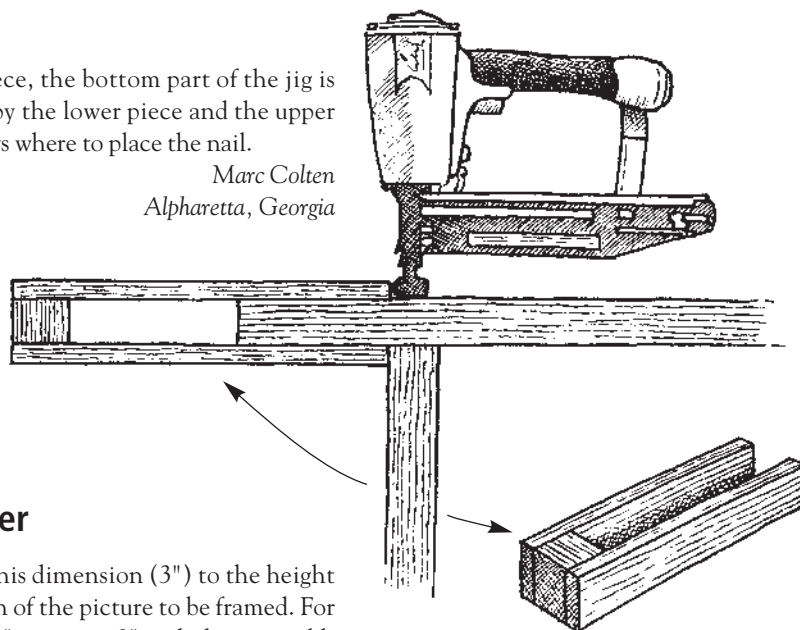
continued from page 22

Gun Sight for Blind Nailing

I often had trouble correctly placing an air-driven nail when the lower piece was hidden by the upper, such as attaching the roof of a bird house or a shelf on the inside of a cabinet. If I missed the edge of the inside piece, it could ruin the work. I solved this by creating this jig: Two equal length pieces of thin wood separated by a wood block, creating an opening large enough for the upper piece of wood. When I slide the jig over the

upper piece, the bottom part of the jig is stopped by the lower piece and the upper part shows where to place the nail.

Marc Colten
Alpharetta, Georgia



Formula Makes Picture Framing Easier

I have a great tip for making picture frames, which I figured out after messing up a few. I'm a do-it-yourself woodworker, and I know there are a bunch of us out there that build picture and mirror frames for around the house. Figuring out the outside dimension of the frame is always a little tricky.

This is an example of the formula that I've come up with to make framing easier.

Stock width:	2"
Rabbet width:	- 1/2"
Moulding width, less rabbet	= 1 1/2"
Multiply by 2:	x 2
Add this to picture dim.	= 3"

Add this dimension (3") to the height and width of the picture to be framed. For an 8" x 10" picture, a 2"-wide frame moulding with a 1/2" rabbet, the outside dimensions should measure 11" x 13". And if the pieces are then mitered, you know the outside dimension lengths of your horizontal and vertical members.

Phillip E. Woolsey
Galesburg, Illinois

Using Duct Tape for Easier Bent Laminations

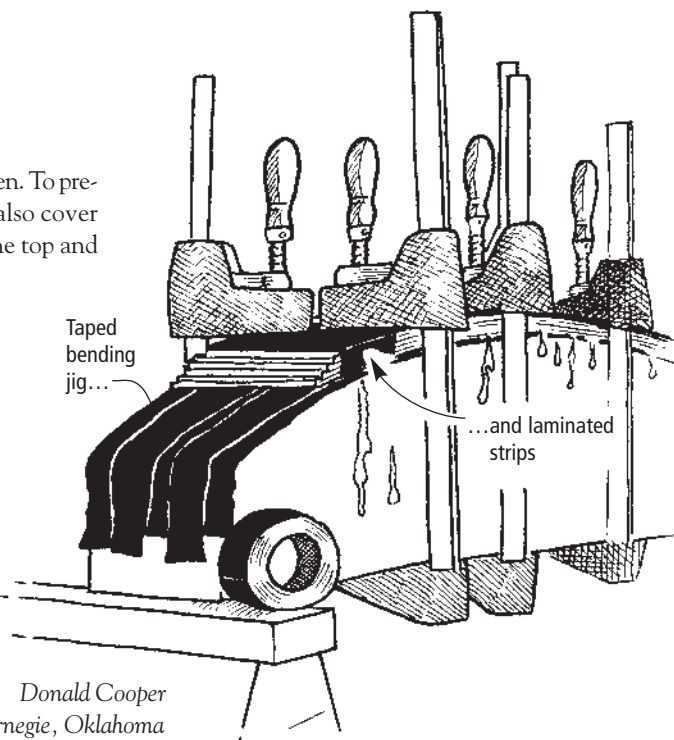
While building an Arts & Crafts-style rocking chair with curved arms, back rails and rockers, I discovered another great use for the ubiquitous duct tape.

Anyone who has ever done any wood bending by laminating thin strips to achieve the desired thickness knows it can be a mess. Glue gets everywhere: on the finished faces of the piece, on the clamping cauls and on your jig. Aligning the pieces during clamping also can be a struggle. My answer to this sticky problem is duct tape.

When preparing for a glue up, I cover the face of my bending jig and my cauls with duct tape, to which glue does not stick. Glue squeeze-out inevitably gets on the outside faces of the top and bottom board and is very hard to remove from the curved surfaces without a lot of sanding and scraping, which can

leave the surface uneven. To prevent this problem, I also cover the outside faces of the top and bottom board of the lamination with the tape before gluing.

The last step before moving to the jig after applying the glue and stacking the boards together is to wrap each end of the bundle with duct tape. This keeps them aligned during clamping.



Donald Cooper
Carnegie, Oklahoma
continued on page 26

TRICKS OF THE TRADE

continued from page 24

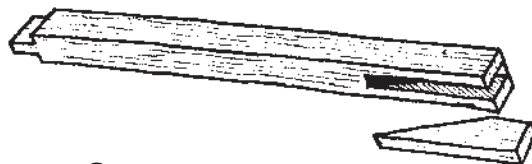
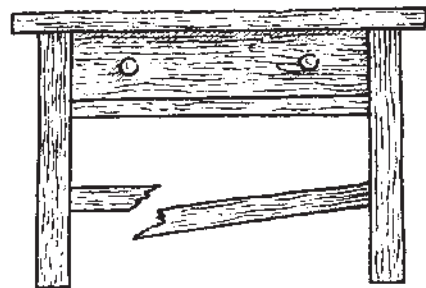
'Secret' Tapered Tenon Repairs the Impossible

If a rail on a stool, chair or similar piece of furniture breaks, a replacement cannot be made with ordinary tenons, as the legs cannot be sprung apart to get it in. I solved the problem with a secret tenon.

After removing the broken rail and cleaning out the mortises, I made a new rail with a normal tenon at one end. I cut the other end to fit snug against the leg and made a long tapered tenon-width groove on the underside, where it would not be seen. I made

a loose tenon to fit the mortise that is tapered to fit in the rail groove. With the tenon glued into the mortise and the taper glued into the groove, no one will know it's a repair unless they turn the job upside down.

*Percy Blandford
Stratford-upon-Avon, England*



Tricks to Making Cope-and-stick Doors With Fewer Cuts

When cutting rails and stiles for cope-and-stick doors, I cut them in pairs from wider boards to reduce the number of cuts needed and increase my accuracy. If the stiles and rails are to be 2½" wide, I first cut 5½"-wide boards to length.

Then I mark each board with an identifying number or symbol to keep them together. I then rip the stiles to width, but I leave the rails at 5½" wide and then cope

the ends using a cope-and-stick set in my router table. A wider board is easier to cope on the router table and it saves time by cutting the number of coping passes in half. Another benefit is there's less chance of tearout. If any tearout does occur on the ends, you can rip the piece to have the tearout on the fall-off section because of the extra width.

Then, by ripping the rails to finished width, (or a little wider if you want to joint

them) and keeping the pairs together, you know they are the same length. This also works well with the stiles, because even a small difference will keep them from being square. By using normal router or shaping practices and backer boards, tearout should be nil.

*Charles Townsend
Longview, Texas*

continued on page 28

TRICKS OF THE TRADE

continued from page 26

Centered Mortises and Grooves, No Measuring Required

This jig's rudimentary design belies its superior results. It automatically centers a router-cut mortise in a workpiece of almost any size and makes the cut smoothly – thanks to inexpensive roller bearings. And by making the bearings adjustable you can mortise near the end of a workpiece.

Start with a piece of $\frac{1}{4}$ "-thick acrylic. Using your router base as a template, mark, drill and countersink screw holes to attach the base to your router. Screw this new base to your router and chuck a V-groove bit into the tool. Plunge the spinning bit down until the bit tip is just proud of the base's bottom. This is the exact center of the base.

Now draw a straight line through the center. This is easily accomplished with masking tape and a pencil. From the center, measure out in both directions $1\frac{1}{4}$ ", $2\frac{1}{4}$ ", $3\frac{1}{4}$ ", etc. Take care because these holes must be exactly equidistant from the center.

Now take any size roller bearing that a standard machine screw fits snugly through;

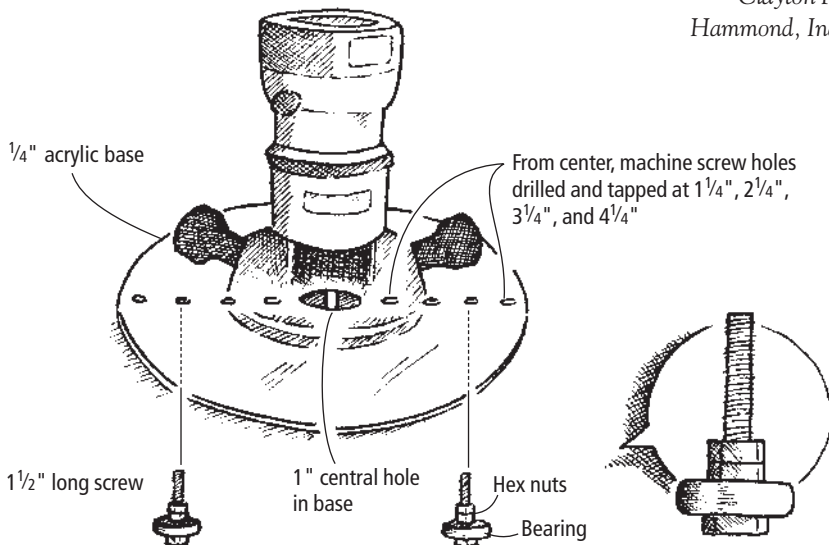
in my case this was a $\frac{5}{8}$ " outside-diameter bearing with a $\frac{1}{4}$ " interior diameter.

Drill and tap the aforementioned marks to match the machine screw size, then drop the bearings over the screws and secure them

with two hex nuts. Place one screw/bearing assembly to each side of the bit.

Now all that's left is to give the router a twist to engage both bearings on the stock to be mortised – and you're centered! **PW**

Clayton Foster
Hammond, Indiana



We Predict a 'Bear' Market for Grizzly's New Band Saw

Grizzly Industrial is known for offering sound machinery at reasonable prices, so when the company decides to top itself, it's pretty impressive. The new G0555 14" band saw does just that. This 1-horsepower floor-model saw offers upper and lower ball-bearing (thrust and side) guides, a nice aluminum fence system that is adjustable for blade drift, a two-speed motor and a quick-release blade-tension lever. Priced at \$375 (plus \$55 shipping), this saw is almost half the price of most competing machines that aren't equipped with these extra features!

Other nice amenities include a 4" dust port located on the rear of the lower cabinet, a basic but adequate miter gauge and the always-valuable option of adding a 6" riser block (\$50) to the machine to increase the resaw capacity to 12". The G0555 can accept blade widths from 1/8" to 3/4", taking a standard 93 1/2"-long blade. The all-metal housing and partially enclosed base brings the total weight up to a sturdy 210 pounds.

We were able to set up a pre-production model in our shop for some quality cutting time this summer. We went right to tweaking the settings and were pleased with the new tension-release mechanism. With the throw of a lever we went from ready-to-change-the-blade to ready-to-cut-wood. The blade tension can be adjusted with the tension on, making fine adjustments simple.

The G0555's bearing guides are a nice improvement compared to standard "block"-style guides. All the adjustments (on both upper and lower guide sets) are easily accessible and accomplished using thumb screws and hex-head screws – the routine adjustments are all toolless.

The rip fence and scale proved handy to use, and easily adjustable. The scale (marked in both metric and English increments) is even useful. Once everything was set, we ran some 2"-thick hard maple through the saw, pushing faster than normal to check slippage

or motor bog-down. While we won't necessarily recommend this saw as a dedicated resawing machine, the motor didn't choke in heavy cuts. Equip it with a high-quality blade (such as a Timberwolf) and it will likely perform very well for all normal woodshop tasks.

The semi-enclosed stand offers a nice middle ground between a cabinet base and an open stand. The saw was stable and there was room for a shelf below (a space wasted with most band saws).

The 4" dust collection port is located on the back of the lower wheel housing, offering improved collection compared to a 2" port.

The blade guard assembly is still gravity controlled, and while we'd like to have a rack-and-pinion mechanism in place, Grizzly has added a pressure screw to keep the guard from falling free when released.

Bottom line? For \$375, this saw has what every home shop is likely to need at a great price. We recommend buying the 6" riser block, which raises the delivered price to \$480. It's money well spent.

For more information, circle #126 on Free Information Card.

continued on page 32



SPECIFICATIONS

Grizzly G0555 14" Band Saw

Street price: \$375

Motor: 1 hp, 10 amp

Blade capacity: 1/8" to 3/4"

Max. cut height: 6 1/2" (12" with riser)

Dust port: 4"

Weight: 210 pounds

Performance: ●●●●○

Value: ●●●●●

Grizzly: 800-523-4777, or grizzly.com

HOW WE RATE TOOLS

We test new tools and products with an honest, real-world workout. We start from the box, assemble the tool if necessary, and read the manuals to see how clear they are. Then we put the tools to use in our shop, building projects. Then our staff shares the result with you.

We rate on a one-to-five scale, with "five" indicating that we consider it to be the leader in its category. For value, "five" means the tool is a great deal for the money, while "one" can mean a pricey tool, though, a unique low-value rated tool may be worth the price.

If all your questions aren't answered here, e-mail me at david.thiel@fwpubs.com or call me at 513-531-2690, ext. 1255. You also can visit our web site at popularwoodworking.com to read previous tool reviews and sign up for our free e-mail newsletter (focusing on tools) that's sent out every other week.

—David Thiel, senior editor

TOOL TEST

continued from page 30



Photo by Christopher Schwarz

Lie-Nielsen's Backsaws Cut Extraordinarily Fast and True

Most woodworkers know Lie-Nielsen Toolworks for its line of premium hand planes. But in recent years, the company has begun making Western-style backsaws that are good enough to make you put away that dozuki.

All of the saws feature a solid milled brass back, hardened steel blades and curly maple handles that are patterned from 19th century saws – back when we knew how to make a proper saw handle. The saws are sharp out of the box, an annoying problem with some other brands we have used.

In use, all the Lie-Nielsen saws work as well as any Japanese saw I've tried. They track a straight line effortlessly, create a small kerf and cut with minimal downward pressure. Compared to premium Japanese saws, the Lie-Nielsens take just a few minutes more to master, but the teeth are more durable and can be resharpened easily and inexpensively. I personally prefer the pistol-grip of the Lie-Nielsen over the wrapped bamboo straight handle of Asian saws. (If you prefer a straight handle, Lie-Nielsen offers it on two dovetail saws and a crosscut saw.)

The dovetail saw is pure joy to use. It's filed with rip teeth (many others on the market have crosscut teeth), has 15 ppi (points or teeth per inch) and cuts quickly and cleanly. The carcass saw is a little bigger, has 14 ppi and is filed with crosscut teeth. It is aggressive but doesn't tear out the wood, even with stringy species such as oak.

Lie-Nielsen's biggest backsaw of them all, the tenon saw, comes in a 12" or 14" model,

SPECIFICATIONS

Lie-Nielsen Hand Saws

Dovetail saw: \$125

Carcass saw: \$137

Tenon saws: \$155 to \$175

"Hand-cut Dovetails" video: \$20

Performance: ●●●●●

Value: ●●●●○

Lie-Nielsen Toolworks:

800-327-2520 or lie-nielsen.com

can be purchased with rip or crosscut teeth and is capable of deep and accurate cuts.

And if all this sounds interesting, but you are still intimidated, Lie-Nielsen also offers an outstanding video for \$20 that walks you through the process of hand-cutting dovetails. Hosted by Rob Cosman, Lie-Nielsen's Canadian distributor and an excellent craftsman, this video is aimed at helping the beginning woodworker cut airtight through-dovetails. It's a good reference even if you already own a dovetail saw.

Afficionados of vintage tools might scoff at the price of these new backsaws (\$125 to \$175), and contend that a vintage Disston backsaw can be found for half that money – or less. If you want to spend your time searching for tools, learning to remove rust, fixing bent blades and filing new teeth, then by all means hit the flea markets. But if you'd rather spend your time in the shop cutting dovetails and tenons, these saws are for you.

There are more hand saws in the works from Lie-Nielsen, including a panel and rip saw. High-quality Western-style saws are back, and they're worth a serious look. **PW**

— Christopher Schwarz

For more information, circle #138 on Free Information Card.

TOOL SCOOP

Too New to Test: Jet's SuperSaw and More!



In case you weren't aware, Jet Tools (jet-tools.com) is much more than just Jet. It's part of the WMH Tool Group, and that includes Powermatic, Performax and Wilton. We recently had a chance to see three impressive products from these sister companies that you should be on the lookout for in the next few months.

Jet's SuperSaw – Part of a growing category, this 1¾ hp hybrid table saw is not quite a contractor saw and not quite a cabinet saw. The motor is suspended inside the enclosed cabinet, but the trunnions are still mounted to the top, similar to a contractor saw. Also included are an optional sliding table that replaces the left wing, an adjustable-location power switch and a completely enclosed dust-collection system. Pretty clever. Pricing at \$849 without the sliding table (for the 30" version, but also available in a 52" version), and about \$1,200 with the sliding table.

Powermatic's 14" Band Saw – A traditional 14" cast iron band saw with the optional 6" riser block, Powermatic has loaded this saw with all the goodies. A 1½ hp motor, oversized cast iron table with "filler" plate between the post and table, standard bearing guides with up-front adjustments, a blower to remove dust from the cut, a quick-release tension lever for easier blade changing, nine-spoke heavy-duty wheels, a goose-neck light, rip fence and deluxe miter gauge. All this selling for \$850 or so. Nice package.

Performax's 12" Drum Sander – This machine is so new we saw only a prototype. Performax is responding to the small shop owner with a 12" single-drum sander, priced less than \$500. The open-end machine will be able to handle a 23" board in two passes, but it will take up no more room than a standard benchtop planer.

Clamp Caddy

Organization is everything.

I once belonged to a woodworking club that ran an annual contest for clamp ownership. The woodworker with the most clamps won – what else? – another clamp. That, of course, made him one clamp harder to catch the next year.

I always thought that the real contest should be for clamp organization. Most of us who are serious about woodworking have a lot of clamps. And we are always acquiring more, better and niftier clamping devices – at least, as long as our clamping funding holds out. The reason for collecting clamps is that you never know just what sort of assembly nightmare is waiting for you in the middle of a project, and you'd better hope you have the clamps to handle it. But having the clamps is only half the battle. The other half is finding them – being able to put your hands on just the right clamp a split second before the working time of your glue expires and a bevilion dollars in walnut becomes firewood.

This simple roll-around box holds dozens of clamps at arm's length. No more sprints to the rafters for handscrews or dashes to the far wall for bar clamps.

It's just for that sort of emergency that I built this clamp caddy. This caddy is to a workshop what a triage cart is to a hospital emergency room. All your clamps are or-

ganized, displayed and held at ready so all you have to do is choose one and tighten it down. Another disaster averted, another project saved by skill, cunning and intelligently organized clamps.

Making the Caddy

OK, so what is this organizational wonder? Well, it's a plywood box. Specifically, a plywood box with some holes in it. And some pipes – there are some pipes sticking in the holes. I also threw in a drawer and a 2 x 4 to make it really high-tech. Small clamps, such as C-clamps, spring clamps and short bar clamps, hang on the horizontal pipes. Handscrews rest on the 2 x 4, which forms a ledge. Long bar clamps and pipe clamps are organized in the holes. Finally, specialty clamps such as band clamps and corner clamps are stored in the drawer.

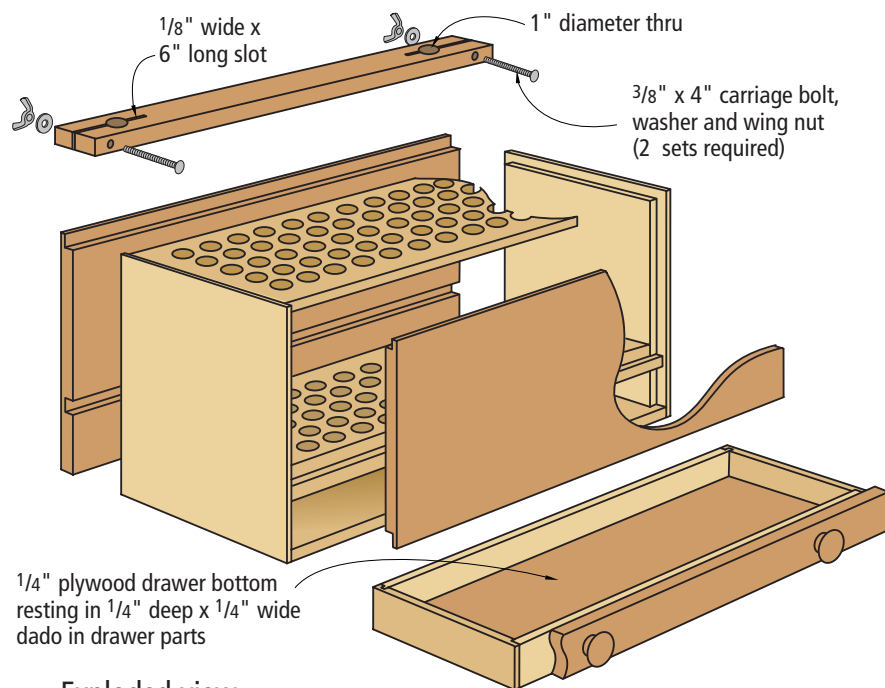
What did I tell you? All your clamps at an arm's length! And to keep them at an arm's length, the box is mounted on casters so you can roll it around your shop.

The box itself is made from $\frac{3}{4}$ " plywood. A simple system of $\frac{1}{4}$ "-deep rabbets and dados join the various parts. The drawer uses the same simple joinery – the front, back and sides are assembled with rabbets while the

continued on page 38



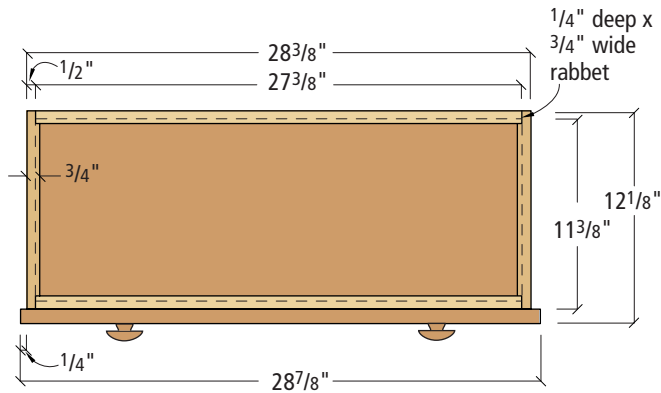
Photos by Al Parrish



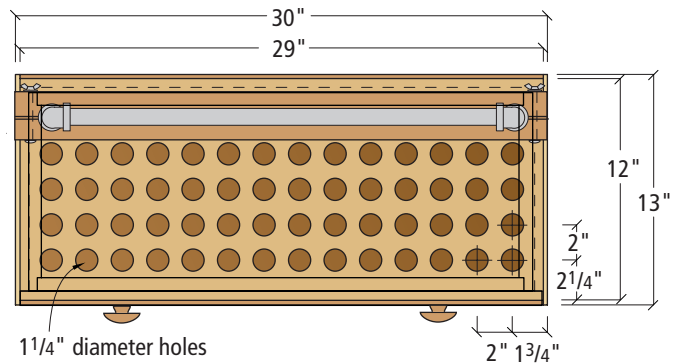
Exploded view

INGENIOUS JIGS

continued from page 36



Drawer plan



Plan

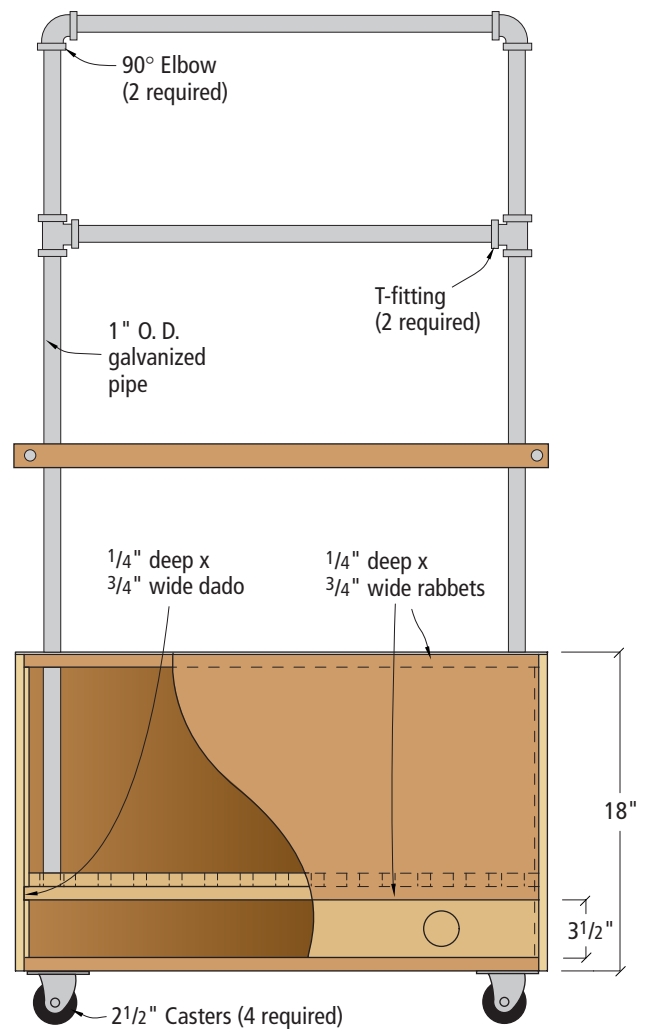


bottom rests in dados. The most difficult parts to make are the "perforated" top and false bottom. These two parts have a grid of 1 1/4"-diameter holes. To cut the drilling time in half, I clamped the parts face to face and drilled them both at once. Note that the top is 1/4" longer and wider than the false bottom. When stacking them for drilling, make sure the top overlaps the bottom 1/4" on all sides.

Glue the parts of the box and the drawer together, fit the drawer to the box and attach casters to the bottom. Then assemble the pipe racks. Depending on the number of small clamps you have, you may need two or more horizontal pipes. I made a rack with two horizontal members.

I made a 2 x 4 ledge to hang beneath the bottom horizontal pipe. I drilled 1"-diameter holes in the board, cut slots through the holes, then ran bolts through the slots near the board ends. These bolts clamp the 2 x 4 ledge in place. After assembling the pipe rack and ledge, insert the supporting pipes in two holes in the top and false bottom. Wedge the pipes in place. **PW**

To secure the pipe rack in the box, cut several small wooden wedges. Press the wedges into the spaces between the pipes and the plywood.



Elevation

Illustrations by Mary Jane Favorite

Nick Engler is the author of more than 50 books on woodworking, plus countless articles. Currently, he's helping kids across America build ribs for a full-size replica of the first true airplane, the 1903 Wright Flyer.

BEST NEW TOOLS OF 2002



For years we all thought that router technology had reached its zenith. The tools were affordable, accurate and versatile. What more could we possibly want?

How about routers that are astonishingly more affordable, accurate and versatile? We got all that this year with three new routers that made us shake our heads in amazement. Here's a quick look at these tools:

- Ryobi introduced the first 1/2"-collet variable-speed plunge router for only \$100.

- DeWalt's new router combo kit will turn the router market on its head with a new depth-adjustment system that makes your fixed-base router a precision tool.

- And Triton, an Australian company, has introduced a new large plunge router that is loaded with innovations that were unimaginable until now.

But it wasn't just the router market that was hot this year. Delta has made changing speeds on its benchtop drill presses quick and easy. Grizzly rolled out its newest 14" band saw that is loaded with expensive features with a mind-blowing price of \$375.

And high-quality hand tools are flowering in the market, starting with the finest marking gauge we've ever seen. Then there's an affordable Veritas low-angle

smoothing plane that's a champ at the bench.

After testing and evaluating hundreds of tools this year, these 14 really stood out. If you're on the prowl for some new iron for your shop, we suggest you look here first. And even if you're not in the market, some of these new tools are so clever or useful you just might not be able to resist.

by David Thiel & Christopher Schwarz

Questions or comments? You can contact Chris at 513-531-2690 ext. 1407 or at chris.schwarz@fwpubs.com; or David at 513-531-2690 ext. 1255 or at david.thiel@fwpubs.com.

THE WINNERS

Delta
Veritas
DeWalt
Craftsman
Tite-Mark
Porter-Cable
Ryobi
Grizzly
Jesada
Jet
Excalibur
Jointech
Triton



Delta Variable-speed Drill Presses

Changing the speed on a drill press has always been more difficult than it should be, with belts, pulleys and tension levers all standing in the way of the perfect speed. Machines that had easily changed speeds all cost more than \$500.

Now Delta has changed all that with two inexpensive benchtop drill presses that make speed adjustments a breeze. First you turn on the machine, then you turn the knob on the front until the chuck is spinning where you want it. You're done setting the speed. Go to work.

The DP250 (a 10" model) and the DP350 (a 12" model) both adjust anywhere between 500 and 3,100 rpm with ease. The drill presses both have a ½" chuck and a decent 3¼" quill stroke (the amount

the chuck will plunge). The cast-iron table tilts 90° in both directions and is moved up and down using a crank – a worthwhile feature that's not found on all benchtop machines.

Delta officials say that this same variable-speed technology eventually will migrate to the company's floor-model drill presses, but they did not know when this would happen.

The DP250 sells for about \$130 and the DP350 sells for about \$210.

In our opinion, these drill presses are long overdue in the home workshop. Stop burning up your large and expensive drill bits just because the speed is a pain to change. And say "bye-bye" to belts.

Contact Delta at 800-438-2486 or deltawoodworking.com

Veritas Smoother a Triumph of Engineering

Veritas's newest hand plane is based loosely on the much-coveted and discontinued Stanley 164 low-angle smoothing plane. And it's fair to say that this Canadian company has created a plane that is significantly improved over the original Stanley.

Low-angle smoothing planes are, in essence, overgrown block planes. And like block planes, they have an adjustable mouth opening and the iron is bedded at 12°.

They excel at planing end grain and short grain (trimming dovetails, finger joints and miters). But they have somewhat mixed utility on long grain. In softer woods and in straight-grained hardwoods,

the tool excels. But when dealing with unruly grain patterns and direction in hardwoods, I turn to a traditional bench plane with the iron bedded at 45°.

The Veritas smoother has a number of excellent refinements. Its body is made of nearly indestructible ductile iron. The blade is hard-wearing A2 steel. And the adjuster itself changes both the depth of cut and the skew angle of the iron.

On top of all this, the Veritas is priced at only \$139, a great price for a plane that will see a lot of use in any shop.



Available from Lee Valley Tools, 800-871-8158 or leevalley.com

DeWalt Multi-base Router



DeWalt waited a while to introduce a single-motor/multi-base router system, but it was worth the wait. The motor slips into one of three bases, using a pair of quick-release latches, then locks in place with the switch position also locked in one place. Height adjustment (in 1/64" increments) in either the fixed- or D-handle base is handled using the microfine adjustment ring. When used with the plunge base, the height adjustment moves to the smooth-operating columns with through-the-column dust collection and a simple micro-adjust depth stop.

All the switches are located within easy operating access, and a strong level of attention

to ergonomics is obvious. The detachable rubber power cord makes it affordable to replace the cord in case of damage and makes switching to the available D-handle base a snap.

Along with both a ¼" and ½" collet (with spindle lock), the system offers a quiet, soft-start 12-amp variable-speed motor, with plenty of power for the serious woodworker.

This is a very nice router system that's been carefully thought through with the end user in mind. Sold as a fixed/plunge single-speed kit (DW616PK) for \$199, and the variable-speed kit (DW618PK) for \$249, this system is one of the best tools to happen this year.

Contact DeWalt at 800-433-9258 or dewalt.com

Craftsman Self-cleaning Planer



Tired of hooking your dust collector to your portable planer and fighting with the hose? Craftsman has the answer with its model #21743 13" thickness planer with built-in dust collection.

The planer itself is of decent construction, with all the bells and whistles you'd expect from a premium benchtop. But the amazing feature is a fan (powered by the planer's motor) to pull the dust and chips away from the cutterhead and into

either a plastic garbage bag or garbage can. Now that's clever and convenient!

And while they were adding extra duties for the motor, they added a switch to raise and lower the cutterhead with a motor instead of the hand crank. When you're moving the head 3" in either direction, this is a nice feature.

The planer itself (priced at \$440) is a little pricey, but the take-off fan for dust collection is a great idea if you don't own a dust-collection system. It's a product worthy of note by woodworkers and manufacturers. Very clever.

Contact Craftsman at 800-377-7414 or craftsman.com

Tite-Mark Worth the Investment

Don't be put off by the \$80 price tag on this tool. The Tite-Mark cutting gauge will earn its keep in your shop, especially if you ever cut dovetails, tenons or mortises by hand.

The circular blade scores deeply if asked, and it refuses to follow the grain or chatter across your work like the pin does in many wooden marking gauges. The tool's microadjustable head lets you get close to the setting you want and then sneak up on your ideal measurement by turning the knurled knob – an excellent feature when dovetailing.

And the tool's design is well thought out. The

tool's rear locking knob prevents the Tite-Mark from rolling across your bench, and the head is milled so you can retract the resharpenable blade into the head, which protects the blade and allows you to store the tool upright.

After almost a year of use in our shop, the blade hasn't come loose once, a common complaint with other cutting gauges on the market.

Because of the price, we were a tad skeptical of this tool when we first tested it, but the Tite-Mark quickly became our favorite cutting gauge and we highly recommend it.



Available from Glen-Drake Tool Works (glen-drake.com), Garrett Wade, Lie-Nielsen and other catalogs

Porter-Cable Laser Miter Saw



Every year someone puts a laser on a tool and calls it genius. Well this year they might be right. The new Porter-Cable 3802L LaserLoc (Delta has a similar model) is easy to use, super accurate and outshines (pun intended) all the aftermarket laser doodads we've tested.

Here's the difference: The saw has two independently adjustable lasers, one on each side of the blade. You flip a switch (separate from the saw's trigger) and you can see two lines on your work with the blade's kerf running down the middle. This allows you to cut on either side of blade with the laser to guide you. The lasers are easily adjusted in three axes so you can

sport-tune your setup (or regain your settings if you drop the saw). The lasers shine brightly and can be seen even outside. We found them to be accurate enough for tight-tolerance woodworking.

The saw itself is a 12" compound model with a 15-amp motor, electric brake and a horizontal handle. A 40-tooth carbide blade is standard. The saw, which is due to hit stores in late 2002, is expected to sell for \$350 to \$400.

The big question is: Do you really need a laser-guided miter saw? We found that thanks to the lasers we spent less time sneaking up on measurements and more time cutting wood and getting down to business. In our book, that's worth something.

Contact Porter-Cable at 800-487-8665 or porter-cable.com

Ryobi's \$100 Router is Loaded with Features



A while back Ryobi began introducing power tools with a \$100-or-less price tag on nearly everything. Some of those initial tools left us wanting, but this year's crop is pretty impressive. And one of the best new tools in Ryobi's crop is the router shown at left.

The RE180PL offers a 10-amp motor with soft start and electronically controlled variable speed (15,000 to 23,000 rpm). The electronic control maintains a constant speed under load. It also comes with both 1/4" and 1/2" collets, a spindle lock, decent plunge action and depth adjustment. All these features are yours for \$100.

Now we're not going to tell you that this router

is the best one on the market. But with these features, usually found only on professional routers, packaged in a tool that performs well for only \$100, this is pretty impressive. If you're a beginning woodworker looking for the router to start with, this is a great bargain and a good tool value.

In fact, if you're an experienced woodworker just looking for an extra router, buying the RE180PL is money well spent.

Are you still not convinced this router is a great deal? How about a two-year warranty and a 30-day, no-risk satisfaction guarantee?

Did I mention it's only \$100?

Contact Ryobi at 800-525-2579 or ryobitools.com

Grizzly's Tricked-out, 14" Band Saw Bargain

Wow, a new 14" band saw! Well, that was my initial reaction until I received the details. Grizzly's new G0555 model is something to talk about. Built on the standard cast iron 14" band saw frame, Grizzly has upgraded it to a two-speed, 1 hp motor, added a semi-enclosed base for stability, and added a well-designed rip fence. Then the engineers went and added a quick-release tensioning arm, making blade changes much easier, and a 4" dust port for better dust collection. And then there's the upper and lower ball-bearing guides. Very nice.

OK, that's all well and good, but other manufacturers have that, right? Not priced at \$375 they don't! And the saw will still take a 6" riser block

(\$50), increasing the resaw capacity to 12". Yes, you're going to pay \$55 shipping unless you swing by a Grizzly retail store. Either way you go, this is a lot of saw for the money.

Always one to look a gift horse in the mouth, we decided to not take this saw at face value and see how it performed. The motor did a decent job standing up to a faster-than-necessary feed rate in hard maple.

As with all band saws, we recommend a premium blade to improve the cut of the G0555. But for the money, this saw performed as expected and promised. There may be better 14" band saws out there, but not anywhere near this price.



Contact Grizzly at 800-523-4777 or grizzly.com

Jesada's 17th Century Profiles – 21st-century Technology



Ogee & bead bit

Ogee panel moulding bit

It's embarrassing to admit, but even with as many router bits as we have in our shop, there are times when I'm building something special where a roman ogee just isn't good enough. Our ancestors had the answer to this problem with hundreds of moulding planes. The clever folks at Jesada were able to recreate some actual mouldings from English antiques and now offer them as a set.

While these new 17th century router bit profiles aren't the least expensive way to be creative, they offer some great-looking profiles, as well as

variations on familiar profiles, to jazz-up your next project. A complete set of all 11 bits (and there's another set in the works) is \$375. Individually, the bits run from \$21.90 to \$49.90.

We think this is money well spent, as we've come to respect Jesada for the quality of its tooling, no matter what the profile.

So if you're looking for something special or for something very traditional, check out the newest look in router profiles.

Contact Jesada at 800-531-5559 or jesada.com

JET's Super-fast Jointer Clamps

One of the woodworking products *du jour* are corner squares that – with the help of a couple bar clamps – hold cabinet parts square while you screw or nail them together. Nifty? Yes. Should you buy them? Nope.

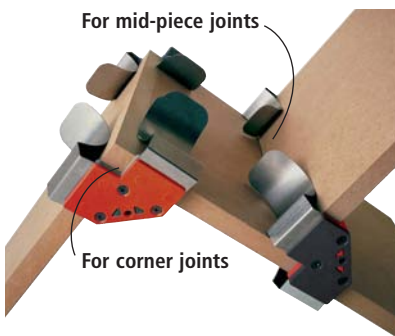
Instead, take a look at Jet's new assembly clamps, which are corner squares and clamps all in one. Here's how they work: Put your parts together and slide the assembly clamps over the joint. The springs hold them in place at 90° as you screw, nail or clamp the joint.

The clamps work with any 90° joint, such as securing a top or shelf to a cabinet

side. We were impressed by the holding power of these clamps. When attaching a 34" x 24" cabinet bottom to a side, it took only one clamp to hold the bottom in position perfectly. Thanks to these clamps, we were able to assemble huge cabinets easily without a helper.

The clamp bodies are made from a tough fiber-filled composite material – dropping them won't hurt them. The springs themselves are made from thick stainless steel.

Priced at just \$20 for a set of two, these clamps are essential for accurate case construction, especially in the one-person workshop.



Contact JET Tools at 800-274-6848 or jettools.com

Excalibur's Merlin Splitter - One We'll Use!

Splitter guards on table saws are always a pain to use, but we know they serve a useful purpose. So we grumble and stick it back on the saw. If only it were easy to remove and replace the splitter. Happily, after a year of refining, Excalibur has an answer for us.

The new Merlin Splitter is a toolless, thin-kerf splitter with twin pawls. It's toolless because a universal adapter replaces the front mounting bolt, making it possible to simply press the release bar and swivel the splitter up and out of the way.

By drilling a small hole in the throat plate of your table saw, you can use a pencil to remove the splitter without removing the plate.

Another common annoyance with stock splitters is solved by Merlin's thin-kerf design. On most splitters, when a thin-kerf blade is used, the splitter blade is too thick, causing binding, rather than curing it. Also, the twin, alternate-height pawls effectively stop kickback problems in thin and thick stock.

Priced at \$110, the Merlin splitter, when used with a good overarm guard, finally makes it convenient to work smart and safe on your table saw.



Contact Excalibur at 800-357-4118 or excalibur-tools.com

Jointech's SmartMiter Sled

We've tested a lot of aftermarket miter gauges and sliding sleds, but the Jointech SmartMiter is hands-down the best of the whole bunch.

The sled base is computer-machined from solid and tough phenolic, which lends this smart miter sled accuracy and durability.

The miter fence is adjustable at 1/2° detents between 50° and -50°, or it can be locked be-

tween stops if need be. A bit of clever engineering from the Jointech people keeps the fence edge right against the blade at any miter setting.

The fence also telescopes out to handle 48"-long crosscuts or miters, which is all most woodworkers will ever need.

We were impressed with how easy the sled was to set up and zero on any table saw. And after months of heavy everyday use, the SmartMiter has stayed as accurate as the first day we set it up in our shop.

At \$260, the SmartMiter isn't cheap compared to its competitors. But thanks to its high quality and repeatable accuracy it promises to be the last table saw sled you'll ever build or buy.

Contact Jointech at 800-619-1288 or jointech.com



Veritas Scraper a Better Tool at the Same Price

The cabinet scraper is an essential tool for both rough and fine work. It can hog off dried glue from a panel, flatten a tabletop or even remove wispy shavings before final finishing. It's all in how much you turn the tool's camber screw to bow the blade.

The new Veritas cabinet scraper is bigger, beefier, heavier, more durable and comfortable to use than the Stanley #80 scraper, on which this new tool is based. And here's the part that will make you happy: The Veritas scraper doesn't cost any more than the Stanley.

Priced at \$33.50, the Veritas cabinet scraper is made using unbreakable ductile iron. The blade is 2¾" wide and has two cutting edges beveled at 45°. The sole of the scraper is about 25 percent bigger than the Stanley version and the blade is set forward a bit more, which gives you more control at the end of your cut. The angle of the handles makes long scraping sessions as comfortable as possible.

Among all the tools in the scraper family, the cabinet scraper is the easiest to sharpen and set up. A file, sharpening stone and burnisher is all you need to get started. With all these improvements, the Veritas is the clear choice.



Contact Lee Valley Tools at 800-871-8158 or leevalley.com

Triton's Cool New Router From Down Under

This router is from Triton, a tool manufacturer that's new to the U.S. market. We did some checking, and in its native Australia, Triton is a well-respected brand. The router we tested indicates that the respect is appropriately placed.

Noteworthy features include the plunge mechanism that lets the collet extend past the base for easy bit changes (in and out of a router table). In this position, a spindle lock is automatically engaged and the power switch cover plate locks closed to keep your hands off the switch.

They've also included a depth-adjustment mechanism that's rather new. The router offers the traditional free-plunging mode and locking lever for in-

termediate positions, but they also added a "winder" mode to allow easy, precise depth adjustments at your fingertips. The router is a ¾ hp (15 amp) tool with variable speed (8,000 to 20,000 rpm) and soft-start convenience.

The tool accepts both ½" and ¼" bits and is shipped with a pretty nice cutting guide that functions as both edge guide and circle-cutting jig. Triton even tossed in a ½" carbide straight bit.

This is a well-thought-out router with some great innovations. At \$329 it's a little pricey, but well worth a careful look.



Contact Triton at 888-874-8661 or tritonwoodworking.com.

Tools Too New To Test

There were also a few tools unveiled this year that were too new to test or use in time for this issue's deadline. These are the tools we'll be talking about in 2003, but here's a sneak peak.

SawStop Table Saws – The makers of the SawStop safety device are offering their own table saws with the device in place. The machines are not too pricey and look pretty nice.

Performax 12" Sander – A single-drum, "C"-arm version for the small shop woodworker. The price should be less than \$500.

Delta Butterfly Grinder Nut – This replaces the grinding wheel nut with a hand-tightened and loosened butterfly nut that makes the process toolless. We're anxious to see other applications.

Bosch Cordless Jigsaws – Being offered in 14.4-, 18- and 24-volt tools, these powerful cordless saws also offer toolless blade removal that's easier than anything else on the market.

Lee Valley Portable Dolly – A plastic, four-piece, shape-adjustable snap-together dolly (20¾" x 14¼") with a load limit of 220 pounds, priced at \$8.95. This we've got to see.

Ryobi \$100 Oscillating Spindle Sander – A 3.5-amp motor spins the spindle at 2,000 rpm and oscillates at 58 opm, while offering a ⅝" stroke length. The table size is 19¼" x 15¾" and the 49-pound machine includes dust collection, five rubber spindles and sanding sleeves. Cool.

Lie-Nielsen Chisels and Spokeshaves – Look for a set of nice chisels based on a desirable old Stanley pattern soon. Also, the company has planned a line of spokeshaves. The smallest shave is available now, and so far we're impressed. **PW**



Under- the-Saw Cabinet



Photos by Al Parrish

The space below your table saw is a prime storage area that's likely been doing little more than gathering scraps.

In my eternal quest to find more shop space, I discovered a respectable piece of real estate right under my nose, err, well my table saw anyway. Yes, right below the table board was a beat-up box of odd cut-offs that were about as valuable as ice cubes are to Eskimos.

After noodling around with design ideas I settled on the rig you see here. Not only does it provide a lot of useful storage, but it has really helped me organize my blades and accessories that weren't always at my fingertips. There's even extra storage on the "out-feed" side of the cabinet.

The Shaker-style flat-panel doors gave me a chance to try out some new router bits. We've included a special pull-out poster that provides all the details for making these doors, or other doors, that will make a handy reference when hung in your shop.

Build the Case

Cut out the plywood for the sides, top, bottom, the common back, partition, front rail and full bottom that goes below the router-bit storage tray.

On the two sides, cut a rabbet on the top edge that's $\frac{1}{2}$ " deep by $\frac{3}{4}$ " wide that will hold the top. For the bottom, make a dado $\frac{1}{2}$ " deep by $\frac{3}{4}$ " wide that starts 3" up from the bottom edge.

Next will be several $\frac{1}{4}$ " by $\frac{1}{4}$ " dados and grooves. These joints join the common back to the sides, the partition on the "infeed" side of the cabinet where it joins the common back, and where the rail and full bottom form the drawer openings. Refer to the drawings for the placement of each of these dados. Remember to stop the dado on the cabinet side for the router



Before assembly, handsaw 3" x $\frac{3}{4}$ " notches in the sides at the bottom corners to make the toe kick space.

bit section bottom so it doesn't pass beyond the common back.

For the corresponding parts, cut $\frac{1}{4}$ " tongues on the edges. On the back, these are on the two sides; for the partition, they're on the back edge. The 4" rail has tongues on both ends, and the full bottom on both long edges.

Now, before you begin assembly, notch the bottom corners of the sides to create the setback for the toe kick. The height of the kick is the same as the lower edge of the dado you cut for the cabinet's bottom.

Dry Fit, then Assemble

Dry-assemble the case to check the fit of the joints. Make sure that during the real assembly you have all the parts oriented in the right direction so you don't turn a part with a $\frac{1}{4}$ " tongue around and create a cabinet that won't go together.

When you are ready for final assembly, have a friend around or assemble the parts in stages.

Before nailing the top in place, screw two cleats into the sides of the router bit opening that are $\frac{1}{2}$ " up from the bottom. Make sure a $\frac{1}{2}$ " piece of plywood will slide smoothly in the space because this will be the simple slide method for the router bit pull-out tray.



Apply a hot iron to hot-melt-glue backed edge veneer, then file off any veneer overhang using the teeth on your file's edge. It works just like a saw.

When done, install the top. Next, turn the cabinet upside down and nail or screw through the bottom into the bottom edges of the common back and partition.

While the case is in this position, nail on the kick pieces after edging the ends with hot-melt glue-backed veneer tape. While the iron is hot, veneer the other edges of the cabinet and shelves to conceal the plywood core.

Make, Install the Drawers

The project requires one regular drawer and two pull-out trays. All three are made the same except the trays have a cut-out front. The router bit storage behind the other drawer front isn't really a drawer at all, but another kind of tray. Here's how to make the regular drawer and trays.

Cut out the parts according to the cutting list. On the draw-



Mark the cutout on the fronts of the pull-out trays and then band saw to the line and sand. Then go ahead and assemble the trays.

by Steve Shanesy

Comments or questions? Contact Steve at 513-531-2690 ext. 1238 or steve.shanesy@fwpubs.com.



Both the pull-out panel and the pull-out tray are guided by simply creating grooves for them to slide in and out.

er fronts and backs, cut rabbets that are $\frac{5}{16}$ " deep by $\frac{1}{2}$ " wide. These accept the sides. The back is $\frac{1}{2}$ " narrower in width than the sides and front. This allows the bottom to slip in $\frac{1}{4}$ " x $\frac{1}{4}$ " grooves cut in the sides and front, $\frac{1}{4}$ " up from the bottom edge. Before assembling the trays, make the cutout on the front. Make the cut $2\frac{1}{2}$ " in from the side and the top edge. To assemble, use glue and nails. After the glue has dried, slip the bottoms in place, then check for square before nailing the bottom in place.

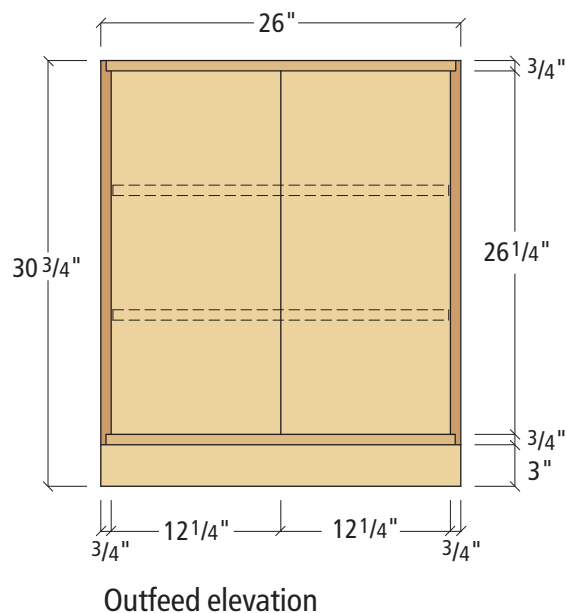
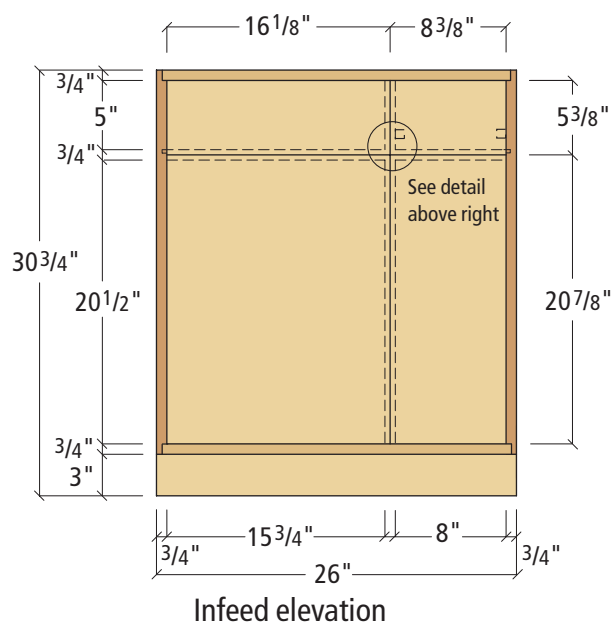
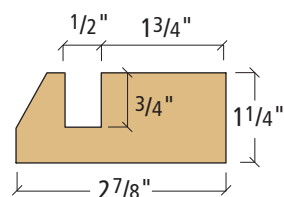
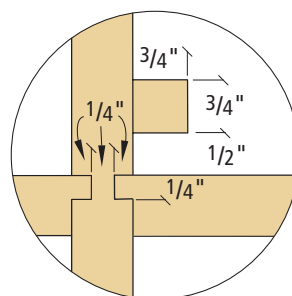
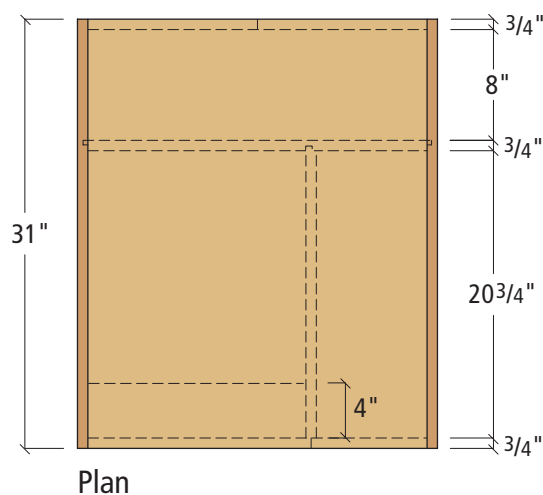
Install the drawers following the instructions for the type of drawer slides you use. The drawers are sized to use common $\frac{1}{2}$ "-thick drawer slides.

The tray for the router bits is

just a $\frac{1}{2}$ " piece of plywood glued into a $\frac{3}{8}$ " x $\frac{3}{8}$ " groove in the drawer front that starts $\frac{5}{16}$ " up from the bottom edge.

Position the plywood to allow for the drawer front gap on the right side of the front. Later, add another layer of plywood with holes cut to stand your bits in place, then screw this second layer to the tray bottom.

Now turn to the vertical pull-out panel. It is simply $\frac{1}{2}$ " plywood that runs in grooves on top and bottom to guide it. A hole near the front edge gives you a place to grasp and pull. Cut two pieces of stock $1\frac{1}{4}$ " x $2\frac{7}{8}$ " x $21\frac{3}{4}$ ", then cut a groove $\frac{3}{4}$ " deep by $\frac{1}{2}$ " wide that's $1\frac{3}{4}$ " from the edge. Screw these to the cabinet in the upper and lower corners.





Use your router and an edge guide to mortise the hinges on the door stiles. I set my hinges 3" from the stile ends.



Swaging hinges will allow a better door fit. Place the hinge on a solid surface, cover the leaves with a piece of steel up to the hinge barrel, then give it a good whack with a hammer.

Make and Install the Doors

Turn to the center spread of this issue for a special pull-out poster containing complete details for building the doors.

Mortise the butt hinges on the stiles to the thickness of one hinge leaf. I used a router with a 1/4"-diameter bit. Use a chisel to square up the mortise corners. To swage the hinges, see the photo at right.

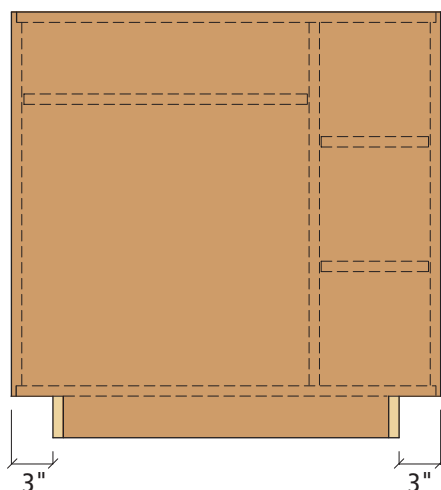
Screw the hinges on the doors after drilling pilot holes. Use parafin on the screw threads and a screwdriver if you're using brass screws, which are quite soft.

Position the doors in the opening and use shims to set the door up from the bottom. Carefully pencil the hinge locations, then mark and drill the pilot holes for the hinges and install.

To complete the project, drill holes for the adjustable shelves. I spaced mine 1 1/2" in from the front and back, then from the bottom, up 8 1/2", 10", 11 1/2", 17", 18 1/2" and 20". Before finishing,

install door catches, and the door and drawer pulls.

For finish, your cabinet deserves a little protection so give it a clear coat of your favorite finish material. **PW**



Profile

UNDER-THE-SAW CABINET

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 2	Sides	3/4	31	30 3/4	birch ply	rabbet top edge
❑ 1	Common back	3/4	25	26 1/4	birch ply	rabbet both sides
❑ 1	Partition	3/4	20 15/16	26 1/4	birch ply	rabbet back edge
❑ 2	Top/bottom	3/4	25 1/2	31	birch ply	
❑ 1	Rail	3/4	4	16 1/4	birch ply	
❑ 1	Full bottom, router area	3/4	8 1/2	20 3/4	birch ply	rabbet 2 long edges
❑ 2	Toe kicks	3/4	3	26	birch ply	
❑ 2	Shelves	3/4	7 5/8	24 5/16	birch Ply	
❑ 1	Pull out panel	1/2	20 3/4	19 1/2	birch ply	
❑ 2	Panel guides	1 1/4	2 7/8	19 1/2	solid hardwood	
❑ 1	Drw front	3/4	5 3/8	8 3/8	solid birch	
❑ 1	Drw front	3/4	5 3/8	16 1/8	solid birch	
❑ 1	Router bit tray bottom	1/2	7 15/16	21	birch ply	tongue, 1 short end
❑ 1	Drw sub front	1/2	4 1/4	14 3/4	birch ply	rabbet 2 short ends
❑ 1	Drw back	1/2	3 3/4	14 3/4	birch ply	rabbet 2 short ends
❑ 2	Drw sides	1/2	4 1/4	19 5/8	birch ply	
❑ 1	Drw bottom	1/4	14 1/4	19 3/4	birch ply	
❑ 4	Sides, pull out trays	1/2	4 1/2	20	birch ply	
❑ 2	Fronts, pull out trays	1/2	4 1/2	13 9/16	birch ply	rabbet 2 short edges
❑ 2	Backs, pull out trays	1/2	4	13 9/16	birch Ply	rabbet 2 short edges
❑ 2	Bottoms, pull out trays	1/4	13 1/16	19 3/16	birch ply	
❑ 4	Door stiles	3/4	1 1/2	20 7/8	solid birch	
❑ 2	Door rails	3/4	1 1/2	6 1/4	solid birch	tongue 2 short ends
❑ 1	Door panel	1/2	6 3/16	18 11/16	solid birch	
❑ 2	Door rails	3/4	1 1/2	14	solid birch	tongue, 2 short end
❑ 1	Door panel	1/2	13 15/16	18 11/16	birch ply	
❑ 4	Door stiles	3/4	1 1/2	26 1/4	solid birch	
❑ 4	Door rails	3/4	1 1/2	10 1/8	solid birch	tongue, 2 short end
❑ 2	Door panels	1/2	10 1/16	24 1/16	birch ply	

Traditional Hanging Shelves

Few projects are as fast, easy and good looking as these two American designs.

These shelves are quite popular with my two best customers: my wife and my daughter. We have them hanging in several rooms of our farmhouse where they hold plates and knickknacks.

Not surprisingly, these shelves are also popular with my paying customers. While many of them may dream of buying a custom corner cupboard, sometimes what they can best afford are the hanging shelves. So these small projects make everyone happy.

by Troy Sexton

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





Photos by Al Parrish

For the home woodworker, these shelves are a home run. These two traditional designs look great in most homes, and the woodworking part is so simple that almost anyone should be able to build these in a weekend.

Patterns and Dados

Both of these shelves are built using the same techniques and joints. The only significant difference is that the Shaker-style unit has three shelves and the 18th century “Whale Tail” project has four shelves and a more ornate profile that looks vaguely like a whale’s tail. To me, it looks more like a goose.

Begin your project by selecting your lumber and planing it down to $\frac{1}{2}$ " thick. Using the supplied patterns and the construction drawings, draw the profile on your side pieces and mark where the dados should go.

Now set up your dado stack in your table saw so it makes a $\frac{1}{2}$ "-wide cut that’s $\frac{3}{16}$ " deep. As you can see in the photo, I made this cut using only the fence. I feel real comfortable with this cut; but if you’re not, I recommend you use your miter gauge and a stop block attached to your fence to guide the work instead.

Cut the dados and then head for the band saw.

Cutting the Details

I use a band saw to shape the sides. Begin by making several “relief” cuts along the profile of your side. These allow you to remove the waste in chunks so your blade and workpiece are easier to maneuver through the cut.

Once you’ve completed both sides, sand the edges using a drum sander that’s chucked into your

drill press. I recommend you tape the two sides together using double-sided tape and sand them simultaneously. It’s faster and the sides end up identical.

Once that’s complete, fit the shelves and sides together for a dry fit. Notice anything? The square edges of the shelves don’t match the sides exactly.

Mark the shape of the sides onto the end of the shelves. Now, using a jointer with the fence beveled (or a hand plane), shape



Cut the dados in the sides using a dado stack in your table saw. If you're a beginning woodworker, I recommend you perform this operation with a miter gauge to guide the work instead of the fence. I've made a lot of these shelves and am quite comfortable with this method.

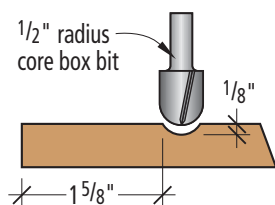
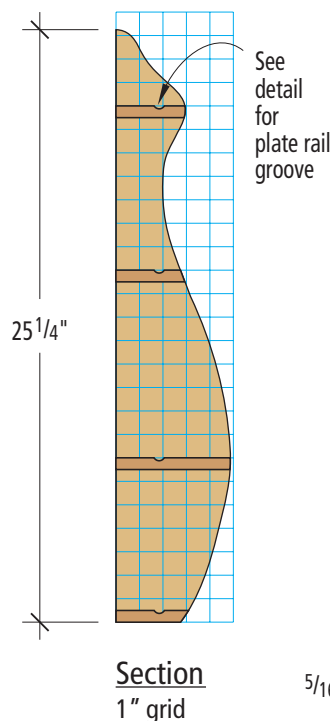
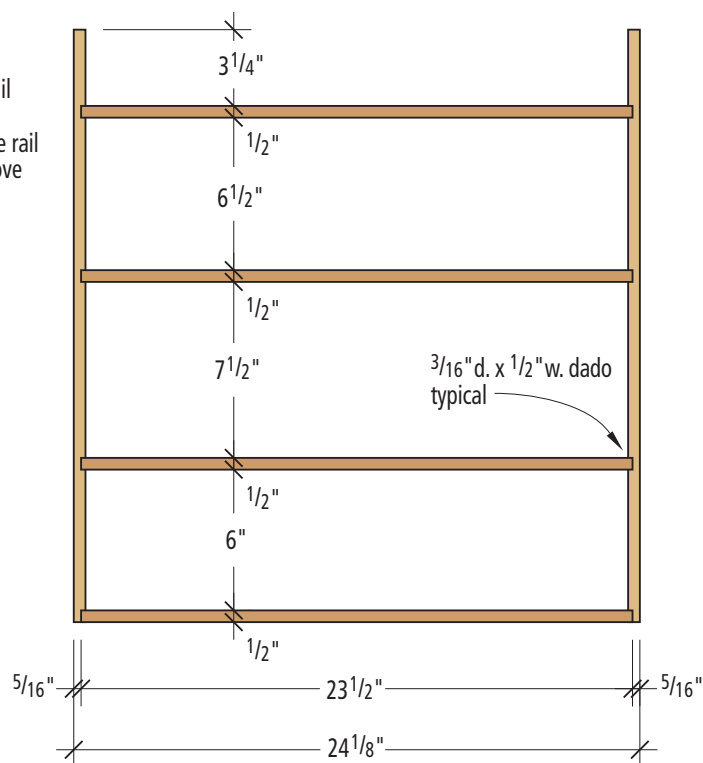


Plate rail groove detail



Section
1" grid



Elevation

WHALE TAIL SHELF

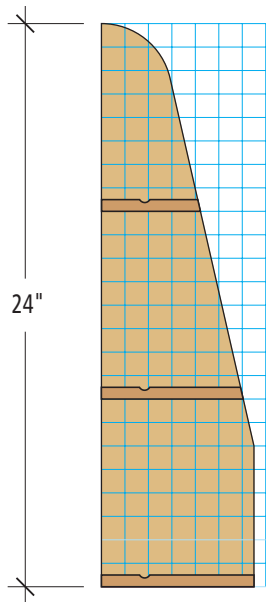
	NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
			T	W	L		
<input type="checkbox"/>	2	Sides	1½	47⁄8	25¼	Maple	
<input type="checkbox"/>	1	Bottom shelf	½	3½	23½	Maple	in 3⁄16" x ½" dado
<input type="checkbox"/>	1	Middle shelf	½	47⁄8	23½	Maple	in 3⁄16" x ½" dado
<input type="checkbox"/>	1	Middle shelf	½	3	23½	Maple	in 3⁄16" x ½" dado
<input type="checkbox"/>	1	Top shelf	½	3	23½	Maple	in 3⁄16" x ½" dado

the outside of the side pieces and putty your nail holes. Ease all the sharp edges of the project using 120-grit sandpaper. I dyed my project using a water-based aniline dye that I mixed myself from several custom colors. I recommend you use J. E. Moser's Golden Amber Maple dye for a similar effect. It's available from Woodworker's Supply at 800-645-9292 or woodworker.com.

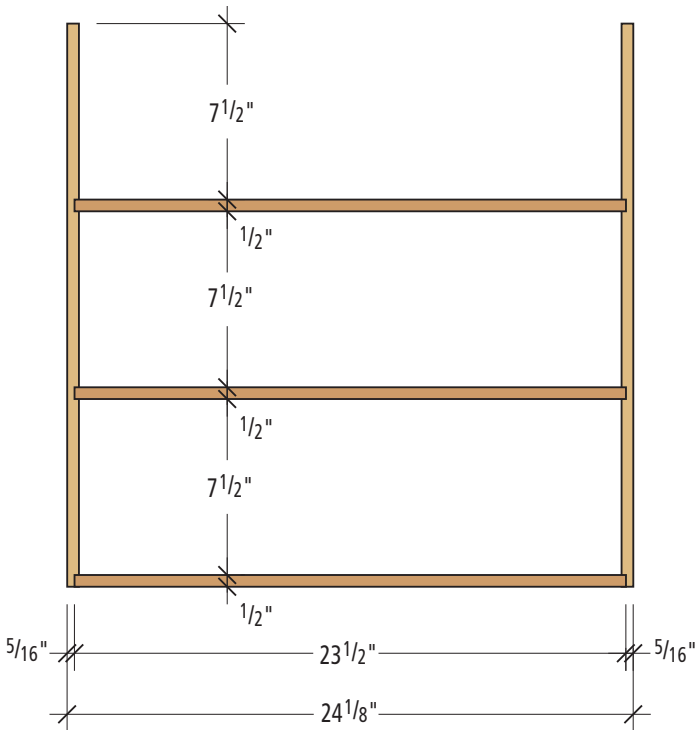
Finally, add a couple coats of your favorite top-coat finish and sand between coats. Hang your shelf using some common picture hooks, available at any home center or from the source listed in the box below. **PW**



Notice the relief cut I made in the sides. By removing the waste in smaller hunks (instead of all at once), the blade is more maneuverable.



Section
1" grid



Elevation

SUPPLIES

Picture Hooks
available from home-center
stores or from Lee Valley Tools,
800-871-8158 or
leevalley.com

Item # 00D78.02, 50 picture
hooks, \$3.90 plus shipping

SHAKER HANGING SHELF

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
2	Sides	1/2	6 1/2	24	Cherry	
1	Bottom shelf	1/2	6 1/2	23 1/2	Cherry	in 3/16" x 1/2" dado
1	Middle shelf	1/2	6	23 1/2	Cherry	in 3/16" x 1/2" dado
1	Top shelf	1/2	4 1/4	23 1/2	Cherry	in 3/16" x 1/2" dado

Turned Bottle Stoppers



Here's what you need to know to get started and a few great ideas for what's possible when making these fun projects.

Your choice of wine is thoughtful. The taste and bouquet are pleasing. But what if you don't finish the wine, and you want to save it for later?

Do you push the cork back in? Aluminum foil? Plastic wrap with elastic bands? Plastic soda-bottle caps?

There is an elegant solution: Unique, beautiful and functional bottle stoppers that are made on your lathe and are appealing to the eye.

The following information tells you how to choose the right materials and set up your lathe to turn these stoppers. I've also included a few photos of stoppers I've made to spark your imagination.

Choosing a Stopper Insert

There are several types of stopper inserts available now: cork, silicone and metal-plated (chrome or nickel) with rubber ribs or O-rings. They can be purchased from suppliers such as Penn State Industries

and The Woodturners Catalog (see the Supplies box for more details). Many of these supply houses also sell exotic wood that you can use for turning blanks.

Cork is an authentic and traditional material. Cork inserts with mounting dowels cost about 35 cents each. The metal-plated stopper inserts are eye-catching and durable, but they are the most expensive at \$3.50 to \$7 each. Silicone stoppers with dowels are about 85 cents each.

Pick Your Materials

My favorite woods for making bottle stoppers are cocobolo, padauk, walnut and zebrawood. (Be sure to use a face mask and dust collector because the sawdust will cause allergic reactions in some



by Charles A. Turnage

Charles A. Turnage is a professional turner in Worcester, Massachusetts.



Photo by Al Parrish; additional photos by Edward Jeffrey Newcombe



Here you can see the three bottle stopper blanks and the piece for the stand. The hole drilled in the center of each blank is $\frac{23}{64}$ " in diameter and 1" deep.



I've found the best way to turn these stoppers is to screw them onto a bolt (that has had the head cut off) that's chucked into my lathe.



After sanding down the corners, mount the blank on the bolt and use the tailstock of your lathe for support.

people.) Choose a wood with rich color and appealing figure, because in a turned piece it is the visual quality of the wood that impresses the customer or recipient of your stopper. I have used almost every kind of wood available, as well as antlers, horn, tagua nuts and legal ivory to make my eye-catching creations.

The shape of the finished stopper can be like a chess piece, Swedish modern furniture, a minaret or something else. The material of the stopper body can be identical to that of the stand, or a contrasting wood. The ensemble – stoppers and stand – can match or complement your dining room set or utensils. You also can use blonde wood stoppers for white wines and rich red woods, such as cocobolo, for red wines.

Cut the Material to Size

For your blanks, you need wood that is at least $1\frac{3}{4}$ " thick. You also can achieve interesting effects by laminating different woods together to achieve your finished thickness. The stands can be made to hold any number of stoppers. In this article, I make a three-stopper stand using zebrawood and cork stopper inserts.

Begin your project by cutting three stopper blanks to $1\frac{3}{4}$ " x $1\frac{3}{4}$ " x 3". For the stand, cut one piece that is $1\frac{3}{4}$ " x $2\frac{3}{4}$ " x $4\frac{1}{2}$ ".

Turning the Stopper Body

First, don't use the dowel supplied with the stopper insert to turn your stopper. The supplied dowel, with its lengthwise serrations, is great for gluing the stopper assembly together, but it will splinter under the stress of turning.

Instead, make a turning insert that is essentially a headless bolt. Take a $\frac{3}{8}$ "-diameter bolt that's $2\frac{1}{2}$ " long and threaded along only part of its length. Cut off the head with a hack saw.

Insert the unthreaded end into a $\frac{1}{2}$ " keyed chuck. Now, using a $\frac{23}{64}$ " drill bit, drill a 1"-long hole into the center of your stopper blank. Screw the blank onto the threaded rod.

If you have a belt/disc sander, it's a good idea to now knock the edges off your blank, especially if you're turning a blank with the grain perpendicular to the lathe. (That is, you're turning end grain at least some of the time.) This makes turning the stopper a lot easier. Always use the tailstock of the lathe to help balance the stopper while turning it.

Sanding and Finishing

After you have turned your design, remove the tailstock and start sanding. Begin with 150-grit paper and work your way up to 320 grit. Then use a hand pad (the 3M Scotch-Brite 7445 pad works best for me) to apply a sealer or wax. Then use a lint-free cloth to friction polish the stopper.

Now take the finished stopper off the lathe and ream out the hole for the dowel by using a $\frac{3}{8}$ " bit in your drill and running it in reverse. Apply some regular wood glue in the hole and press the dowel in the stopper body.

For the best finish possible, here's what I recommend: Once your glue has cured, dip the stopper into Hi-Gloss Project Finish. Prepare to dip by getting some scrap wood and drilling holes in it that are a bit larger than $\frac{3}{8}$ " in diameter and at least 2" apart.

After dipping each stopper, shake it for about 20 seconds (like an old fashioned thermometer) to remove the excess liquid. Place the stopper's dowel upright into one of the holes you drilled and let it dry overnight. Or, if you like, you can add a second coat after 30 minutes or so and let the stopper dry overnight.

Finally, glue on the cork and

cut off and sand any part of the dowel that extends through the base of the cork.

Making the Stand

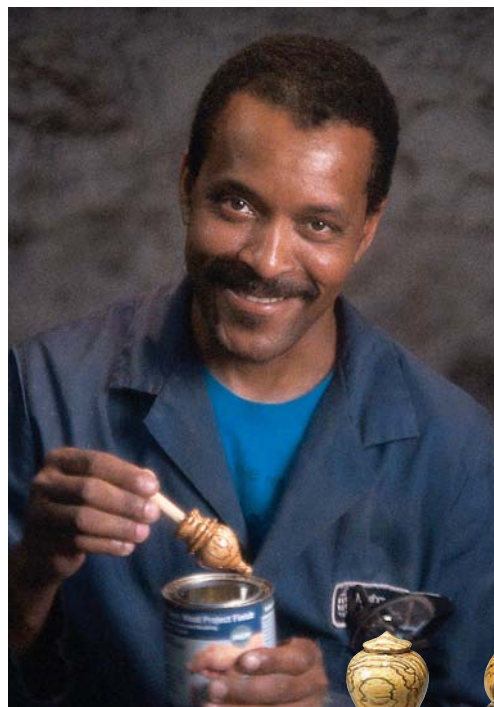
As a rule of thumb, you want to have about 1½" of length in your stand for each stopper that it will hold. This project has three stoppers, so I made a 4½"-long stand. Draw a center line on top of the stand along the length of the wood. Mark the locations of the 7/8"-diameter holes as shown in the diagram below.

Use an awl or nail to mark the center of each hole. Then use a 7/8" Forstner bit in your drill press to drill a

hole 1½" deep. You can decorate the edges with a router in a router table. If you like, you can cut out the underside of the stand to give it two legs. I cut a 7/8"-wide by 1½"-high notch that runs the length of the stand. You can use a table saw and make several passes to cut the notch, or you can use a band saw and clean up the saw marks with a sharp chisel, a file or some sandpaper.

Sand the stand and finish it using the same finish you used for the bottle stoppers.

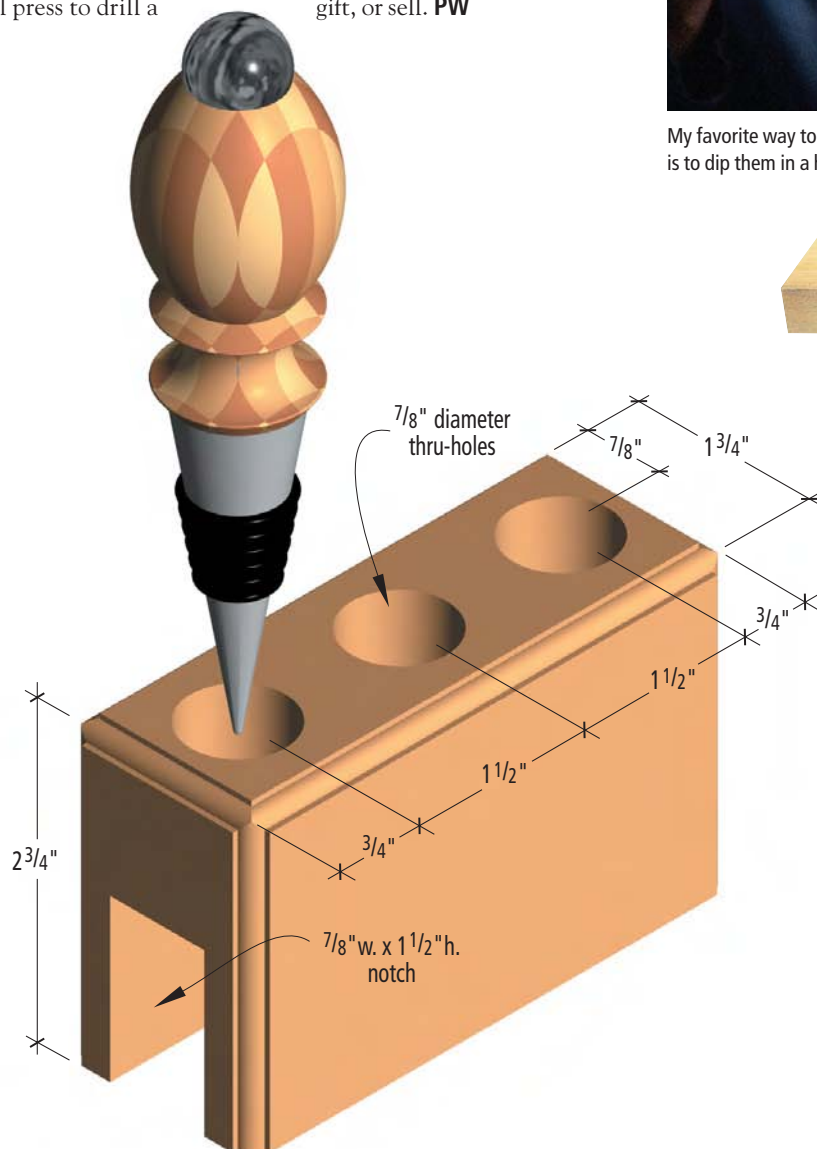
Your stoppers and stand ensemble are now ready to display and use, wrap and present as a gift, or sell. **PW**



My favorite way to finish these stoppers is to dip them in a high-gloss varnish.



After applying the finish to the stoppers, the best way to let them dry is to make a small rack that holds the stoppers' mounting dowels.



SUPPLIES

Penn State Industries
800-377-7297
pennstateind.com
Carries, among other things, a chrome stopper kit, Hi-Gloss Project Finish and other supplies.

The Woodturners Catalog
800-551-8876
woodturnerscatalog.com
Carries cork stoppers, silicone and combo corkscrew/bottle stopper kits and supplies

Yankee Hardwood Specialties
800-646-6929
yankeehardwood.com
Carries exotic hardwoods

The Driftwood Connection
503-864-3709
Carries domestic softwoods and hardwoods

USING THE SHAPER

When set up and used correctly, the shaper is a safe and powerful machine that's capable of making some amazing cuts. Here are the basics to this sometimes-feared machine.

Whenever I teach a workshop on shaping, first-time shaper users always are impressed with the machine's power and smooth performance. While many woodworkers think of the shaper as a machine suited only for production runs, it's also a great addition to the small home workshop. Its large spindle and powerful induction motor allow it to easily breeze through cuts that bog down even the largest router. And although the router table has many advantages compared to the shaper (see issue #129), it's no match when it comes to profiling table edges, cutting rabbets, creating

complex mouldings, and other shaping tasks associated with building furniture and cabinets. So read on to find out how you can put this heavyweight to use in your own shop.

Shaper Anatomy

Compared to other complex machines such as the planer, shapers are stone simple. Most shapers feature a large, cast iron table with

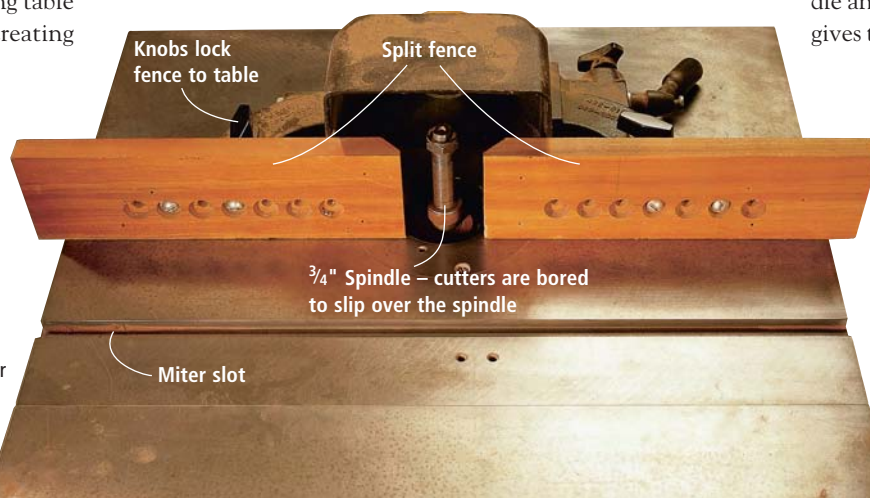
a large spindle protruding through an opening in the center of the tabletop. A split fence locks securely to the table to guide the workpiece; the opening in the fence adjusts to suit the diameter of the cutterhead and provides good support of the stock. Take a look under the table and you'll find a large induction motor mounted to an iron or steel framework. Power is transferred to the

spindle with a belt and pulleys. Most shapers feature a set of stepped pulleys that allow you to select from at least two speeds, usually 7,000 and 10,000 rpm. Multiple speeds allow you to adjust the rpm to best match the diameter of the cutterhead.

A unique and valuable feature found on most shapers is a reversing switch for the motor. In a typical setup, the motor and spindle turn counterclockwise and stock is fed past the cutterhead from right to left – like in a router table. However, there are times when reversing the spindle and motor to spin clockwise gives the machine much greater

by Lonnie Bird

Lonnie Bird is the author of "The Complete Illustrated Guide to Shaping Wood" (The Taunton Press) and teaches woodworking. You can contact him about his woodworking classes at lonniebird@earthlink.net.



The major parts of a shaper include the cast iron table, the spindle, the split fence and the miter slot.





When shaping an edge profile, it's always a good idea to add a shop-made guard (such as the one shown here) that will protect your fingers from injury, help hold the work against the table and remind you of the correct feed direction for that operation.

versatility and gives you more shaping options. For example, by inverting the cutterhead you can shape profiles on a large, complex moulding that would otherwise be difficult or impossible to reach. Just remember to invert the cutterhead and feed the workpiece from the opposite direction.

The heart of any shaper is the spindle. Ranging in size from $\frac{1}{2}$ " to $1\frac{1}{2}$ " in diameter, spindles are threaded for a nut or screw that securely locks the cutterhead in position. When shopping for a machine, remember that the best size spindle for small shop use is $\frac{3}{4}$ ". Spindles that are $\frac{1}{2}$ " simply are too small for the cuts you'll want to perform; shapers with spindles greater than $\frac{3}{4}$ " are too large and expensive and best suited for factories and custom mill-work shops. Yet another advantage to $\frac{3}{4}$ " spindle shapers is the wide variety of cutterheads that are available.

Basic Shaper Setup

Among the most common uses of a shaper are creating rabbets

along backboards and lipped drawer edges and shaping simple moulding profiles such as the ogee, thumbnail and ovolo.

Begin by mounting the cutterhead on the spindle and securing it in place with the spin-

dle nut. When mounting the cutterhead, it's usually best if it cuts from beneath the workpiece. This way the work acts as an additional barrier to shield your hands. To accomplish this, it might be necessary to invert the cutterhead and reverse the spindle direction.

Next, adjust the height of the cutterhead with the spindle handwheel and lock the handwheel to secure the setting. To accurately adjust the height you can position a square on the table adjacent to the cutterhead.

Once the height is adjusted, the next step is to set the fence. Position the fence for a light cut and lock it to the table with the fence studs provided. Unlike a table saw, it's not necessary to position the fence parallel to the miter slot unless you're using the miter gauge. Once the fence is positioned, adjust the fence halves to keep the opening as small as possible. A small opening is safer because it helps prevent the work from tipping into the cutterhead. To adjust the opening, first loosen

the screws that fasten the wooden fence halves to the main body of the fence. Slide the fence halves as close to the cutterhead as possible and tighten the screws. Spin the cutterhead by hand to make certain that it clears the fence.

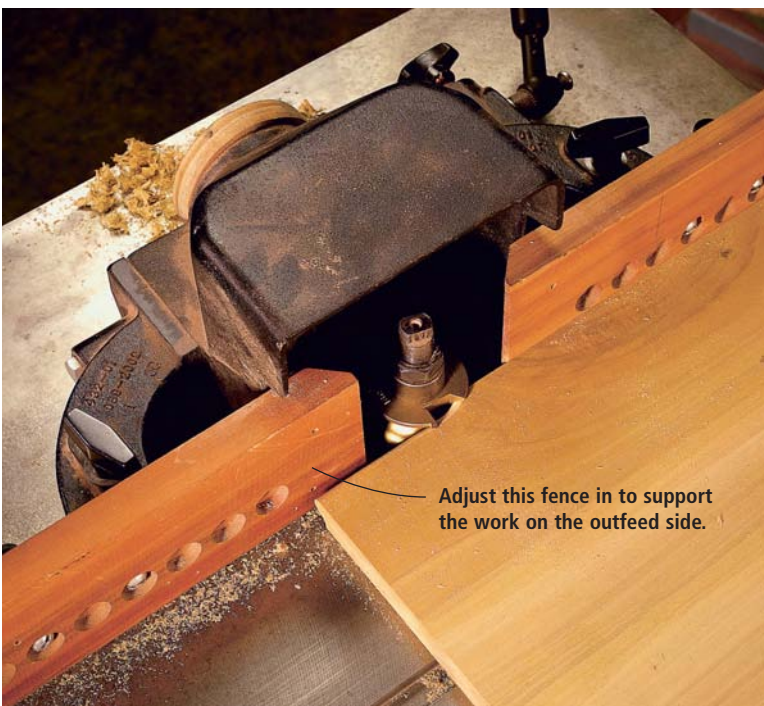
The final step in the setup procedure is to position the guard. While many shapers come equipped with some type of barrier guard, others do not. But you can rig up one of your own; a thick plank clamped to the face of the fence works well. Simply position the plank at a height that allows your workpiece to slide smoothly underneath it.

Make a Test Cut

With the fence, spindle height and cutterhead secure, you're ready for a test cut. But first make certain that the cutterhead is rotating in the proper direction. If in doubt, turn the machine off and watch the cutterhead as it coasts to a stop. Remember, too, always feed the workpiece against the rotation of the cutterhead.



Depending on the cut required and the geometry of the cutter, you frequently will need to reverse the direction of the cutterhead and your feed direction.



One of the superior features of a shaper's fence is its split design. This allows you to independently adjust the infeed and outfeed fences to support a large profile on the outfeed side.

Shaping an Entire Edge

Some moulding profiles, such as a bullnose or reverse ogee on the edge of a tabletop, shape away the entire edge of the stock. Consequently, as the workpiece is shaped it also is reduced in width. If the small loss of stock isn't compensated for, the trailing end of the workpiece will become sniped as it passes the spinning cutterhead.

To compensate for the loss of stock width, shapers are equipped with what's known as a split fence. This simply means that the fence halves are independently adjustable. Making the fence adjustment is easy: First, shape the first few inches of the stock. Next, turn off the power.

While the workpiece is firmly positioned against the infeed fence, adjust the outfeed fence forward so that it comes in contact with the stock. Now lock the fence setting and proceed with the remainder of the cut. The outfeed fence might also be adjusted with a micro-adjustment knob at the rear of the fence.

Shaping Narrow Stock

Attempting to shape narrow stock is an invitation for a kickback. But small mouldings and other narrow workpieces can be shaped safely if you remember to always shape the profile on the edge of wide stock first, then rip the moulding free. The wide stock adds plenty of mass to reduce vibration and provides lots of room to position your hands a safe distance from the cutterhead.

Shaping End Grain

Every woodworker knows that end grain is tough and can be difficult to work. Shaping end grain is no exception. For example, the grain can splinter or blow out at the trailing end of the cut. And if the workpiece is narrow, such as a door rail, the cutterhead has a tendency to pull it into the fence opening, spoiling the profile. The simplest solution to these problems is to first shape wide stock and then rip it to a smaller width afterwards. If this technique isn't feasible, then a good alternative method is to support the narrow

stock with a miter gauge. First fasten a backup board to the head of the miter gauge to provide additional support and prevent blowout. Then clamp the workpiece firmly to the backup board. The clamp will hold the work securely as you feed it, eliminating the risk of the stock dropping into the fence opening. To further reduce the risk, adjust the fence opening as small as possible before making the cut.

Shaping Curves and Arcs

Not all furniture is entirely comprised of straight lines. Many furniture styles from centuries past to the present day use flowing curves and arcs to add visual interest and appeal. Arched frame-and-panel doors, gooseneck mouldings and free-form chair legs are all examples that require special shaping techniques.

Shaping curved mouldings, panels, and other details present two challenges – guiding the stock and limiting the cutting depth. Although this is usually accomplished with the fence, with curved work a guide bearing is used instead. The bearing is first mount-

ed on the spindle above or below the cutterhead. If the entire edge isn't shaped, the guide bearing can roll along the workpiece. However, if the entire edge is to be shaped, a template must be used to guide the stock and limit the depth of the cut.

Let's take a closer look at both methods. But before you make the jump to shaping curved stock, you should realize that shaping curves requires advanced techniques with associated safety risks – techniques that should only be attempted after you've gained plenty of experience shaping straight stock.

Freehand Shaping

The simplest method for shaping curves is referred to as freehand shaping. This technique is useful whenever the edge is partially shaped, such as when creating a chamfer along the edge of a curved chair leg. When shaping freehand the guide bearing follows the workpiece as it is being shaped. For safety, it's best to position the cutterhead below the bearing. This way the work will cover the cutterhead and unused



If the entire edge is to be shaped, you should create a template that rests on the shaper's table. A bearing beneath the cutter follows the template as the cutter shapes the work above. Note the guard above the spindle to keep your hands safe.

portions of the cutterhead can be safely positioned below the surface of the table. By far, the most important part of the setup is a starting pin. The pin is positioned close to the cutterhead and acts as a fulcrum to provide leverage to safely start the cut. Once the workpiece contacts the bearing, it can be pivoted away from the starting pin to complete the cut.

Whenever shaping curves freehand, it's crucial that you limit the cutting depth by using a large diameter bearing. Also, the work-

piece must be large enough to provide mass and safe positioning of your hands.

Shaping Curves with a Template

The second method of shaping curves uses a shop-made template to guide the work. This method is the only option when the entire edge of the curved workpiece must be shaped. The workpiece may be secured to the template with toggle clamps or screws or a combination of both. Be sure

to leave the workpiece oversize until after shaping to provide extra mass and room to fasten the work to the template.

When designing and constructing the template, be sure to keep several factors in mind. First, extend the template beyond the workpiece. This way the template will contact the shaper's guide bearing before the cutterhead will contact the stock. This method provides a smooth, safe entry to the cut. Second, make sure the template is large enough to safe-

ly distance your hands from the cutterhead. Plastic push blocks fastened to the template work well as hand grips.

Finally, always take light cuts when shaping curves. Start each series of cuts with a large diameter guide bearing to limit the cutting depth. After each successive cut, switch to progressively smaller diameter bearings until the final profile depth is reached. **PW**

SHAPING SAFELY

All woodworking machines have inherent safety risks – and the shaper is no exception. In fact, the shaper has a reputation as a somewhat dangerous machine. However, as a long-time woodworker with nearly 25 years of experience using the shaper, I can say that it's a safe, productive machine when set up and used properly. As with any machine, always read the owner's manual and manufacturer's safety guidelines, use guards and pushblocks, and exercise common sense. In addition, here are guidelines that I follow when using the shaper:

1. Avoid heavy cuts. Heavy cuts on a shaper are much more prone to kickback. A safer alternative is to shape the profile in several small passes or to remove excess stock first using your table saw.

2. Always feed the workpiece against the rotation of the cutterhead. If your shaper has a reversing switch, make certain of the rotation of the cutterhead before you begin.

3. Select the appropriate spindle speed. Large diameter cutterheads, such as those designed for panel-raising, have a higher rim speed than small diameter cutterheads and should be run at a lower rpm.

4. Keep the fence opening as small as possible. This safety precaution helps prevent the workpiece from dropping into the cutterhead.



Using the right guard and keeping your hands away from the cutterhead will help avoid accidents.

5. Position the cutterhead so that it cuts from underneath the workpiece. Using this method, the workpiece acts as a barrier and any portion of the cutter not being used will be safely positioned below the shaper table's surface.

6. Avoid shaping short, thin or narrow stock. Instead, first shape an oversize piece of stock, and then size it to the dimensions needed after shaping.

7. Use spring holddowns and featherboards whenever possible.

These simple devices aid in keeping the stock against the table and fence, reducing vibration and helping to keep the workpiece flowing in the intended path.

8. Always keep hands a minimum of 6" from the cutterhead. Use pushblocks, jigs and pushsticks.

9. Always use a starting pin when shaping freehand. The starting pin works as a fulcrum to allow you to safely pivot curved work into the spinning cutterhead and against the guide bearing.

10. When shaping with a template, extend the template beyond the workpiece. This way, the template will contact the guide bearing before the workpiece contacts the cutterhead.

11. Disconnect the shaper from its power source before making any setups or adjustments.



American Corner Cabinet

The triangular shape of this project puts off most woodworkers. Here's a secret: It's actually quite easy to build.

There is something about corner cabinets that spooks most woodworkers. They look like trouble because they've got a lot of angles and the case isn't square – it's got six sides. Well allow me to let you in on a little woodworking secret. These are easy to build.

If you know how the case goes together, you'll understand what I mean. Essentially, there are three important assemblies: a face frame for the front with a couple extra wings on it, the rear support (which has dados for the shelves), and the shelves themselves. You put these three parts together and everything else – the moulding, doors and back – is easy.

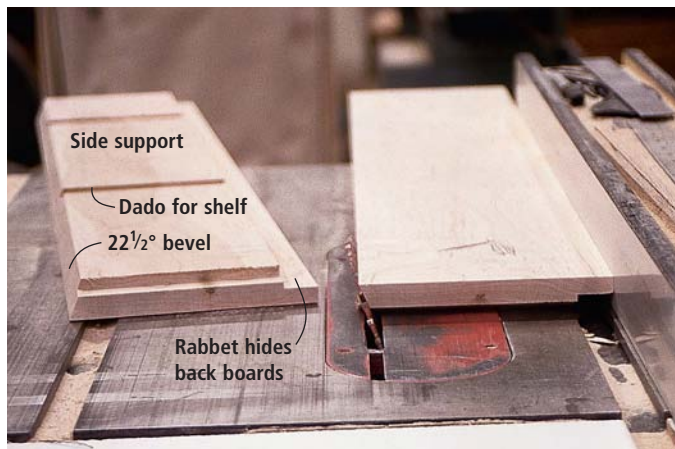
I've made this project even easier for you by providing the exact layouts for the shelves. Even the angled work is easy. You'll only need to adjust your saw blade's bevel to 22½° and 45° during this project, two common settings.

Pick your wood carefully for this project because what shows in the front has got to be good. I used curly maple as the primary wood, with poplar as the secondary wood for interior parts. Because so much of this project is behind the face frame, most of this project is made using common poplar.

So not only is this corner cabinet easy to build, it's also pretty inexpensive for such a large case piece.

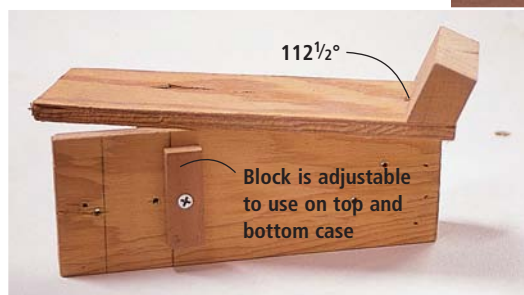
by Glen Huey

Glen Huey builds custom furniture in his shop in Middletown, Ohio, for Malcolm L. Huey & Son, is a contributing editor for Popular Woodworking and is the author of "Fine Furniture for a Lifetime."

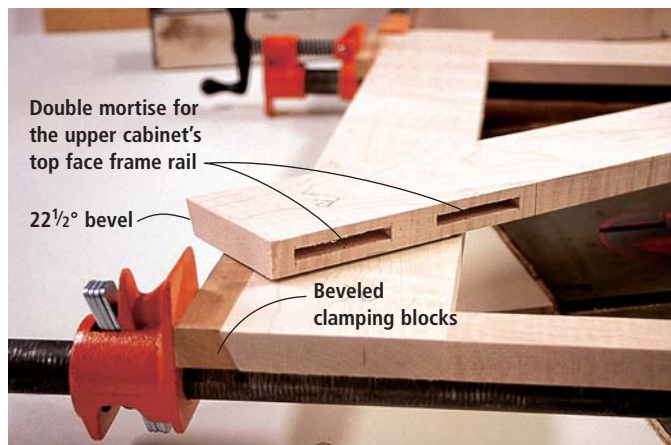


1 Begin by cutting the upper and lower side supports and rear supports to size. Then mark the shelf dado locations using the diagrams and rout $\frac{1}{4}$ "-deep dados in all six pieces for the upper and lower shelves. Now cut a $\frac{3}{4}$ " x $\frac{3}{8}$ " rabbet on one edge of each side support to hide the backboards, then rip a $22\frac{1}{2}^\circ$ bevel on the other edge. On the back supports, cut a 45° bevel on each long edge.

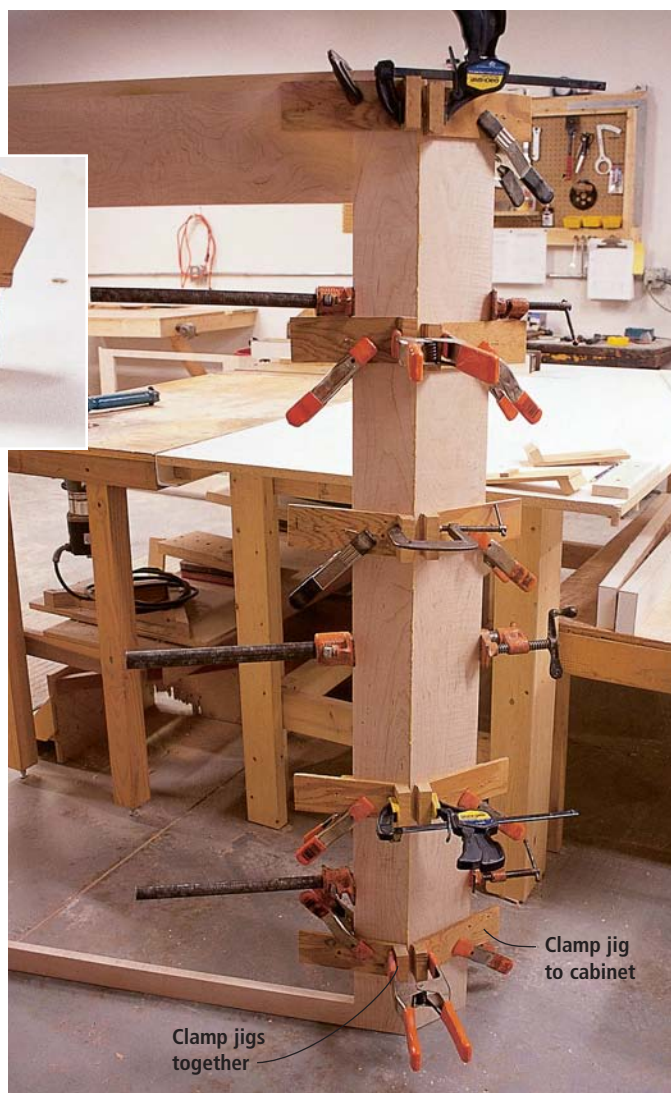
3 Sand the interior of all pieces and then glue the side supports to the face frames. To make things easier, add a few biscuits to the joint to keep things aligned during glue-up. I use a special clamping jig (see below and right) that I designed for assembling corner cupboards. Make sure you have plenty of clamps.



4 The shelves are nearly all the same size, so I milled and glued individual boards to create enough blanks for all eight pieces, using the larger, lower shelf dimension to start. By offsetting the boards, as shown in the photo, you can lay out two interlocking triangular shapes per blank, reducing waste.

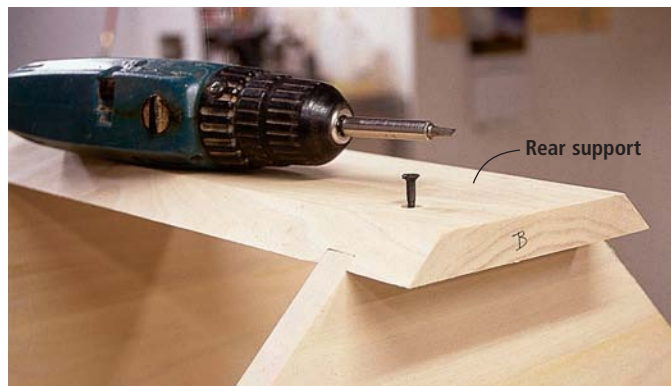


2 Cut the mortise-and-tenon joinery for the upper and lower face frames. Note that the mortise-and-tenon joint for the upper cabinet's top frame rail is a double tenon, and the lower cabinet's bottom rail doesn't extend to the floor. Rip a $22\frac{1}{2}^\circ$ bevel on the outside edge of each face frame stile. Assemble the two frames. Use small blocks with a corresponding $22\frac{1}{2}^\circ$ angle to make clamping easy.





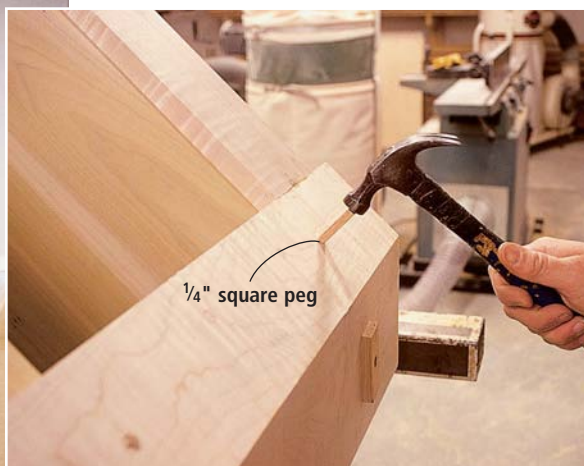
5 Next, cut the shelves to size, following the patterns in the diagrams. I generally make one shelf for each section of the cupboard and then use them each as a pattern for the balance of the shelves. Make just three shelves for the top case with the cut as shown. The remainder are straight at the front edge.



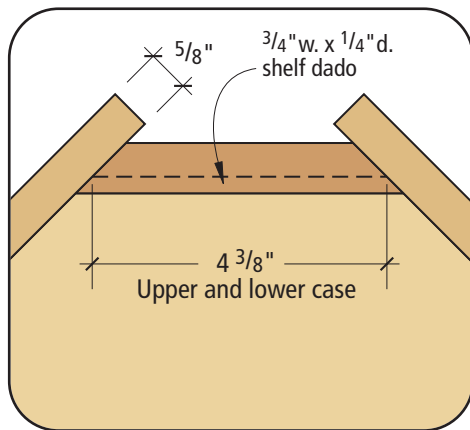
6 Apply glue to the dados in the side supports and slide the shelves into place. Then set the rear support into place and use two #8 x 1 1/4" screws per shelf to attach everything together.



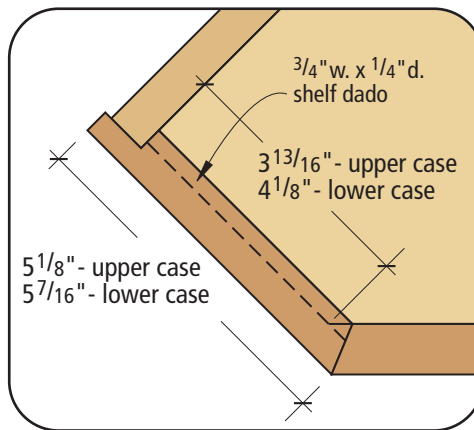
7 Set the unit upright and temporarily attach the face frame and side supports to the shelves using a scrap block and a #10 pan-head screw set in the center of each vertical piece as well as centered in the shelf. These screws hold everything where it belongs as you add the square-peg joinery. Lay the unit on a solid surface and remove the screws one at a time, and install a 1/4" square peg into each location. Complete this step for both units.



8 Build the door frames (see the story "Making Doors" at the end of this article). After the doors are out of the clamps, use your jointer or a plane to fit the door frames to the cupboard, allowing a 1/16" gap on all sides. Then, with the doors in place, mark the location of each shelf on the doors. These will provide the locations for the muntins dividing the glass door, so they will align with the shelves.



Back corner detail



Left and right corner detail

HARDWARE AND SUPPLIES

Hardware from Horton Brasses,
horton-brasses.com,
800-754-9127

Door hinges:
3 pair of #HH-2 3" hinges
\$16.50 per pair

Upper door knob:
1 - H-97L - \$6.50

Lower door knobs:
1 - K-12 (1") - \$3.75 each
1 - H97 - \$6.00

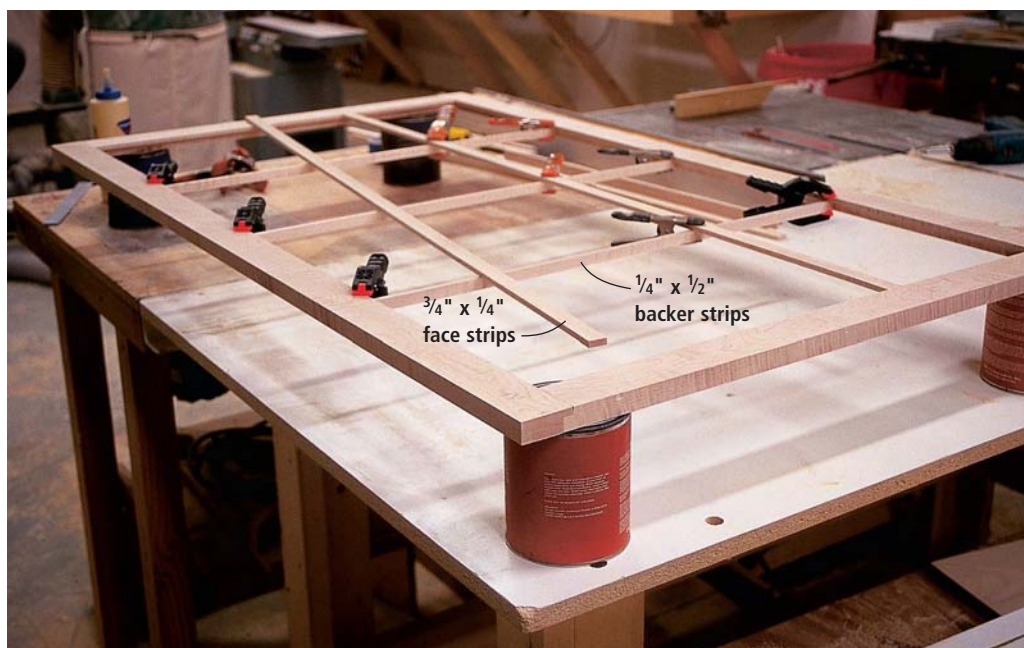
Interior finish:
Brierwood Green acrylic latex
(#2024) from Olde Century
Colors, oldecenturycolors.com,
800-222-3092

AMERICAN CORNER CABINET

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	NOTES
		T	W	L		
Case						
☐ 1	Upper rear support	3/4	4 7/8	60	Poplar	
☐ 1	Lower rear support	3/4	4 7/8	30	Poplar	
☐ 4	Eight shelves	3/4	22 3/8	66	Poplar	Glued offset to create two shelves
☐ 2	Upper side supports	3/4	5 1/8	60	Maple	
☐ 2	Upper face frame stiles	3/4	3 5/8	60	Maple	
☐ 1	Upper top FF rail	3/4	6 3/4	32	Maple	1 1/4" TBE
☐ 1	Upper bottom FF rail	3/4	2	32	Maple	1 1/4" TBE
☐ 2	Lower side supports	3/4	5 7/16	30	Maple	
☐ 2	Lower FF stiles	3/4	3 15/16	30	Maple	
☐ 1	Lower top FF rail	3/4	1 1/4	32	Maple	1 1/4" TBE
☐ 1	Lower bottom FF rail	3/4	4	32	Maple	1 1/4" TBE
Lower Doors						
☐ 2	Outside stiles	3/4	2	23	Maple	
☐ 2	Inside stiles	3/4	2 7/16	23	Maple	
☐ 2	Top rails	3/4	2	13	Maple	1 1/4" TBE
☐ 2	Bottom rails	3/4	2 3/4	13	Maple	1 1/4" TBE
☐ 2	Door panels	5/8	11 3/8	19 1/8	Maple	
Upper Door						
☐ 2	Stiles	3/4	2	51 1/4	Maple	
☐ 1	Top rail	3/4	2	27 1/2	Maple	1" TBE
☐ 1	Bottom rail	3/4	2 1/4	27 1/2	Maple	1" TBE
☐ 8	Grid pieces (approx.)	1/4	1/2	26 1/2	Maple	
☐ 2	Grid pieces (approx.)	1/4	3/4	50	Maple	
☐ 3	Grid pieces (approx.)	1/4	3/4	26 1/2	Maple	
Moulding						
☐ 1	Base	5/8	4 1/2	5lf	Maple	
☐ 1	Waist	13/16	1	5lf	Maple	
☐ 1	Crown	3/4	4 5/8	5.5lf	Maple	
Backboards						
☐ 2	Upper	5/8	27	57 1/2	Poplar	Multiple half-lapped pieces
☐ 2	Bottom	5/8	28	26 1/2	Poplar	Multiple half-lapped pieces

KEY: TBE = tenon on both ends

9 To begin the muntin section of the doors, cut three horizontal $\frac{1}{4}$ " x $\frac{1}{2}$ " backer strips to divide the glass area into four horizontal rectangles. The fit should be snug, but not so tight as to bow the frame. Glue the backer piece into the rabbet area and clamp until dry. Flip the door over. Then install the two vertical $\frac{3}{4}$ "-wide x $\frac{1}{4}$ " face pieces that divide the glass into three vertical rectangular sections. These are glued to the first three backer strips at the intersections, but left loose at the edges of the frame for now. This technique is covered in more detail in the August 2002 issue of *Popular Woodworking*.



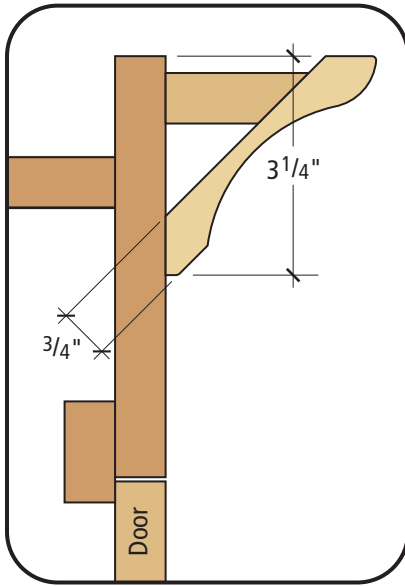
10 When your spring clamps are available again, flip the door to the back side and install the eight remaining vertical $\frac{1}{4}$ " x $\frac{1}{2}$ " backer strips to the back of the two vertical face pieces. When dry, all that is left are the nine $\frac{3}{4}$ "-wide x $\frac{1}{4}$ " facing strips on the front side of the door.



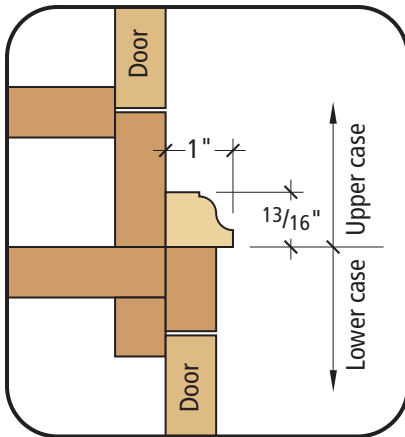
11 I used my table saw to mill the one-piece, bold crown moulding (as shown at right), then created a molded edge on both the top and bottom edges before final sanding. If this is a new technique to you, it is detailed in issue #117 of *Popular Woodworking*, or you can simply purchase a suitable pre-made crown moulding.

12 Next, cut the crown to length, fitting it to the upper case, and attach it using square-head reproduction nails. When finished, cut reinforcement blocks and install them between the face frame and the crown.

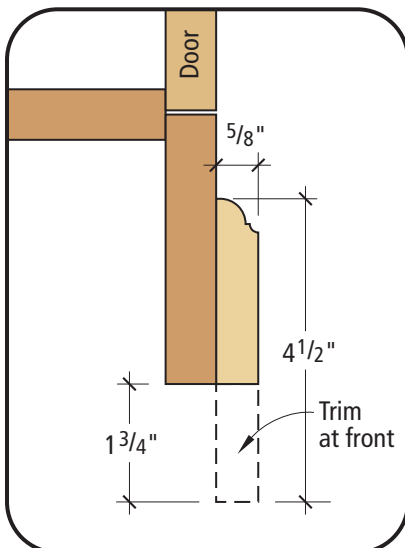




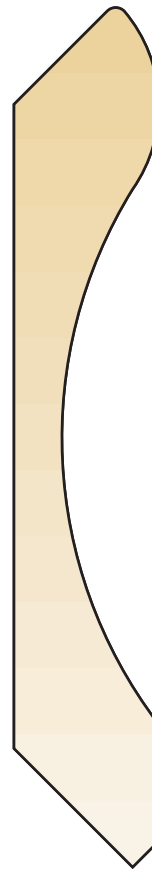
Crown moulding detail



Waist moulding detail



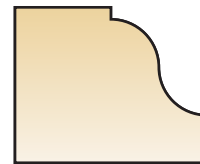
Base moulding detail



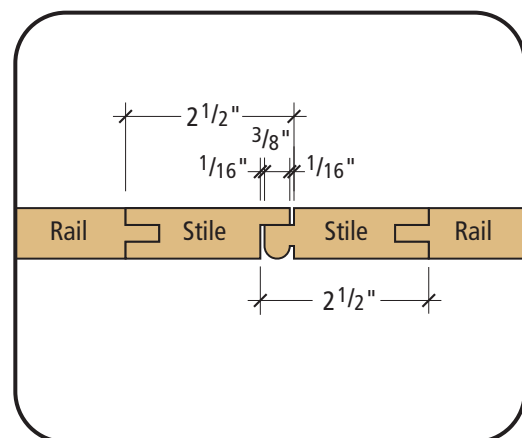
Full-scale
crown moulding



Full-scale
base moulding



Full-scale
waist moulding



Door meeting detail



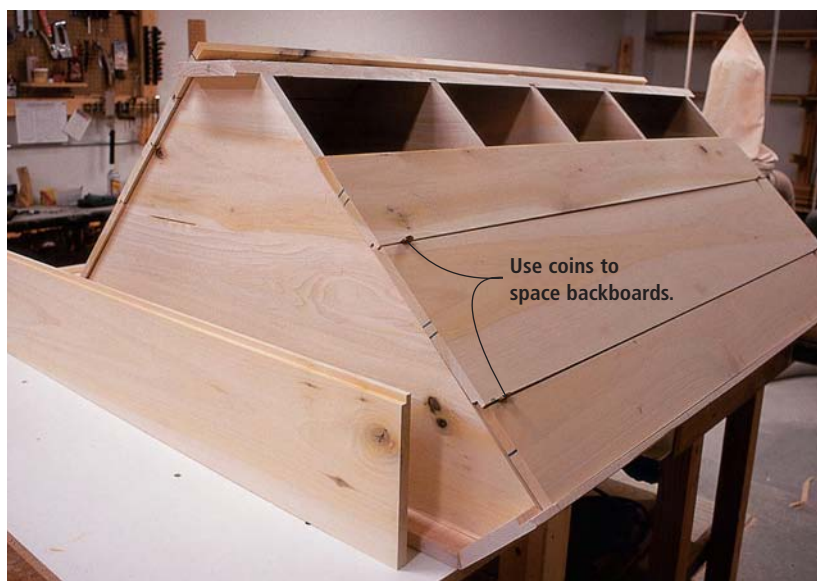
13 Mill the base moulding for the lower cabinet and rout the top edge profile. Fit and cut the base to the cabinet; but before attaching it, create the cut-away area on the front base. The curve is a 2" radius that starts 5½" from the corner. Then glue and nail the base in place.



14 The waist moulding is next. Set the upper unit onto the lower unit, aligning the rear supports and sides. Fit the waist moulding to overlap the two sections, tacking the moulding in place on the lower unit, but not the upper unit. Separate the two sections, then finish nailing the waist moulding to the top edge of the lower unit.



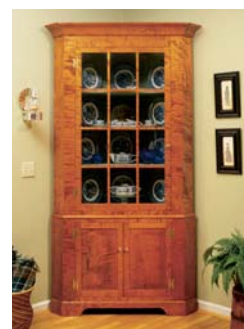
15 Before attaching the back pieces, use a ½" core box or roundnose bit to rout a plate groove into the top side of the three cut-out shelves and bottom shelf of the top section. Set the center of the cut at 1½" from the wall sides of the shelves.



16 Create the backboards using half-lap joints, but leave the pieces loose at this time. Finish sand all the pieces, and you're ready to add the finish. After the piece is stained and complete, paint the interior with two coats of a simulated milk paint, including the backboards. When dry, install the backboards using nails or screws, allowing a bit of a gap for expansion.



17 To complete the project, fit the glass into the upper door and install the hardware. The glass is held in place using Durham's water putty. For the hardware on this cupboard I used surface-mounted H-hinges and brass door catches.



I dyed this project using J.E. Moser's golden amber maple water-based aniline dye (available from Woodworker's Supply (800-645-9292 or woodworker.com).

MAKING THE DOORS



The lower doors are simply a raised-panel style door with a half-lap center and a bead detail at the lap. A $\frac{1}{4}$ "-wide x $\frac{1}{2}$ "-deep groove in the stiles and rails hold the raised panel.



Begin the upper glass door by milling the lumber according to the cut list and cutting the mortises in the stiles, leaving a minimum $\frac{3}{8}$ " interior shoulder. Next, cut a $\frac{5}{16}$ " x $\frac{1}{2}$ " rabbet on the interior, inside edge of all four door pieces.



Make the face shoulder cut so that the blade just clears into the rabbet.



Next, change the fence location by $\frac{5}{16}$ " by moving it closer to the blade. Then make the second shoulder cut, creating an offset of the cuts.



With the fence at the same location, cut to create the edge shoulder. Remove the cheeks and the shoulder, remembering that there are two different cheek heights to cut.



With the joints finished, you are ready to assemble this door frame. As you can see, the rabbet for the glass is created, and the joinery is professional. **PW**

A Craftsman's First Toolbox

A fine collection of traditional tools that are strong enough to withstand the enthusiasm of a young woodworker and nice enough to show off in your den.

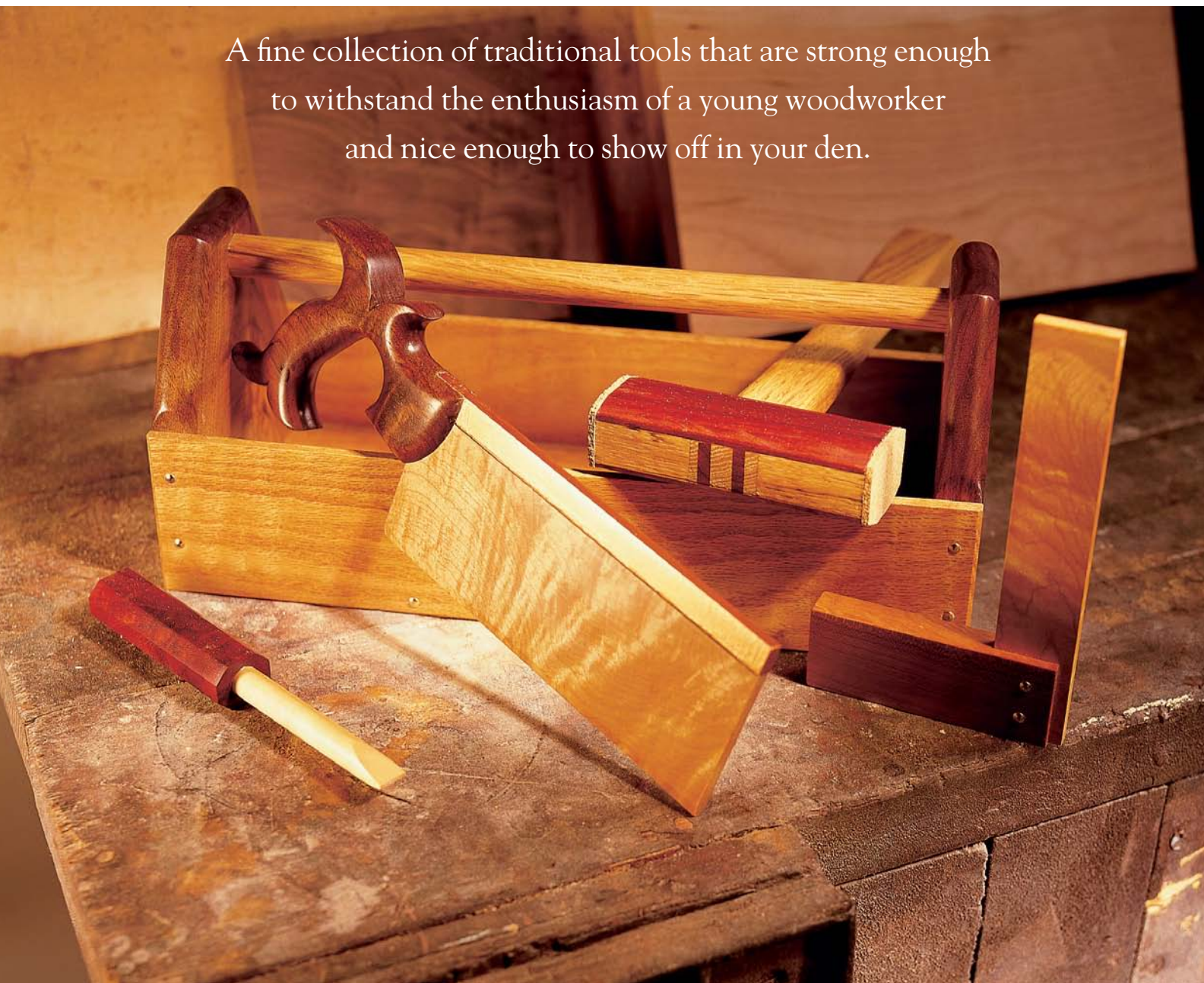


Photo by Al Parrish; step photos by the author

I'm sure I'm like most uncles when I say this, but Samuel's not like other 2-year-olds. Sure, he still likes the taste of a good book, but lately he spends hours staring at the construction drawings in his dad's woodworking books and magazines. To encourage the little craftsman, I built this toolbox and starter tool set. After finishing the set, I realized that a few of his tools not only looked better, but were more comfortable to hold than my own.

Although the tools shown here were designed for a child, I'm guessing that you may also know a few adults who wouldn't mind having a set like this decorating their desk. You can also use the toy plans to upgrade your own tools. For example, you can enlarge the saw pattern to fit your hand, and use a band saw to cut the kerf for a metal blade. A slightly beefier mallet would be perfect for assembling joints.

This is a perfect opportunity to use scraps that you've been hoarding for a special occasion. Just make sure to choose woods

that won't splinter in case your craftsman gets a little too zealous. You might even want to consider a small production run...one for you and one to give away.

Start with the Box

To build the toolbox, start by cutting the ends to size, then making a $\frac{3}{8}$ "-deep dado along the inside face of the end pieces to hold the bottom of the box. I nibbled out the groove by raising the cutting depth on my sliding compound miter saw and making repeated passes, but you could also use a table saw with a dado blade or a router with a straight bit. Now drill the handle holes and nip off the top corners at the angle shown. Lastly, use a router to round over both faces of the top end and the tapered edge.

After cutting out the bottom and end pieces, consider investing a little time in sanding before assembly (it's a lot easier to sand now than it will be later). Assemble the box using glue and clamps.

Hold off on the brass nails until you've completely sanded and

put the first coat of finish on the box. It's too easy to sand through the nails' thin brass plating.

Now it's time to attach the handle. Wedged tenons are an attractive and rock-solid way to attach the handle into the ends. Make sure to cut the wedge across, rather than parallel to, the end grain so that the dowel doesn't split when you drive in the wedge. It also helps to cut the wedge long, so that you can trim back the tapered end in case you need the dowel to flare more to fit the hole. Rub glue onto the outside of the dowel where it contacts the end pieces and to the faces of the

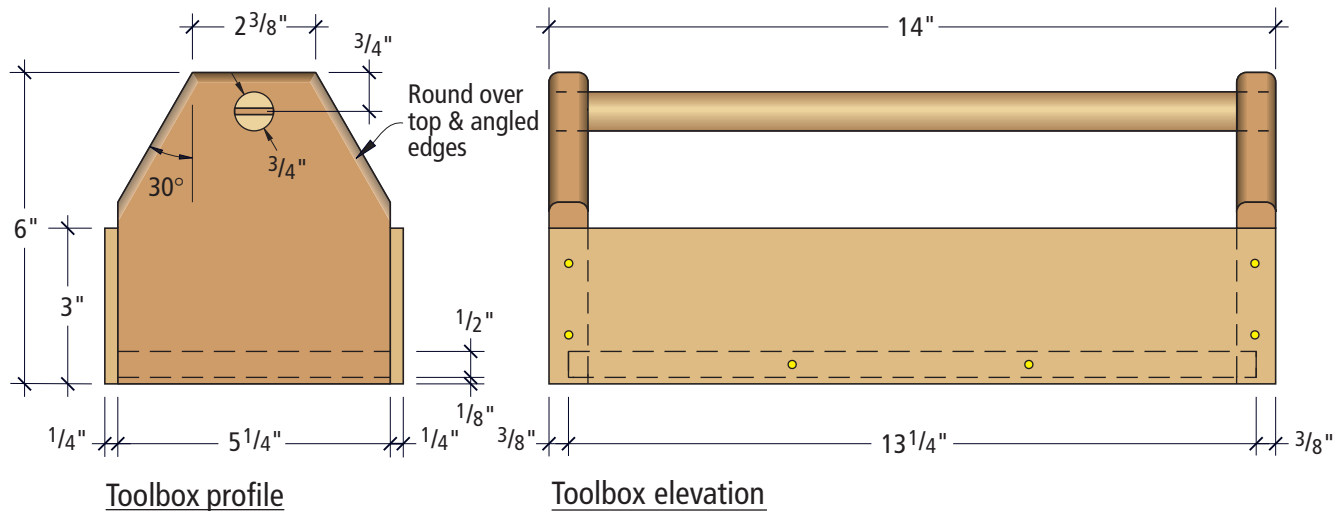
wedges. Then tap the wedges in place. Wipe off any excess glue right away, but wait until the glue is dry before trimming the wedge with a dovetail or flush-cut saw.

The Saw and Square

The saw looks like an antique, and it feels like it was made for your hand (which it is), but it's no more difficult to make than a scroll-sawn duck. Simply copy the pattern on the next page, affix it to a suitable piece of scrap, and start cutting. To make things even easier, I used my drill press to make the curves as shown below, then connected the holes with my band

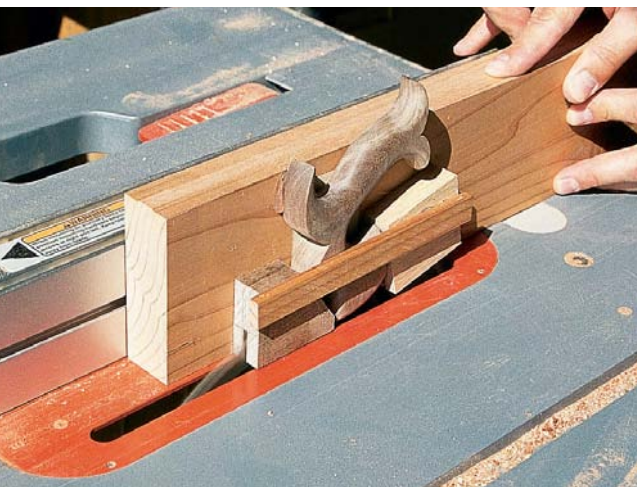


Use Forstner bits to make perfectly radiused curves. Connect the holes using your band saw, and you are halfway there.



by Joe Hurst-Wajszczuk

Joe Hurst-Wajszczuk is a writer and woodworker. He lives in Denver.



Secure the handle to the kerfing jig with carpet tape and hot glue. Glue a scrap from the handle blank in front of the handle to double-check the position of the blade.



Back your sandpaper to smooth the curves. Old mouse pads and carpet padding make excellent custom sanding pads.



To make a quick-and-dirty scratch stock, sharpen the head of screw with a file. Apply light pressure, keep the stock against the blade and let the screw do the work.

saw. After cutting the basic shape, use a rasp to smooth out any major bumps. Then use your router to round over just the areas indicated on the drawing. To keep your fingers safely away from the bit, consider hot-gluing a handle to the saw handle before you rout.

Next, cut the kerf for the blade. To do this, I made a simple kerfing jig from a scrap of 2 x 6 lumber. I attached the handle and the stops to the board with carpet tape and hot glue. As you can see in the photo above, the front stop was made from a leftover scrap from making the handle. I used this stop not only to secure the handle but also to mark out

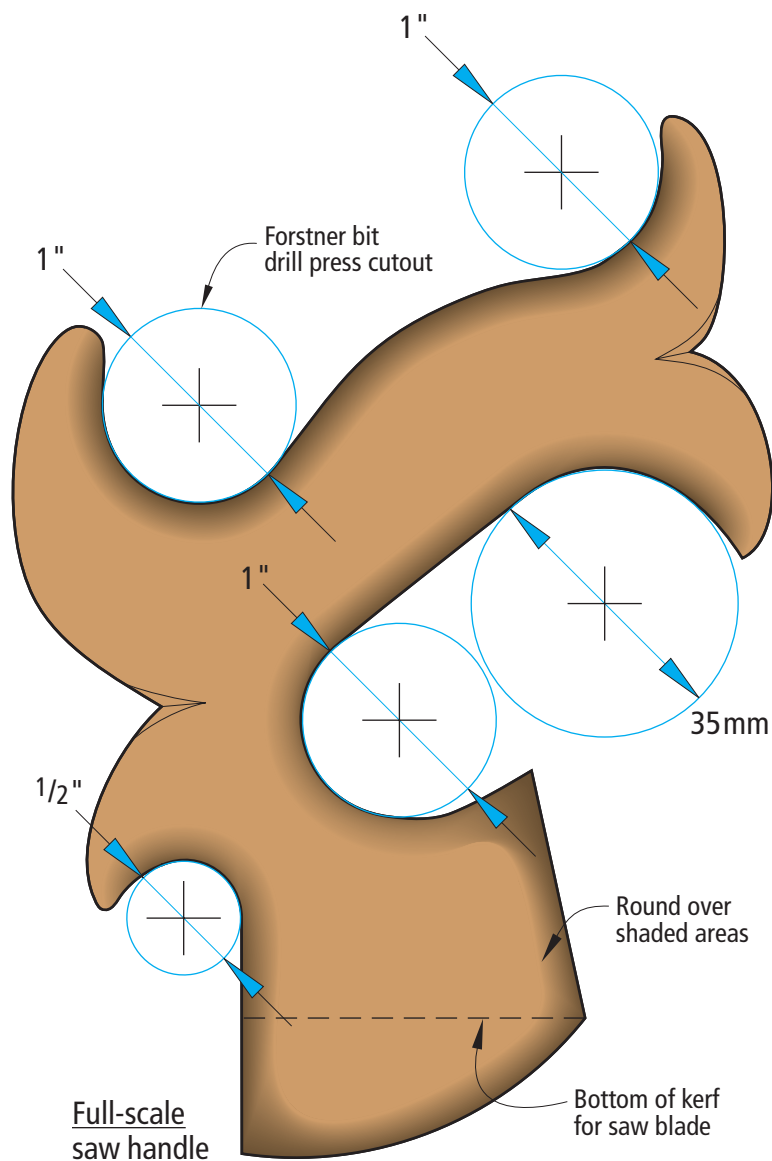
the slot for the blade. The straight-edged stop is much easier to mark out than on the curved handle. Marking out the stop instead of the handle also gave me advanced warning if the fence or blade were not set correctly.

The last, but most important, step in building the handle is sanding. To help me get into the tight curves, I used a variety of materials as shown above left. Cork, carpet padding and old mouse pads are some of my favorites. Wipe on a light coat of oil or mineral spirits to make any spots you've missed stand out.








Now it's time to shift focus to the blade. To make the backer

strip, I used a shop-made scratch stock as shown at left by filing the head of a screw to a point, then screwing it into a small block of wood. If you like, you can use spray paint or metal leaf to make the backer look like the real thing. Next, I planed a small bevel on the opposite edge to represent teeth. (Don't think of filing "pretend" teeth on the saw. I discovered that a maple blade can saw through a pine table leg.) Once you've finished the blade, apply a small amount of glue and insert it into the handle.

Once you've built the saw, the square is a piece of cake. Cut the pieces to size, kerf the handle,





	NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
			T	W	L	
Screwdriver						
	1	Handle*	7/8	1	4	Padauk
	1	End cap	3/4-dia.			Maple round head plug
	1	Blade	1/2-dia.		4 1/2	Maple dowel
Mallet						
	2	Head outer face	1/4	1 3/4	4 1/2	Padauk
	2	Head core	3/4	1 3/4	1 3/4	Oak
	2	Wedges	3/4		2	Padauk
	1	Handle*	3/4	1 1/4	12	Oak

83

and glue the blade in place. Sand, finish and add the brass nails.

Screwdriver

The screwdriver is made up of just three parts: the handle, the blade (a 1/2"-diameter dowel rod), and the end cap (made from a round head plug I found at my local craft store). The hardest part of making this tool is accurately drilling the ends of the handle. Starting with rectangular stock, cut the handle about 1/2" longer than you need. To locate the center of the handle, draw diagonals from corner to corner on both ends of the handle. An easy way to do this is by connecting opposite corners using a wide chisel and giving it a tap to establish the line.

After establishing the center point, drill the holes for the blade and cap. When drilling small stock it's important to clamp the wood in place. To provide something to clamp to, I made a simple clamping jig as shown below. After drilling the holes in both ends, insert the end cap, tilt your table saw's blade to 45° and trim off the corners to make the handle octagonal. Just make sure that you

don't cut into the cap. Next, trim the handle to length and glue in the blade and end cap. Lastly, shape the tip of the blade on a belt sander or with a chisel.

Mallet

Rather than attempting to mortise the head of the mallet, I made a simple three-ply lamination. Laminating the head is an easy way to make a tapered mortise that guarantees that the handle will never come loose.

First, cut all the pieces to size. Remember to cut a small 2°-or-so-bevel on the inside edges of the core pieces. Make the core and handle from the same stock to ensure a perfect fit. (Consider making the head's outer laminations thicker for a wider striking surface.) Next, use your table saw and kerfing jig to cut the slots in the handle for the wedges and two small steps along the outside edges. The steps stop the handle when it's inserted into the head. Drill holes in the bottom of the kerfs for the wedges so that you don't split the handle.

Shaping the handle is easier to do before it's attached to the

head. Clamp the handle blank as shown below and use a spokeshave or file to knock off any sharp corners until you've got a comfortable handle. Finish up the handle with a light sanding.

When gluing the head together, position the core pieces so that their bottom edge touches the handle. There should be about a 1/8" gap between the end of the core piece and the top edge of the handle. To prevent the core from slipping during glue-up, I drove staples into each lamination,

and then clipped off the heads so that the tip remained as shown below.

When the mallet head has dried, use your chop saw or table saw to trim off any squeeze-out and bevel the head. Bevel only the outer lamination; otherwise the handle will stick out past the head. Now you can insert the handle and glue in the wedges. Try to tap in the wedges the same amount so that when they're trimmed you get an even stripe pattern on the top of the mallet.



You can shape the handle with a spokeshave in less time than it takes to read this article. By clamping the handle as shown, you can spin the handle to quickly round over all four edges.



When drilling into end grain, you can't use too many clamps. The stop also ensures that the small piece is perpendicular to the table.



Clip the heads off of staples to prevent the laminations from slipping during glue-up.

If you're making this tool set for a child, I recommend padding the mallet's ends with leather or cork. (Don't ask me how I know this...sorry about the tub, Dave.) Cut the pads slightly oversized and attach them to the head with contact adhesive. Trim the caps to size after they're in place.

Finishing

Because I wanted to make tools that begged to be touched, finishing took almost as long as building the pieces did in the first place. But I think the results were worth the extra effort.

First, sand everything down to 600 grit. This isn't as tedious

as it sounds. Careful planing and scraping can help you jump straight to 320 grit. In fact, the padauk looked better after scraping than it did after sanding.

To bring out the grain, start with an oil finish. Once the oil has cured – use the applicator rags as a guide – apply a few coats of

wipe-on polyurethane for extra protection. Don't apply poly to the padauk; the oils in the wood will prevent the finish from curing. Finally, rub on a coat of wax with an ultrafine (white) abrasive pad for extra shine. **PW**

THE ULTIMATE SET OF WOODEN TOOLS

Mark Gordon starts with simple projects that always seem to spiral out of control. Ten years ago Gordon, a cabinetmaker whose hobbies include woodcarving, built a box and filled it with sentimental hand-carved keepsakes, turning it into a memory box. Another box became a treasure chest filled with wooden coins and jewels representing 25 different species of wood. His bird houses turn into bird mansions complete with turrets and gingerbread trim.

Last year Gordon built the mahogany box shown at right. He added a removable maple tray and filled it with 98 wooden tools and hardware, turning it into the ultimate wooden toolbox. Each piece was cut on a band saw, sanded and then carved to its finished shape. What started out as a goal to use 50 different species of wood turned into an achieved goal of using 100 different species of wood from around



the world. According to Gordon, finding the 100 different species of wood wasn't always an easy task.

Inside Gordon's box is a pencil made from ebony and a router bit that originated from a friend's apple tree. There's a pair of scissors made from sassafras, a wood that, according to Gordon, was a joy to sand because of the smell. The Columbus, Ohio, resident chose burlled buckeye, a local wood, for the drill bit. Then there's the washer. The wood for the washer, Irish blackthorn, was extracted from the handle of a reproduction battle hammer purchased in Ireland. Gordon sawed the hammer's handle in half, took the wood he needed and then glued the battle hammer's handle back together.

"Every piece I came up with was truly a challenge," Gordon says. "But the challenge was the greatest thing about it. It was a blast to do."

— Kara Gebhart



Gordon's toolbox cost about \$400 to make and took between 450 and 500 hours of working time to complete. In 2001 the project won first place in the Ohio State Fair's woodcarving competition.

Here you can see the level of detail in four of Gordon's tools. Gordon chose gum wood for the level and hickory for the spade bit. The tape measure is made out of red oak while canary wood was the wood of choice for the hammer.



Gordon finished his project with a clear lacquer to show off the many colors represented in the different species of wood.



A Contemporary Mobile File Cabinet

Elegant design emphasizes the contrast between birch and cherry while providing no-nonsense functionality.

A few years ago I built some office furniture for a local internet consulting company, and recently they called me back: Not only had they survived the dot-com crash, but they needed some mobile file cabinets. I had already developed a unique look for their computer workstations: birch surfaces surrounded by rounded-over solid cherry edge-banding. The style was crisp, clean and a nice fit for the company's bright and airy office.

My clients had a few ideas in mind: They planned to move the cabinets around so that people could share files, and they wanted to wheel the cabi-

nets underneath their desks to be easily accessible without occupying extra floor space. Locking casters and the ability to hold letter-size hanging file folders would also be nice. These guidelines created a set of dimensions to work from, and the fact that these cabinets are mobile also dictated that they be finished on all sides so that they could be enjoyed from all angles.

In terms of materials, we ruled out solid-wood panels because of their inevitable cross-grain expansion and contraction, and laying up the veneers myself would've been prohibitively expensive.

Fortunately I was able to locate some nicely figured $\frac{3}{4}$ "-thick birch plywood, and this allowed us to keep the look we were after without spending a fortune or sacrificing durable construction.

Cutting and Edge-banding the Cabinet Parts

First inspect the edges of the plywood, because the joint between the solid-wood edge-banding and the plywood panel needs to be crisp. Although it

by Chris Gleason

Chris Gleason designs and builds contemporary furniture and cabinetry for homes and commercial spaces in Madison, Wisconsin. You can see more of his work at interestingfurniture.com.

is tempting, you can't assume that a factory edge is up to snuff, and a quick glance may reveal numerous dings, dents and scratches. I often end up ripping $\frac{1}{2}$ " off of each factory edge. To minimize tear-out on cross-cuts, I use a sharp plywood blade and a zero-clearance throat plate. Feeding the panels more slowly, good-side facing up, also helps keep the cuts free of tear-out.

Once your panels are neatly trimmed to size, it's time to mill some edge-banding. I use cherry

because I like the color that it darkens to, but substitute as you like: I've also used walnut with pleasing results. I simply plane the cherry to $\frac{3}{4}$ ", then rip it into $\frac{1}{4}$ " strips. Precision is critical, as inaccurately sized strips will either overhang the plywood panels and need to be trimmed, or they won't cover the edge entirely and you'll have to make new ones. I usually mill some extra stock in case I notice a defect in one of the strips that wasn't evident beforehand. The cut list calls for 12

strips, which allows for one extra.

I own a few clamps that are designed for attaching solid-wood edge-banding, but they end up gathering dust for several reasons. To edge-band a number of panels requires more clamps than I'm willing to buy, and some clamps seem to lack the clamping pressure that I'd like. I also hate lugging heavy, clamp-laden panels around the shop while I wait for glue to dry. My solution is probably not original, but it is highly practical: I use blue painter's-grade masking tape. It is quick, inexpensive and lightweight. You can even stack a series of panels on top of each other to use space efficiently. And because an ounce of prevention is worth a pound of cure, I use just enough glue to create a tiny amount of squeeze out, which I then wipe up.

Because the edge-banding may overhang a bit, I use a router with a flush-trim bit to carefully remove the offending cherry; a careful touch with a random-orbit sander will remove any glue residue left over. The side panels need to

SUPPLIES

- 4 - Locking swivel casters with 2" - diameter wheels
- 3 - Drawer pulls
- 3 - 20" drawer slides, contact Accuride (562-903-0202 or accuride.com) for a distributor near you

be edge-banded on all four edges, and the top and bottom panels get edge-banded on their front and back edges only. The back receives no edge-banding at all. As a word of caution, veneered plywood is notoriously unforgiving when it comes to sanding. I've learned the hard way that there is no adequate method for repairing sand-throughs in the top layer of veneer, so work carefully to ensure that you'll have to do a minimal amount of sanding.

Assembling the Cabinet

I use biscuits here because they are strong and reliable. In addition, they are invisible once the cabinet goes together, and I didn't want any filled nail holes or



During the second stage of cabinet assembly, laying the cabinet on its side keeps you from fighting with gravity. The cabinet comes together relatively easily, and the alignment is a snap thanks to the biscuits.



Go slowly while rounding over the edges, as the cherry can tear out and splinter if a cut is rushed. The roundover is key to the smooth, clean feel of the piece.

plugged screws interfering with the lines of the piece or interrupting the flow of the grain.

I assemble the cabinet in two steps: First I sandwich the back between the top and bottom, and once the glue there has set, I sandwich that assembly between the sides. For the first step, I clamp the three parts together and line them up precisely. After marking the locations for biscuits, I pull off the clamps and cut the slots. After dry-fitting, I glue it up and wait a few hours. For the second step, I place one side panel flat on the table, inside facing up. I position the top-back-bottom assembly correctly on top of that, and finally place the remaining side on top of it all. With a couple of clamps holding the parts snugly in place, I mark the biscuit locations, then repeat the process I used on the first half of the cabinet assembly.

With a roundover bit in a router, I ease each edge, which

softens the sharp lines of the cabinet. By routing the edge-banding after the cabinet is assembled, the inside corners of the edge-banding flow together smoothly, and the eye is swept through graceful little curves that add a fine detail to the finished piece.

Making the Drawers

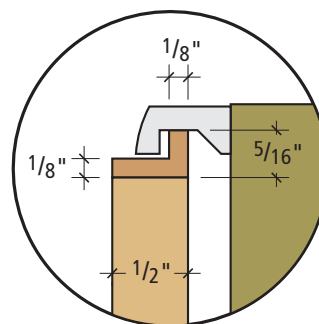
I build the drawers out of Baltic birch plywood because it is attractive, stable and inexpensive. If you like, you can mill solid-wood panels for the drawer parts – if you do, dress the stock to $\frac{1}{16}$ ", as the Baltic birch plywood sold as $\frac{1}{2}$ " actually measures out at $\frac{1}{16}$ " less. Refer to the cut list for the quantities and dimensions you'll need here. Once you've got the drawer parts cut, rip a groove in the bottom of each – you could use a dado blade here, but for a small number of parts like this, I don't take the time to change blades: I just make two passes side-by-side for the $\frac{1}{4}$ " groove.

For this project, I use a rabbet-dado joint to lock the drawer parts together. It is a strong mechanical joint with plenty of surface area for glue. I sketch it full-sized on paper, then set up my table saw to cut the dado on the inside face of the sides.

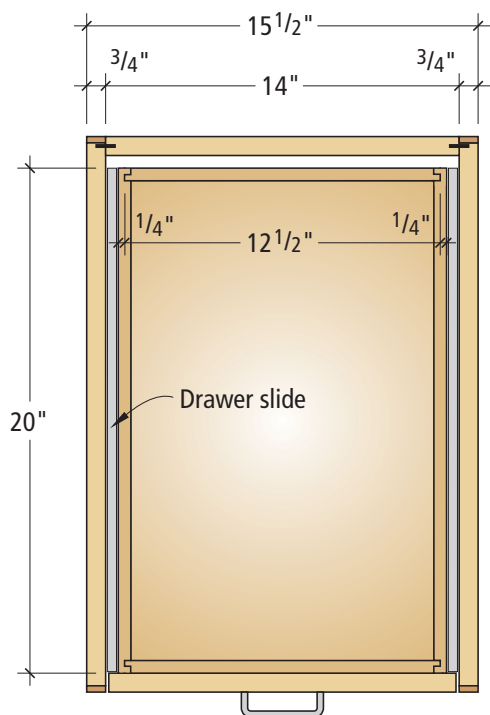
I use my miter gauge with a stop attached to make sure the dados are cut at a consistent distance from the ends of the drawer sides. This will take two passes. I then cut the rabbet in the drawer fronts and backs with a

similar setup – just change the blade height and move the stop on your miter gauge to correctly position the cut. Test the fit of the joint now while you're still set up to make changes.

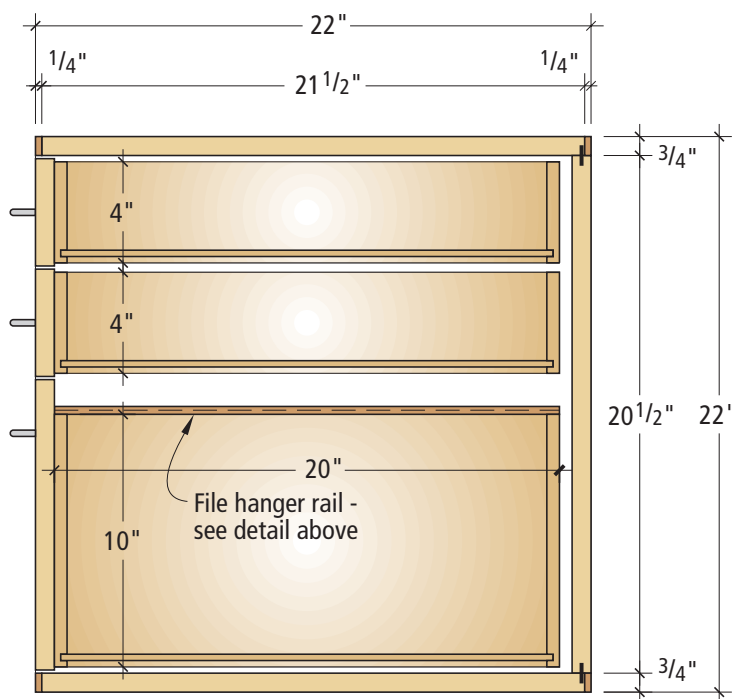
Once the rabbets and dados fit snugly, cut out the drawer bottoms. During glue-up, check that the drawers are square by measuring their diagonals. This ensures that the drawer fronts will line up evenly. If a drawer is slightly out of square, clamp it across the longer diagonal and apply



Hanger rail section



Horizontal section



Profile section



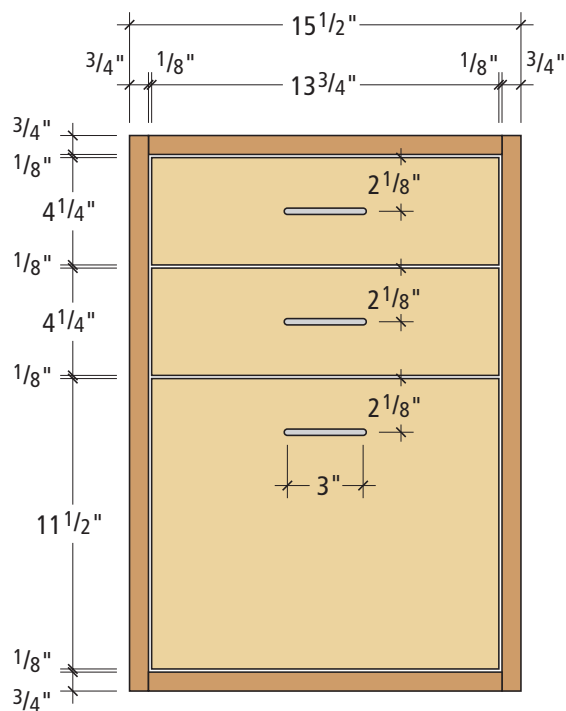
Using spacers to position the drawer slides eliminates one of the leading causes of poor-fitting drawers: inconsistent spacing of slides. Before putting in the spacers, be sure to brush out any sawdust or woodchips that may have accumulated inside the cabinet. A $\frac{1}{16}$ " discrepancy at this point could cause an annoying misalignment that you'll have to backtrack to correct later on.

pressure until it conforms. Once the glue dries, it should remain in the correct position.

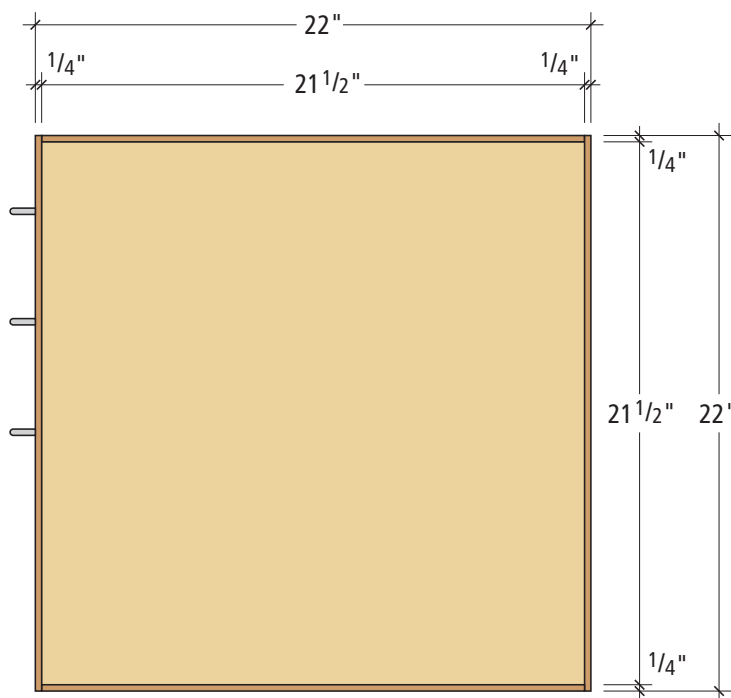
So that hanging file folders can be easily slid forward and backward in the bottom drawer, you'll need to make two rails that mount on the top edges of the drawer sides. I mill two 20" strips of cherry to $\frac{1}{2}$ " x $\frac{5}{16}$ ". I then make two cuts with the table saw to create the "L"-shaped piece needed. The piece can then be screwed into the tops of the drawer sides – be sure to countersink the heads so that they don't stick up and interfere with the movement of files across the rails.

Installing the Drawers

I use 20" Accuride slides because they're smooth and reliable. Each drawer requires one pair of slides, and each slide can be separated into two pieces: The larger one mounts inside the cabinet, and



Elevation



Profile

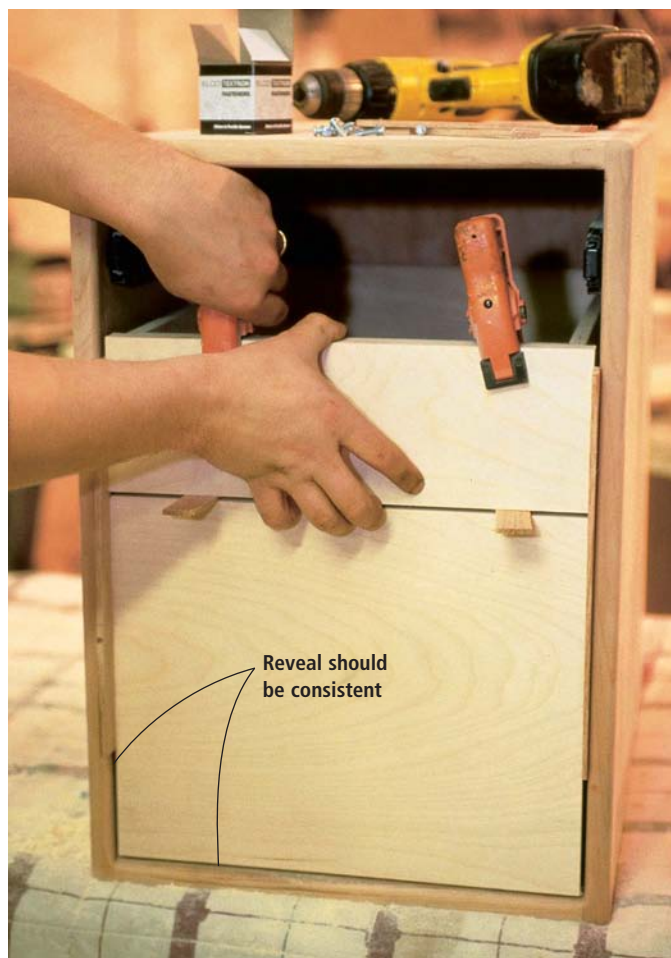
the smaller one attaches to the drawer. I keep the slides together during installation, and I use plywood spacers to lay them out evenly. With the cabinet on its side, I insert the lower spacer (4⁵/₈" wide), the first drawer slide, the middle spacer (6¹/₄" wide), the second drawer slide, the upper spacer (2⁷/₈" wide), and finally the upper drawer slide. Then I simply screw the slides in place with three screws. After flipping the cabinet onto its other side, I repeat the process.

With the cabinet upright on my bench, I push the bottom drawer halfway in and place ¹/₈" shims underneath it to establish a consistent and correct height for the drawer. I pull out the slides (it should be a snug fit, but not excruciatingly tight) and line them up with the front edges of the drawer. I screw in the front edges of the slides, and then pull the drawer out all the way. With the shims still under the back edge of the drawer, I screw in the back-ends of the drawer slide. The top two drawers go in the same way, except I use thicker shims on top of the bottom drawer because it receives a taller drawer front to hide the tabs on file folders that

protrude above the drawer box.

Trim your false drawer fronts to size on the table saw and iron on veneer tape to all four edges. To attach the drawer fronts, I remove the top two drawers and push the bottom drawer all the way into the cabinet. I then set the drawer front into position, using ¹/₈" shims on the bottom and sides to ensure a correct reveal all the way around. I use spring clamps to hold the drawer front in place, then I run screws into it from the inside of the drawer. The middle drawer front attaches the same way, but the top one doesn't have room to get a clamp around it. I solve this dilemma by dabbing some quick-set epoxy on the back of the drawer front then pressing it into position. Flipping the cabinet onto its back and shimming around the edges of the drawer front assures that it will remain aligned. Once the epoxy has cured, the drawer front can be secured with screws like the others.

To attach the drawer pulls, I make a template from a scrap of ¹/₄"-thick plywood and cut it to the same size as the upper drawer fronts. I draw lines across the vertical and horizontal centers of the



A consistent reveal is key to the crisp feel of the piece. The shims shouldn't bow the cabinet sides out at all, but should fit snugly to ensure that the drawer front is centered and that the reveal is even on both sides.

MOBILE FILE CABINET

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
<input type="checkbox"/> 2	Sides	³ / ₄	21 ¹ / ₂	21 ¹ / ₂	Birch ply
<input type="checkbox"/> 2	Top & bottom	³ / ₄	21 ¹ / ₂	14	Birch ply
<input type="checkbox"/> 1	Back	³ / ₄	14	20 ¹ / ₂	Birch ply
<input type="checkbox"/> 12	Edge trim	³ / ₄	¹ / ₄	24	Cherry

DRAWERS

<input type="checkbox"/> 3	Bottoms	¹ / ₄	12 ¹ / ₂	19 ¹ / ₂	Birch ply
<input type="checkbox"/> 4	Upper sides	¹ / ₂	4	20	Baltic birch
<input type="checkbox"/> 4	Upper frts/bks	¹ / ₂	4	12 ¹ / ₂	Baltic birch
<input type="checkbox"/> 2	Lower sides	¹ / ₂	10	20	Baltic birch
<input type="checkbox"/> 2	Lower frt & bk	¹ / ₂	10	12 ¹ / ₂	Baltic birch
<input type="checkbox"/> 2	Upper false frts	³ / ₄	4 ¹ / ₄	13 ³ / ₄	Birch ply
<input type="checkbox"/> 1	Lower false frt	³ / ₄	11 ¹ / ₂	13 ³ / ₄	Birch ply
<input type="checkbox"/> 2	Hanging rails	⁵ / ₁₆	¹ / ₂	20	Cherry

* Measurements of plywood parts do not include cherry edge banding.

template, and center my pull relative to these crosshairs. Once the holes are drilled on your template, you can place it directly on the drawer fronts and drill through your pre-positioned holes. Using a template like this might seem like extra work but, it saves time and guarantees consistent placement on each drawer front.

Finishing it Up

For an office environment, I favor the durability of oil-based polyurethanes, although if I were building this for my home, I might be tempted by the hand-rubbed feel of the newer gel varnishes. When your finishing process is completed, simply screw on four

2"-diameter wheels (locking casters will keep it from rolling around while you open and shut drawers), and bolt on the drawer pulls.

And now, the moment you've been waiting for: Go ahead and fill those drawers with all the stuff that usually clutters up your desk.

While I can't promise that you'll be more efficient or productive as you tend to whatever paperwork keeps you away from the workshop, I'm confident that you'll enjoy the smooth, crisp look of your new rolling file cabinet. And the clean desktop isn't half bad, either. **PW**

A Lifetime of the Finest Work

For 60 years, George Reid has built breathtaking period furniture using only modest power tools, patience and a steady hand.

During the last 30 years I have journeyed to every corner of our country to visit people who have mastered unique aspects of woodworking. But I didn't have to go far from home to meet one of the most impressive artisans ever, master woodworker George Reid of Kettering, Ohio.

Reid and I have been good friends for 18 years, and I never will forget the first time I walked into the Reid home. Heirloom antiques adorned every room. Because I collect antique furniture, I quickly calculated that Reid had a king's ransom in antiques in



Three views of a miniature Chippendale chair. Reid's chairmaking skills are simply astonishing. Photos of the originals are indistinguishable from his copies.

his modest home. But then came the real shock: Reid told me they weren't antiques. He had made them all.

Reid's eye for proportion and dimension not only gives him the ability to build re-

production Chippendale, Queen Anne, Sheraton, Hepplewhite and other classic furniture styles (both full-size and exquisite miniatures) – it has given him the grace to carve them beautifully. His carving is what sets him apart from just about any other cabinetmaker I know. Lots of folks can build the furniture; few can really master the carving.

Other than his signature and date on every custom piece, you cannot distinguish his work from museum originals. Even more impressive, Reid doesn't just make copies. He has studied the classical furniture styles to a degree where he can think and design like an 18th century cabinetmaker. He can handle sensitive furniture restoration, as well as design new pieces in the classic styles, sometimes even adding additional detail that would be appropriate for that period.

From the Farm to the Woodshop

Raised on a family farm near Fletcher, Ohio (the farm is still in his family), Reid grew up with a strong work ethic. If you wanted something, you made it; and the milking stool that was his first woodworking project is still in his den being used as a footstool.

Working with his hands on the farm led to a love of wooden models, including his perfectly built scale model of a stagecoach. That model was eventually shown to folks at Wright Field (now Wright-Patterson Air Force Base) in Dayton, Ohio. Impressed, the



At 88, George Reid is still working every day. Here he's sitting at his workbench with two recently completed miniatures. Each miniature includes completely accurate hand-cut dovetails on the drawers with raised solid panel bottoms. The Delta drill press you see behind him is 1940s vintage. It's all original except the motor, which he salvaged from his first 1940s-era bench saw and upgraded with a length of link belt.

Army Air Corp hired Reid to make scale airplane models for use as training props and for movies during World War II. The original stagecoach is still on display in his home.

After the war, Reid made the acquaintance of a local businessman who was selling the newest hi-fi components in his store in downtown Dayton. His customers were anxious for the radio pieces, but they wanted them housed in cabinets that would complement their existing furniture. Reid started building these cabinets, many matching quality furniture pieces, and that work led to a study, and love, of furniture styles.

He has always worked by referral only, no walk-in trade. His practical head for business led him to always keep detailed records on how many hours each job took so he was able to charge an accurate price that was both fair and rewarding.

After making furniture for a very prosperous golf pro, the stream of new customers was continuous. Word of mouth from happy customers (who always turned into lifelong friends) still keeps him busy in his shop on weekdays and some Saturdays.

Modest Shop, Modest Tools

When you stop by to see George in his 28' by 32' basement shop, you'll likely find him wearing his white shop apron. In the breast pocket is the folding carpenter's rule that was issued to him at Wright Field during the war. He uses it every day, but he comments that it has gotten a little too close to the saw once or twice, pointing out the nicks.

The pictures shown here represent a small portion of the work Reid has created, working in the same shop for 60 years. It should humble all woodworkers who complain about not having enough space or tools.

The machines in his shop are mostly late 1940s vintage, which he purchased new shortly after leaving Wright Field. They are in immaculate condition, and many still have the original manuals hanging handy. The shop itself is just as meticulously maintained. Chalk that up to necessary organization for working in a small space, and to avoiding tracking in dust all over the house.

As you peer around his shop, your eye takes in clamps neatly stored in the basement joists. His original workbench (with a

white oak top) is still as sturdy as the day he made it 60 years ago, and it sees continuous use. This is where he does almost all of his carving, including period ball-and-claw legs and bombé chest miniatures.

His first major purchase was a 1941 Delta tilt-top table saw. It was his only table saw until he received a Delta Unisaw in 1997. The tilt saw is still used right alongside the Unisaw. Most of his Delta tools were purchased in the 1940s and are still used to make furniture. A Delta benchtop drill press near his bench has been upgraded with a balanced pulley and Powertwist belt. His Delta shaper has performed flawlessly for years, to the point that he doesn't own a router.



With barely a scratch on it, this early Delta jigsaw sits in the back corner of Reid's shop, by the lathe. There is not a spot of rust on the cast-iron top. The secret? Reid says he merely wipes it down after use to remove fingerprints.



No tilting arbor here. Reid built most of the furniture in his career using this tilt-top table saw and a high-speed steel blade. After about 60 years of use, the saw still has a lot of life left in it.



Reid has made some amazing turnings on this well-made Craftsman lathe. Reid doesn't profess to be a turner, but his amazing work belies that statement.



This miniature chest-on-chest is perfect in every detail, from the shell carving to the broken pediment. While his miniatures use less wood, Reid estimates that they take almost as much time as building a full-size piece.

The hand-cut dovetails on this miniature Hepplewhite sideboard are tighter than most examples you'll find on full-size furniture. Most of the miniature hardware Reid orders from Ball and Ball (he's been a regular customer since the 1940s), but sometimes he has to make his own.



Reid made the hardware for this William & Mary miniature, which sits in his dining room on top of a full-size Queen Anne lowboy. The turnings are exquisite.

A sanding station is positioned near a heavy-duty shop vacuum to save time sanding. He keeps his shop orderly by doing a thorough cleaning once a day. Ultimately there is no substitute for elbow grease.

A 12" Boice-Crane planer, a Craftsman 1940s band saw and lathe, a 6" Delta bench-top jointer by a smaller workbench and a Delta jigsaw (scroll saw to us today) round out the list of stationary machines.

His small power tools are limited to a couple of vintage corded drills, a belt sander, finishing sander, a rotary flat-top oilstone grinder and a few other common corded tools.

Hand Tools Make the Difference

Reid's hand tools are his prize possessions and are the tools that let his skills shine. They are decades old, but in better shape than when new because of his years of care.

His hand tools include a selection of more than 300 great carving chisels, most from one set he purchased from the son of a leading woodcarver of Pullman train cars. It's an amazing set that's been used to carve ornately detailed period reproductions for many years. Many of Reid's reproductions are built di-

MORE ON LESTER MARGON

After seeing some of the amazing detailed Lester Margon drawings George Reid uses for his work, we wanted to see and know more. If you'd like to see his work, his "Construction of American Furniture Treasures" is available as a reprint in paperback from Cambium books for \$12.95. Visit Cambium's web site at cambiumbooks.com or call 800-238-7724 for information.

rectly from measured drawings of original museum pieces drafted by renowned furniture designer and craftsman Lester Margon in the 1930s, and later published in the 1940s.

When asked what work he respects, George cites the Garvan collection of period furniture at Yale University as the "purest" American collection to be found. Reid credits Francis Garvan for purchasing a piece of furniture only after it was first thoroughly inspected by a master cabinetmaker.

The most important lesson George shares with other woodworkers is to study design every chance you get, in museums, books, plans and magazines. Pay particular attention to dimension, scale and proportions. Take time to understand the designs you are interested in, and just build it.

Reid is a renaissance man who will never stop exploring and learning. Congratulations on creating some of the most awe-inspiring woodworking ever seen, and a woodshop that is still growing and thriving after more than 60 years – an accomplishment that few individuals can boast. **PW**



AMERICAN WOODSHOPS

Woodworkers love to see the shops of other woodworkers. And few people see as many notable shops as Scott Phillips, host of PBS' "The American

Woodshop." In every issue of *Popular Woodworking*, Phillips takes you inside the shops of some of the finest craftsmen (and women) in America. You can see more about George Reid's work and shop in episode #1001 of "The American Woodshop" on your local PBS station. Or you can visit Woodcraft Supply (woodcraft.com) to purchase a videotape of any of "The American Woodshop" programs.

Reducing Brush Marks and Orange Peel

Two of the most common brushing and spraying problems can be avoided with a few simple strategies and a thinner.

Brush marks and orange peel are the flaws created in a finish by the two most common application tools: brushes and spray guns. Unfortunately, there's no way to totally prevent these flaws and still use these tools, but the flaws can be reduced by controlling the viscosity of the finish and by using the tools properly.

Brush marks and orange peel can always be removed after they've occurred, of course, by sanding the hardened surface level (see "Rubbing for a 'Perfect' Finish," August 2001, page 74). But that's a lot of work, and

it can be reduced by keeping the problem to a minimum to begin with.

Brands of the various finishes (varnish, polyurethane, lacquer, water-based finish and so on) differ in how well they flatten out after application, but with any given finish or brand, brush marks and orange peel are worse when the finish is thick or dries fast. Specific to spraying, orange peel can also be made worse by holding the spray gun too close to the work, holding the gun too far away (or moving it too fast), or by not having the gun set right.

The key to determining if you may be creating a problem is to watch the finish in a reflected light while you're applying it. You'll see if the finish is going on smoothly and evenly or if it's brush marking or orange peeling more than you would expect or want.

(I've heard several people say that the way to eliminate brush marking is to use a more expensive brush, but I haven't been able to confirm this. As long as I'm using a decent quality brush – meaning one that costs six dollars or more, has a chisel edge and is made from China or some other good-

Brush marks can be reduced by thinning your finish or slowing the drying time by using a retarder. Buying an expensive brush isn't going to help much.



Photos by Al Parrish

quality natural or synthetic bristle that doesn't fall out – brush marking doesn't seem to vary noticeably among brushes.)

Thinning Helps

You know that thinner alone (mineral spirits, for example) will flatten out perfectly on a flat surface. Thus it's logical that the more thinner you add to a finish the better it will flatten out. In fact, this is the case with all finishes no matter how you apply them.

So, with any finish, you can reduce brush marking and orange peeling by thinning it. This is exactly what manufacturers have produced for you in "wiping-varnish" products, which are commonly mislabeled "tung oil," "tung-oil finish" or "tung-oil varnish," or labeled with some nondescript name such as "Waterlox," "Seal-a-Cell" or "Val-Oil." The finish manufacturers have merely thinned some varnish enough (usually by half or more) so it flattens out well.

The trade off with this finish, or with any finish you thin yourself, is that you reduce the build. So you'll have to apply more coats to reach the same film thickness you would with fewer coats of unthinned finish.

One trick you might consider for overcoming the build problem is to apply several full-strength coats of finish. Sand the surface level and finish off with one or two coats thinned enough so they flatten well but are still thick enough to fill the sanding scratches and produce an even sheen.

Drying Time

Different types of finish dry at different rates. Finishes that dry fast, such as lacquer, shellac and water-based finish, may be drying too fast to flatten out well if the temperature in your shop or work area is high.

With lacquer and water-based finish, you can purchase retarders that will slow the drying process. In the case of lacquer, the retarder is usually marketed simply as "lacquer retarder" (you can use this also with shellac). In the case of water-based finishes, it's often called "flow additive."

Because brands of retarder vary in strength, you'll need to experiment with how much to add to get the results you want. You don't want to add more than you need because you can slow the drying of the finish so much



Orange peel, a problem that occurs with spray systems, can be reduced by thinning and by adjusting the gun. This piece of closed-grain birch should have a flat, nearly flawless finish.

that it collects an unnecessarily large amount of dust, or you get an unnecessarily low build.

Spraying

Reducing orange peel when spraying is more complex than reducing brush marks simply because a spray gun and its air source are more complex. In other words, more than finish viscosity and drying time are involved.

To begin with, it should be obvious that if you hold the spray gun too close to your work, the air from the gun will create turbulence in the sprayed finish that will show up as orange peel. And if you hold the gun too far away from your work, or if you move the gun too fast over your work, you won't wet the surface well enough and this will result in orange peel.

This second cause of orange peel is very common, and both of these application errors are easy to avoid simply by watching what's happening during application in a reflected light and adjusting your distance and speed until you're laying down an even wet coat on your project.

One caveat: With water-based finishes, it's best to keep each coat as thin as possible while still wetting the surface well, even if the finish seems to be orange peeling right after application. As the solvent comes out of the finish, it will relax and flatten out.

Optimizing a Spray Gun

The spray gun itself can also be optimized to reduce orange peel, and you do this by increasing or decreasing the amount of air (and in some cases, fluid material) to the gun.

If you're using a compressor with either a conventional or HVLP (high volume low pressure) spray gun, open the controls on the gun all the way and turn off the air to the gun at the compressor's regulator. Then start opening the regulator in 5-psi increments while testing the spray in short bursts on brown paper, cardboard or scrap wood. When the pattern no longer improves (that is, the fan width doesn't increase), the gun is optimized for the viscosity of that material.

More pressure just produces an excessively foggy work environment as well as unnecessary "bounce back" and waste. To reduce orange peel from this point, you'll have to thin the material.

If you reduce the fan width to spray a narrow surface, you'll still be depositing the same amount of material into a smaller surface area, so you'll need to reduce this volume by screwing in the fluid-control knob. The gun will remain optimized for best performance.

If the transfer of material is slower than you would like, don't increase the air pressure or you'll just increase bounce back. Instead, increase the size of the needle/nozzle set and air cap, and reoptimize the gun.

If you're using a turbine with an HVLP spray gun, you don't have the same control of air to the gun as you do with compressed air. To reduce orange peel, you'll need to thin the material you're spraying until the orange peel comes closest to disappearing. **PW**

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




#56



We Now Take E-mail Entries!

Submit your captions for this cartoon by e-mailing them to **cartoon@fwpubs.com** (be sure to put "Cartoon Caption #56" as the subject of your e-mail) with your name, address and phone number. Or send it to us on a postcard:
Popular Woodworking, Cartoon Caption #56, 4700 E.
 Galbraith Road, Cincinnati, OH 45236 by **Dec. 23**.
 Winners will be chosen by the editorial staff.



The winner receives the Freud FJ85 Jigsaw with Electronic Cruise Control. This variable speed, 6-amp, orbital jigsaw has toolless blade change, and the cruise control keeps the blade speed constant under different loads to provide a finer, faster cut. The runners-up each win a one-year subscription to *Popular Woodworking*.



freud®

#54



Richard Trevino, of Brookfield, Wisconsin, is the winner of our Cartoon Contest from the June issue and recipient of the Freud jigsaw. The following runners-up each receive a one-year subscription to *Popular Woodworking*:

"Oh, the nail-up wasn't too bad, but there was the usual panic getting everything lined up before the glue dried."

Henry Romp, Shoreham, Vermont

"Do you think he looks OK there or should I move him a little down and to the left?"

Dale Michaelson, Broomfield Colorado

"So I say, 'Since you're taking all my tools, don't you want to see how they work?'"

Bruce Kolopajlo, Zanesville, Ohio

Barn of the Damned

To strip an old barn of its old-growth bounty, we used the usual tools: empty fertilizer bags, two wild cats and a high falsetto.



Prior to 1960, Seaford Road was dotted with small houses, boat shacks and many barns. The majority of those barns were built from oak, ash, hickory or occasionally, chestnut. As the buildings and their owners aged, both gradually declined and faded to a subtle, silvery grey before finally disappearing.

There are exceptions, of course, and Margaret Kirby was a fine example.

When I was a boy it was common knowledge that Mrs. Kirby was a witch – a spell-casting, dead-raising, broom-riding harpy. We would circle around the Methodist church, through the graveyard and down into the swamp to *avoid* walking past her house.

Having inherited a tidy sum from her father, a prominent boat builder, Mrs. Kirby had the luxury of staying at home, looking after her army of feral cats and conjuring demons all day. As the years passed, we all expected that she would sell her place and move to a more temperate climate. But Mrs. Kirby was in it for the long haul, and two more generations of youngsters would slink through the cemetery in fear before the “Seaford Witch” succumbed to her fate.

By the time Old Lady Kirby’s estate was settled, the only barns still standing in Seaford (the rest having been scraped away in favor of single family dwellings) were three large buildings that her father had used to refit boats. On the day that the county auctioned her property to a local real-estate developer, we all knew that those three barns – and all of that seasoned oak – would soon fall victim to some stroke of misfortune that would free the builder from the unreasonable expense of demolition.

Well, it took less than three hours from when the “sold” sign was planted in the yard, before my brother John and I were huddled around the dining room table developing our plan of attack – “scheming” is the term my wife, Helga, would use. Like Helga, I’m sure that many of you are wondering why we didn’t just ask for the lumber. Perhaps we might call the real-estate developer and say, “Hey, you think we could peel some of the flooring out of that old barn before you send your arsonists over to burn it to the ground?” Well, let me assure you (as I did Helga) – that’s not the way things are done around here. So with bail money in our pockets, we grabbed our crowbars and set off in search of a barn.

It was almost midnight as we crept across the field and closed in on the free-range lumber. We approached as stealthily as we could. It was no easy task considering that every other step landed on some part of a cat. As we descended upon the largest of the barns, we could hear voices coming from inside. But, because we had come this far, it seemed prudent to climb up into the loft and have a peek inside. From the rafters we immediately identified the culprits: the Patton boys.

It seems that the lust for lumber is a common affliction. Because the Pattons lived only a mile down the road, they had arrived before us and had busied themselves stripping down the interior wall boards. Now, had this been any other occasion, we would have been happy to see Clyde and Cecil and we probably would have sat down and had a drink. However, on this night...well, this was family business and there was only so much lumber to go around. The Pattons would have

to go. But, rather than risk an armed conflict, John decided to pursue a more diplomatic approach. He reached down and grabbed two empty fertilizer bags from the floor and slipped back out through the loft door. He was only gone for a minute or two, but when he returned, the bags were no longer empty.

They say that the mark of brilliance is being able to say just the right thing at just the right time. If that’s the standard, then John proved himself an intellectual giant that night. He strode to the edge of the loft and with the highest, raspiest voice he could muster shrieked, “I’m back, boys...and this time I’m taking you two with me!”

With that he started screaming like a mad woman, slapped the fertilizer bags together and then dumped two feral cats down on Clyde and Cecil’s heads. I can’t say if the Pattons believed that Old Lady Kirby had come back to take her revenge or if they just had an unnatural fear of flying felines. But I can tell you that Cecil was halfway across the county by the time Clyde knocked the barn door off its hinges while making his escape.

We spent the rest of the evening celebrating our victory by harvesting the remainder of the wall boards and half of the loft floor. We finally retired at 5 a.m., just before the sun came up. By the end of the week, a sudden (and unexpected) fire would gut the old barns. We didn’t take it too hard; we’d collected our piece of Seaford heritage. **PW**

Walt Akers now purchases all his lumber in Seaford, Virginia.