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JUNE 2004
ISSUE #141

Popular Woodworking

6 ESSENTIAL WORKSHOP UPGRADES

- Rip Fence Ends Errors
- Better Drill Press Table
- 3 Shop Storage Tricks

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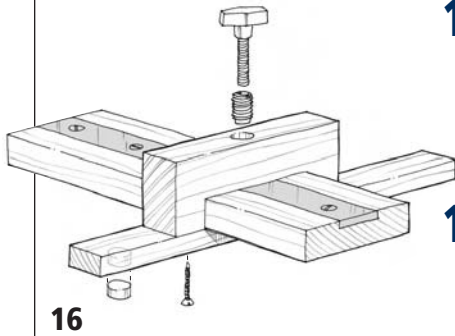
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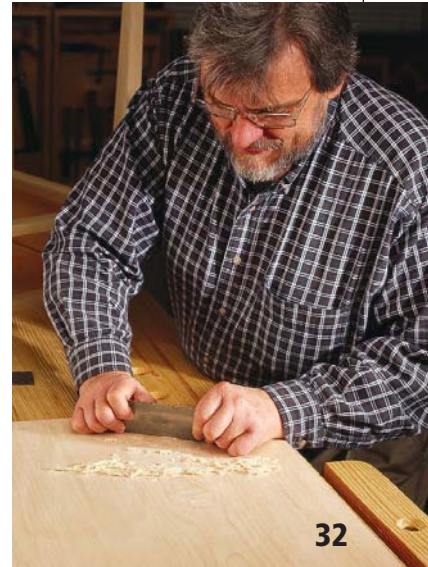
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ON THE COVER

This inlay table, based on a 19th-century piece from Massachusetts, will help you improve your inlay skills, your turning and your mastery of some traditional joints.

Cover photo by Al Parrish

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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!

Many Woodworkers Have Knowledge Gap

In the early decades of the 20th century, home woodworking got its start when woodworking machines with electric motors were first marketed to homeowners. These machines made it possible for untrained and unskilled enthusiasts to produce projects of surprising quality after acquiring the rudimentary knowledge of machine cutting and glue-and-clamp assembly.

In the 1960s, woodworking got another huge shot in the arm when enterprising businesspeople went to Taiwan to have inexpensive equipment made, making ownership of power woodworking equipment within the reach of any American who wanted to pursue the hobby.

It's not surprising that during these years, power woodworking gained supremacy over the use of almost any kind of hand tool. And just as our craft lost much of the knowledge and skills associated with the use of hand tools, hand-tool makers fell by the wayside. During a time when we were flying jet airplanes and landing men on the moon, it made sense to lay down the chisel and pick up a router. Hand tools such as planes and chisels were "old fashioned" in a society whose gaze was fixed squarely on the future.

But I suspect there was more at work here than disdain for old technology. At the start of home woodworking, hand-tool skills already had been lost. There was little instruction for the home woodworker. What learning tools there were came from the manufacturers of power tools, whose bias was understandably self-serving.

Hand-tool skills were not something that could be researched at the library. Rather, they were passed down from master to apprentice. So the hobbyist, working alone in

the home shop, really had no opportunity to learn how to tune up a new hand plane or how to put a keen edge on a set of chisels. Still, an innate sense told the woodworker that he or she should own chisels, hand planes, scrapers and handsaws. Many of these tools, often inferior in quality, have populated the home workshops for decades (though most became ornamental – rather than useful – following a few frustrated attempts at producing a fine shaving).



It is still true today that respectable woodworking can be accomplished without ever learning how to sharpen a hand tool or really understand how it works. But the lack of these skills leaves today's woodworkers compromised. Fundamental hand skills are a cornerstone of woodworking, just like machine work, an eye for design and the know-how to produce a nice finish.

These skills have everyday applications in our shops, and even make some tasks easier. The quality of our work can be improved, making us better craftspeople. And knowing how to use hand tools certainly can enhance our enjoyment of our chosen pastime. Fitting a joint with a hand plane that produces wispy shavings in relative silence is far more enjoyable than eating dust while being assaulted by the noise of a router.

Luckily, we work at time when we have a choice. We can turn on the machines for tasks requiring heavy lifting or we can pick up a hand tool and finesse the fitting of a well-made joint. It's up to us. **PW**

Steve Shanesy

Steve Shanesy
Editor & Publisher

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JOHN HUTCHINSON

Hesitant about calling himself a woodworker, John prefers to reserve that title for those who dedicate their professional lives to the craft. Ask him and he'll say he's a "wood-tinkerer." After designing and supervising countless corporate millwork



projects over his 30-year architectural career, he decided to kick back and smell the roses – or at least a little sawdust. He grew up in Dayton, Ohio, with lights flickering from his father's

table saw. The plain brown envelopes that arrived in the mail with project plans were the stuff of dreams. Fifty years later, John is drawing his own dreams as our project illustrator (see "Benchtop Router Table Stand" and "Portable Writing Desk" for examples). His current projects involve unraveling the teachings of Isamu Noguchi, a Japanese abstract expressionist sculptor, and relearning to play the guitar.

DANNY PROULX

Danny, owner of Rideau Cabinets in Russell, Ontario, has been woodworking for 30 years. Early on, he worked in the shop of his father and father's business partner,



both cabinetmakers trained in England. Eager to impress, Danny often would perform tasks in ways he thought were better. When he failed and asked his father why he had been

allowed to proceed, his father always said: "You'll never do that again, will you?" Today, Danny is an accomplished author – he has written 13 books, with three more in the works, and more than 150 articles on woodworking. His "Drill Press Workstation" (page 58) is an excerpt from his book "Building Workshop Workstations."

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Homemade 'Oil Can' Helps Keep Rust Away

Oil on a Shirt in a Can – Yet Another Good Way to Prevent Rusting

Having been a woodworker most of my life, I was more than a little interested in "Stop Rust Now" (April 2004). I, too, have tried these tests in the salty air of New England, where I live 1,000 yards from salt water.

If something needs more than casual rust-proofing, there's nothing like a thin coat of oil. For day-to-day use, I found something that keeps my machines like new:

Get yourself a coffee can with a plastic top. Tear up a piece of an old T-shirt to about 12" x 12" and spray it liberally with WD-40. Keep it in the coffee can with the plastic lid on tight (this keeps the oil from evaporating). I've had three cans scattered around my shop for about 30 years and I've been very satisfied. Every once in a while, give the rag a squirt (right in the coffee can) to moisten it up and you'll be happy. The longer you keep spraying and wiping your tools with the rag, the longer it retains the oil.

Joel Berler
Pocasset, Massachusetts

Editor's Note: For more letters on this subject, check out "Magazine Extras" on popwood.com.

Washcoat Made with Paint Also Helps Fight the Dreaded Blotching

I enjoyed Bob Flexner's article about fighting blotchy stain on soft woods ("Battling Blotching," April 2004). I recently completed a mirror frame and credenza, using poplar as the base wood. My customer wanted ebony stain, but when I applied the stain over a sealer I was left with a mess.

In a panic I called my brother – he's a painter and decorator in Michigan – and he passed along one of his best secrets. He dilutes about two tablespoons of latex paint in one pint of water and does a washcoat with that mixture. For me, he suggested I use black latex paint; if I was staining a color closer to

oak or maple, I should use a beige or tan latex with the same mixture.

I took his suggestion and washed the poplar with the mixture, and it stopped the blotches. Plus, there's enough latex left to seal the wood and also grab the stain.

John Dayton
Kingsport, Tennessee

Attaching a Router to the Table Saw Fence is Smart, if You do it Right

I just bought a Powermatic contractor's saw with an Accu-Fence. I'm going to install a router in the melamine-covered table on the right side and plan to build a fence for it, but how do I attach the fence to the saw?

Jim VanBramer
Federal Way, Washington

Editor's Note: The Accu-fence is a variation of the Biesemeyer-style fence. Essentially, it is a square steel tube with laminate-covered wood faces on either side. Last I checked, the fences could be removed, so you may want to consider using the same attachment mechanism to slip your router fence into place. Otherwise, you can build your fence with a top and back to form a "U" channel to fit snugly over the entire saw

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WRITE TO US

Popular Woodworking welcomes letters from readers with 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*. How to send your letter:

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LETTERS

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fence. A couple of thumbscrews on the back would hold it in place once it's located correctly. Another idea is to build the fence shown in the April 2004 "Tricks of the Trade" – it's great.

– David Thiel, senior editor

Twin-Screw Vise is a Great Bench Stop If You're Hand Planing, Too

Regarding "Upgrade Your Workbench" (February 2004): I've discovered the Veritas Twin-Screw Vise also works well as a planing stop. Just pull a piece of wood out of the scrap pile and put it in the vise. To make sure the vise handles don't get in the way, use a piece of scrap thick enough to tighten the vise without the handles sticking above the benchtop.

Dan Clermont

Burnaby, British Columbia

Gluing the 24-hour Workbench's Top Can be Easier if You Flip It

The "24-hour Workbench" (December 2003) is one of the best workbench designs I've run across yet. But I was unable to come up with enough clamps, clasps, electric motors, etc., to securely glue the top layer of the tabletop.

I found that if I started from the top down, it eliminates this problem. I flipped the top layer of plywood over and glued and screwed the next layer of plywood to the top's underside. Then I glued and screwed the next two layers of plywood, ending with screws into the bottom of the last layer of plywood. It worked like a charm! **PW**

Ron Mandrell

Fairfield, California

CORRECTIONS

■ A number of items in "The Joint Maker" (February 2004) were incorrect:

□ The slides (parts H and J) should be $\frac{3}{8}$ " thick, not $\frac{3}{4}$ "; the slots they fit into are $\frac{3}{8}$ " deep, not $\frac{1}{4}$ ". The Cutting List dimensions on page 79 were incorrect; the Top Layout Plan illustration on page 81 was correct.

□ The compression springs should be $1\frac{1}{2}$ " long, not 5" long.

□ The lower slots, shown in the Carriage Layout, are 5" long, not 6" long as shown.

■ In "Eames-style Coffee Table" article (February 2004), we stated that plastic resin glue is also known as resorcinol. Resorcinol is a different glue.

Which Dado Set for a Radial-arm Saw?

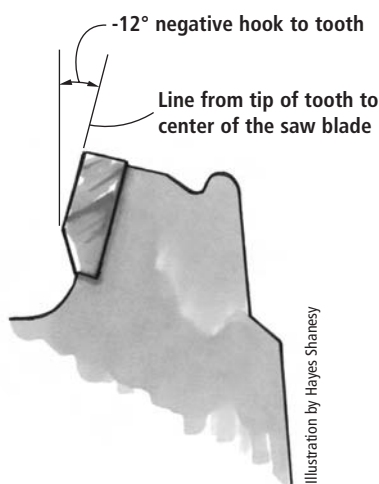
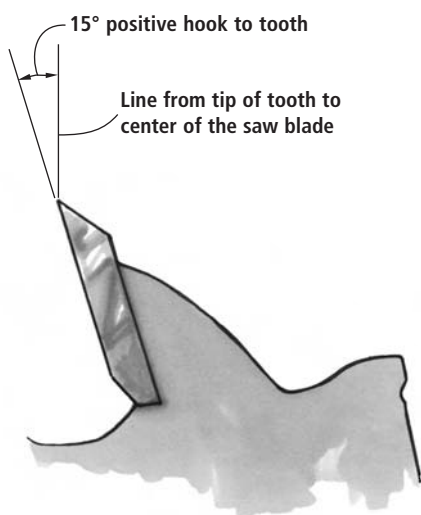


Illustration by Hayes Shaney

Positive-hook Tooth? Negative-hook? Or Should I just Abandon the Idea?

I have a stack dado set that I would like to use on a radial-arm saw. This would relieve me from changing blades on the table saw.

The outside blades of my dado set have, I believe, a positive hook. Is this acceptable? If I were to buy blades with a negative hook would that be better? Or is my plan to make dados on a radial-arm saw not a good idea?

Edwin Van Over
Medina, Ohio

in using a negative hook on the radial-arm saw, but someone using proper techniques and care while making the cut can use the positive-hook dado set as well. The principal benefit of the negative hook is the finish of the edges of the dado, groove or rabbet, particularly in veneered plywoods, melamines and laminates. If you work only in hardwoods and softwoods, the positive hook does the job fine.

—Jim Brewer, Freud USA

When trying to determine if a certain blade, dado set or accessory will work on your saw, you should first consult the recommendations of the manufacturers. They are the experts on your equipment. Their instructions should always be taken over any general recommendations. You also should check with the manufacturers of the dado set for their recommendations on the tool.

The “hook angle” is the angle that the face of the saw tooth makes with an imaginary line that runs from the center of the sawblade to the tip of the tooth. Whether you should use a dado set with a positive or negative hook is primarily an issue of what you intend on cutting. There may be some small margin of reduced risk

WRITE TO US

Every day we get questions from readers on all subjects about their woodworking. Some are letters; many are e-mail messages. We are more than happy to share our woodworking experience with you by answering your questions or adding some clarity to whatever aspect of your craft you are unsure about. In addition to the hundreds we answer privately every month, we want to share the best questions here with readers.

Send your questions via e-mail to popwood@fwpubs.com, or by mail to: Popular Woodworking, Q&A, 4700 E. Galbraith Road, Cincinnati, OH 45236.

How Much Snipe is a Problem?

I'm thinking of buying a thickness planer, but I have no concept of snipe. Is snipe less than .002" even noticeable to the eye? Also, how long is the snipe, and does it happen on both ends of the board?

Reggie Santos
Bothell, Washington

Almost all planers on the market snipe to some degree – it's really just a matter of how much. A thousandth or two is impossible to see, but it will be felt by your fingers. I consider this amount of snipe insignificant – it will be planed or sanded off before finishing.

Usually snipe occurs on the first and last few inches of the board. The best way to minimize it is to feed all your boards continuously through the planer, butted end to end. This way, the snipe occurs only on the first board and the last one.

— Christopher Schwarz, executive editor

How Do I Become a Better Plane User?

I bought a No. 4 Lie-Nielsen smoothing plane, read your article on smoothing planes (June 2003), purchased the Norton sharpening stones and a DMT diamond stone, and I am getting a beautiful edge on the tool's iron. The plane works wonderfully. It takes practice but I am getting smoother, faster surfaces than I ever did by sanding.

I have a couple of questions. Sometimes I am getting tiny nicks in the iron even though I haven't hit any metal – is this normal? Also, I wish to learn more about hand planing: How do I plane a large surface such as a tabletop with out getting "lift marks?" Can you recommend a book or a class I can take to go to the next level?

Tim Thompson
Columbus, Ohio

Tiny nicks in your plane's iron usually are a result of premature edge crumbling. Try increasing the angle of the primary bevel of your iron. The typical angle is 25°, but 30° creates a more durable angle, and it doesn't change the cutting characteristics of the plane because bench planes operate with the bevel down. If the nicks appear infrequently, you might have planed something abrasive. If you increase the bevel angle and you are still getting nicks constantly, it might be that your iron was poorly heat-treated. I suggest you send it back to the manufacturer.

As to planing a tabletop, here are a couple of pointers. When you work a top, first plane diagonally across the surface and then diagonally the other way back across the top. Clean up the diagonal tool marks with long passes that follow the grain and run the entire length of the top. These long passes eliminate "lift marks."

*To advance to the next level, you can take a class from one of the many excellent schools out there. Also I recommend "Planecraft," a book from the early 20th century that has been reprinted by Woodcraft. It'll cost you only about \$10, and it's worth every penny. **PW***

— Christopher Schwarz, executive editor

Crosscut Set-up Block

THE WINNER:

When crosscutting multiple short workpieces on the table saw, the typical approach is to clamp a set-up block to the rip fence on the infeed side of the blade, then register the workpiece against the block before moving the workpiece forward into the cut. Using a set-up block (instead of the rip fence) to register the workpiece prevents the resulting

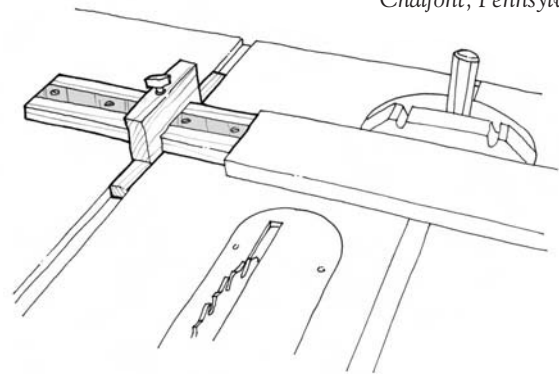
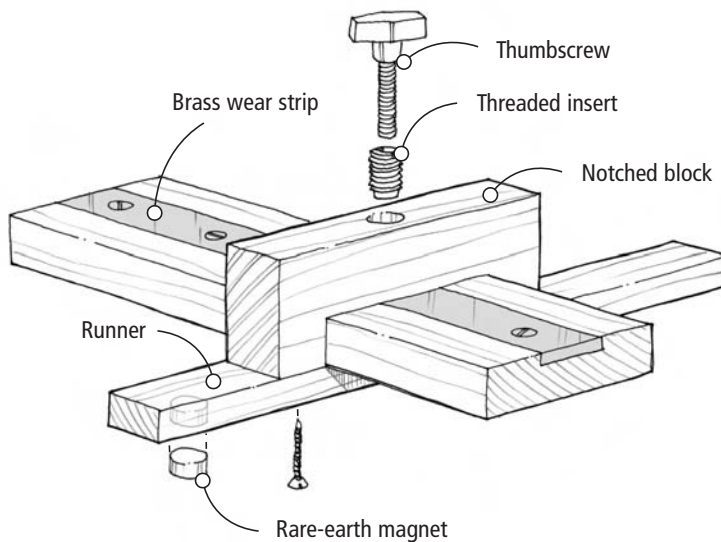
offcut from jamming between the fence and blade and being thrown back at you.

However, even when using a large set-up block, I found that I still had to reach between the fence and the blade to retrieve the offcut. This isn't a safe maneuver unless you shut off the table saw after each cut, which wastes a lot of time.

To solve the problem, I made this adjustable set-up block. It consists of a notched block that is glued and screwed to a runner that rides in my saw's miter gauge slot. A gauge bar that passes through the notch is locked in the desired position by a thumbscrew that runs through a threaded insert in the block above the bar.

To ensure the longevity of this jig, I inlaid a brass strip into the gauge bar and recessed a brass disc into the underside of the notched block to prevent the end of the thumbscrew from marring and galling the brass strip.

*Craig Bentzley
Chalfont, Pennsylvania*



CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives an overarm guard from Penn State. The ideal solution for table-saw safety and dust control, this guard is easy to install and swings out of the way for fast and easy positioning.

Runners-up each receive a check for \$75.

When submitting a trick you must include your complete mailing address and a daytime phone number. You can send your trick by e-mail to popwoodtricks@fwpubs.com or mail it to:

Tricks of the Trade
Popular Woodworking
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Tubes Keep Hung Items Safe and Sound

Nails or drywall screws work fine for hanging tools in your shop. But some tools can be damaged by rough nails or screw threads. I recently organized my shaper cutters on a wall-mounted board. It's convenient hanging them on screws, but I didn't want to scratch the critical inside surfaces.

To prevent this, I bought some clear rubber tubing with a $\frac{3}{16}$ " inside diameter, cut it to length and drove drywall screws through it into the board. It works great, and it can be used to protect all sorts of tools from being scratched by those clunky metal hangers.

*Tony O'Malley
Emmaus, Pennsylvania*

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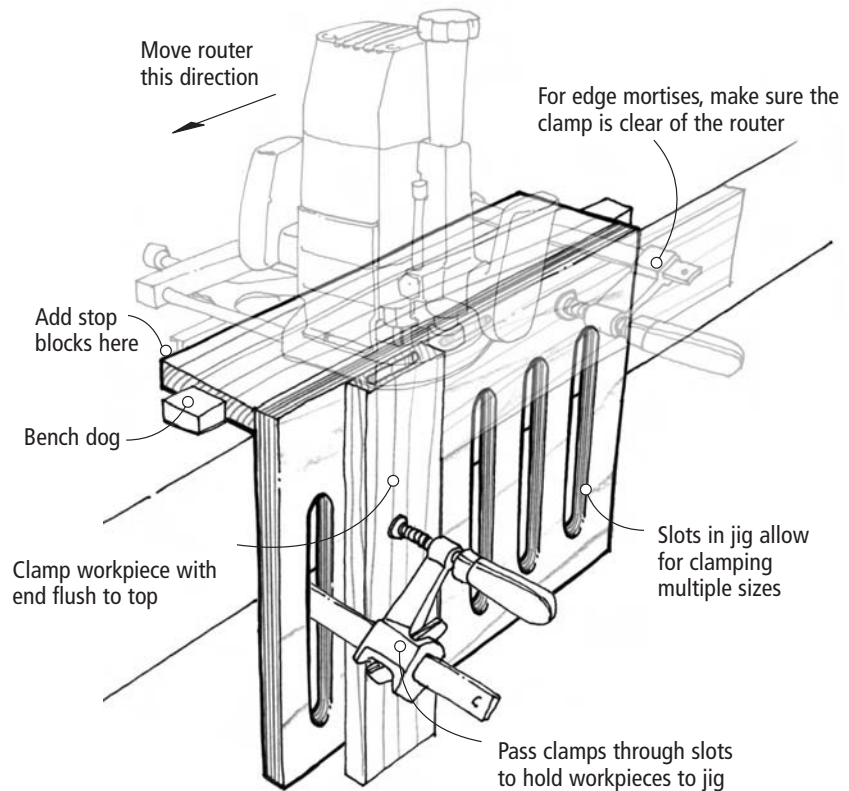
Low-tech Mortising Jig

This easy-to-make jig will have you routing clean, accurate mortises in no time. It allows you to clamp pieces for edge- or end-routing. It's particularly useful for routing mortises in the ends of rails for loose-tenon joinery.

To use the jig, clamp the workpiece with its edge or end flush to the top of the jig. For routing edge mortises, clamp the stock across the top of the jig, making sure the clamps don't obstruct router travel. For routing end mortises, clamp the stock to the front of the jig through the slots.

Attach an edge guide to your router and align the bit over the center of the workpiece by adjusting the guide as it bears against the far edge of the jig. Make a series of plunge cuts to rout the mortise, moving the router from right to left as you face the work. (This is the opposite direction when compared to more conventional edge-guide work.) Some temporary stop blocks can be added to the base plate to limit the mortise length.

Lee Speed
Asheville, North Carolina



Make a Rabbet Plane

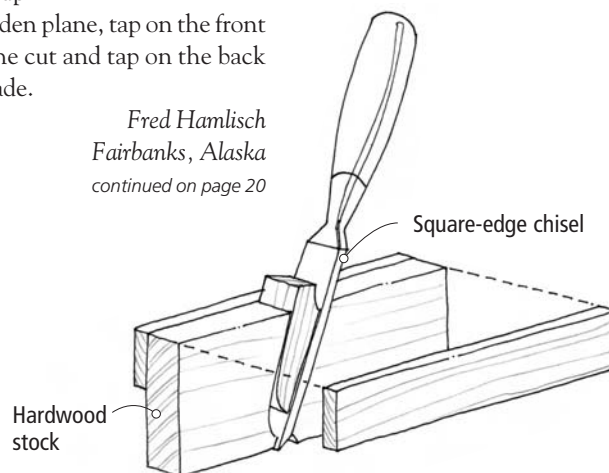
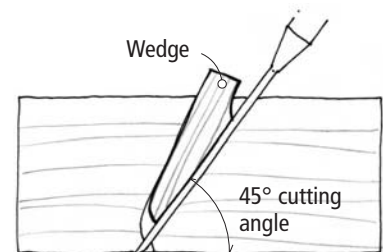
While cleaning up some grooves, I realized the work would be quicker and more accurate if I converted the chisel I was using into a rabbet plane. A quick sketch, a trip to the scrap bin, an hour of work, and I had it – a perfectly respectable rabbet plane.

There are a few things to keep in mind when making a plane such as this. First, it works best with a square-edged chisel; the body of a bevel-edged chisel wouldn't provide as much bearing surface against the plane's stock and wedge. A 45° cutting angle works well, but note that the tool's cutting angle depends on whether the chisel is mounted in the plane with the bevel down or up. This is a bevel-down style plane (similar to a bench plane or a traditional wood moulding plane), which means the cutting angle is determined by the angle that the chisel is held in the plane. The irons in shoulder planes, which look similar, are mounted with the bevel up, in which case the cutting angle is the bedding angle plus the bevel angle.

A tip for assembly: To keep the plane parts from sliding around when you clamp them together, drive a few small brads into the surfaces being glued, then nip them off just above the surface. As you clamp, the tips of the brads will bite in and keep the pieces positioned. The sole can be planed or sanded flat after glue up.

Like any wooden plane, tap on the front end to deepen the cut and tap on the back to retract the blade.

Fred Hamlish
Fairbanks, Alaska
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Shopmade Dial Indicator Base

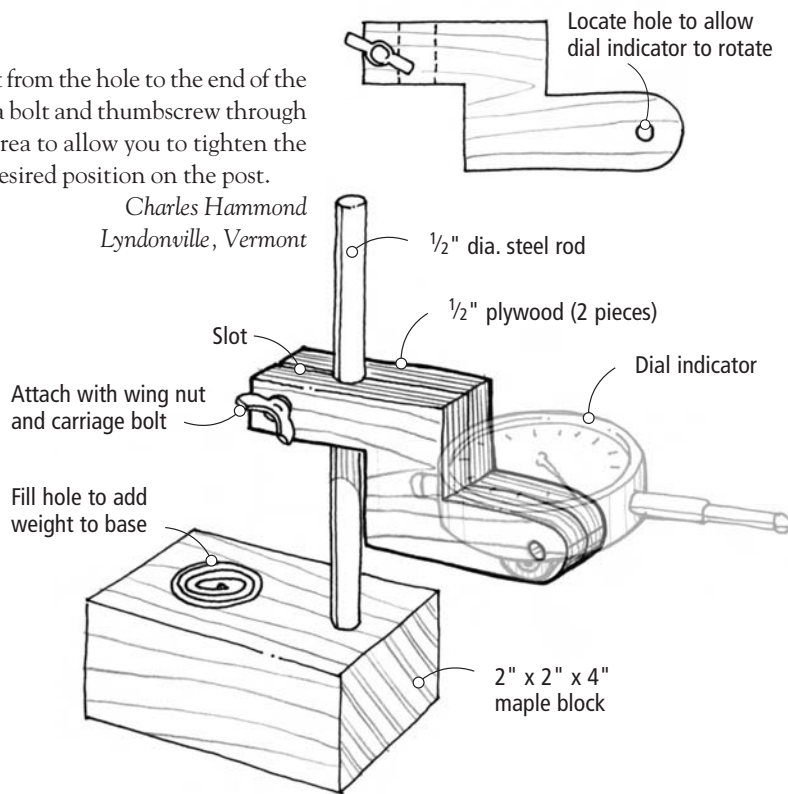
Rather than spending the money on a commercial dial indicator base and waiting for delivery, I decided to make my own. This base allows me great flexibility when checking machines for concentricity, parallelism and height. The dial indicator is bolted to an arm that can be positioned at any height on the post. A jog in the arm allows the indicator to drop down past the top of the base. The rounded end of the arm allows pivoting the indicator to common angles.

The base is made of three parts: the block, the post and the arm. I used hard maple for the 2" x 2" x 4" block, drilled a 1"-diameter hole 1" deep, then filled it with rolled up lead flashing for extra weight. You also could epoxy a magnet in a recess in the bottom to help fix the base to ferrous surfaces. The post is a 1/2"-diameter steel rod that is friction-fit in a hole in the block.

The arm is made by gluing two pieces of 1/2"-thick plywood together, then drilling a hole through the center for the post. After

cutting a slot from the hole to the end of the arm, install a bolt and thumbscrew through the slotted area to allow you to tighten the arm in the desired position on the post.

*Charles Hammond
Lyndonville, Vermont*



Sandpaper on File and Ready to Rip

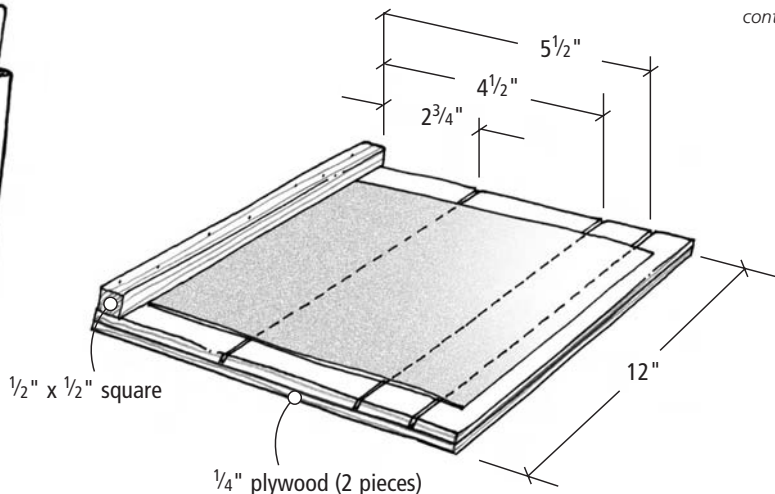
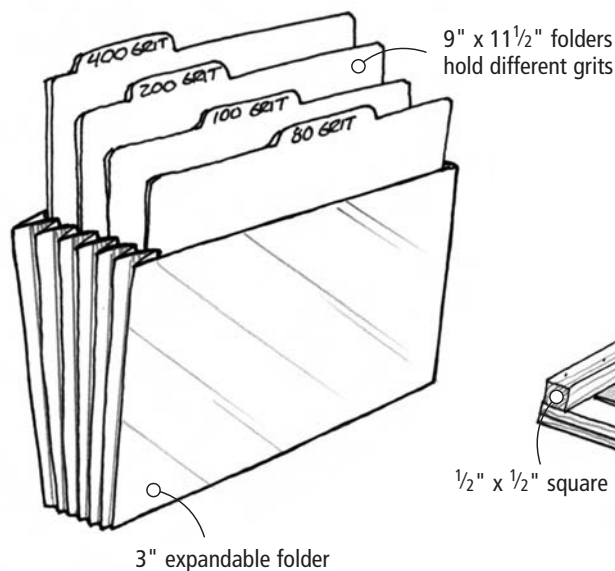
To store and organize my sandpaper, I keep it in manila folders within an accordion-style expandable folder. These are available from almost any office-supply store. Each manila folder holds a particular grit of sand-

paper, which is marked on the folder's tab. About 100 sheets of paper can be stored in the expandable folder.

To cut sandpaper to size, I made a cutting board from two pieces of 1/4"-thick hardwood

plywood glued together. The top layer was sawn through as shown to provide a cutting channel for a utility knife. This allows for quick cutting of pieces to the standard half- and quarter-sheet sizes used on typical sanding blocks and power sanders. (You also can use 1/2"-thick plywood with kerfs in it.)

*Robert Reed
Roaming Shores, Ohio
continued on page 22*



TRICKS OF THE TRADE

continued from page 20

Colors Help You Nail the Right Size

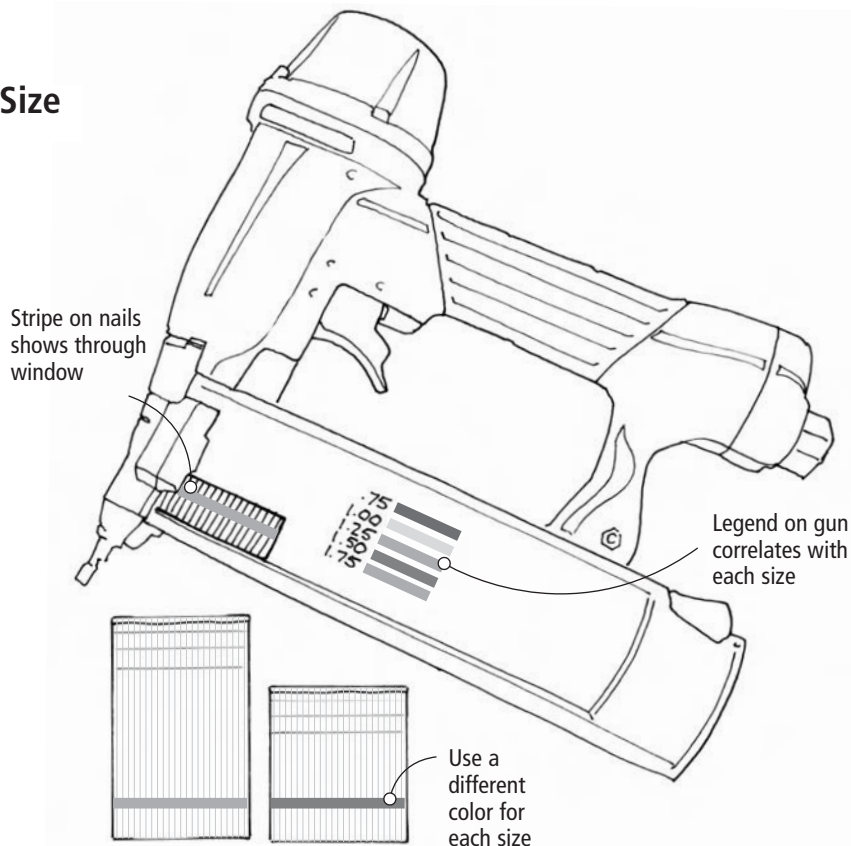
When using my pneumatic nailers, it's often difficult to tell what size nails are in the gun. To prevent shooting the wrong size, I use felt-tip markers to color-code my clips of nails before installing them in the gun. A legend on the gun reminds me which stripe correlates with which nail size.

*Bill Byrd
Chattanooga, Tennessee*

Easy Magnet Cleanup

I use a large speaker magnet on a thin rope to clean up metal scraps (nails, screws, shavings, etc.). To make the job easier, I enclose the magnet in a plastic grocery bag, tying the top of the bag to the rope with a wire tie. When I'm done picking up the trash metal, I untie the bag from the rope and turn it inside out as I pull it away from the magnet, bagging the metal scraps in the process. **PW**

*William Riecke, Jr.
Magnolia, Mississippi*



Performax Small-shop Drum Sander

Most woodworkers have drooled over a drum sander at one point in their life. Whether it was for a project with lots of thin or figured pieces that needed sanding or for a tabletop that you wanted perfectly flat, the drum sander can be mighty enticing.

Unfortunately, drum sanders can be prohibitively expensive. So it was with much enthusiasm that we tested Performax's new small-shop/economy drum sander. That's not too say it's inexpensive (\$500), but the price does make it more reasonable for many.

The 10-20 Plus is a single-drum sander (one grit at a time), capable of sanding a 10"-wide board in one pass or a 20"-wide board in two passes. This is possible because of the open-side design of the machine, which allows the board to extend beyond the sanding drum. By turning the board around and running it again, 20" is possible on this machine.

Also included is a variable-speed feed rate. The material is carried past the sanding drum by a conveyer belt (with a #100-grit abrasive surface) that can be slowed down or sped up depending on the type of wood and the amount of material being removed

with each pass. Drum sanders are designed to remove material in small increments ($\frac{1}{64}$ " per pass is normal).

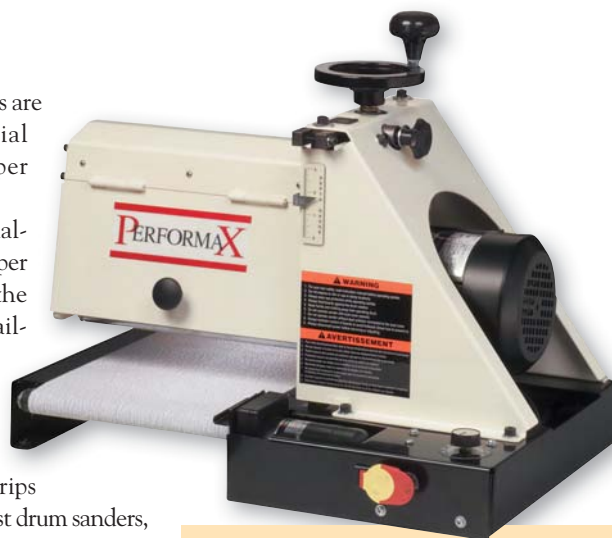
The sanding surface actually is a strip of 3"-wide sandpaper wrapped in a spiral around the sanding drum. Strips are available in grits ranging from #24 to #220. Cut-to-fit strips are available from the company for \$30 each.

Changing the sanding strips can be a tricky process on most drum sanders, requiring one hand to hold the spring clamp open while the paper is positioned. But Performax has added a tool to hold the paper-holding clamp open to ease this process.

Overall, we were pleased with the performance of this sander, but we recommend infeed and outfeed roller stands set at the height of the conveyer table to avoid snipe problems. Its price is a little high for an occasional machine, but it will reduce your sanding time.

— David Thiel

For more information, circle #170 on Free Information Card.



SPECIFICATIONS

Performax 10-20 Plus Drum Sander

Street price: \$500

Motor: 1-hp, TEFC, 1,700 rpm

Sanding width: 10" or 20"

Maximum material thickness: 3"

Minimum material thickness: $\frac{1}{32}$ "

Feed rate: Variable, up to 12 feet per minute

Weight: 74 lbs.

Performance: ●●●●○

Price range: \$\$\$\$

Performax: 800-274-6848 or jettools.com

Sharpening Video Filled With New and Useful Tricks

I've been sharpening tools for a long time, so it's rare for me to start taking detailed notes when I watch a video on sharpening. But David Charlesworth, a well-regarded British woodworker, teacher and author, has some incredible tricks that will make your sharpening faster and more accurate.

His first video released in the United States, which was produced by Lie-Nielsen Toolworks, details the techniques he uses to turn a dull hand-plane iron to razor sharp.

Perhaps most amazing is how little time Charlesworth actually spends sharpening a tool and how few stones he uses. But once I tried the techniques on his video, I became a believer. Here are some highlights:

- Charlesworth's so-called "ruler trick" lets you skip much of the laborious polishing of the plane iron's back. This trick alone is worth the price of the video.

- He shows you how to easily camber the edge of a plane iron for smoothing or joint-

ing tasks with just a dozen or so strokes on a Japanese waterstone.

- See how he uses two micro-bevels – instead of just one – to speed up the amount of time you spend sharpening.

- Set up your chipbreaker and plane iron for a perfect cut without the trial-and-error process most woodworkers go through.

These tricks really work – and they're really fast. I tried every technique from the video and spent a lot of that time wondering why I had never thought of them before.

While the instruction is clear and easy to follow, some basic knowledge of sharpening will ensure that you digest the good stuff much faster. No matter how poor or perfect your current sharpening technique is, you're sure to pick up some tips and tricks from this well-organized and information-rich video.

— Christopher Schwarz

For more information, circle #171 on Free Information Card.

continued on page 26



Photo by Wolfgang Busse

SPECIFICATIONS

Sharpening with David Charlesworth

Street price: \$25

Running time: 77 minutes

Performance: ●●●●●

Price range: \$

Lie-Nielsen Toolworks: 800-327-2520 or lie-nielsen.com

TOOL TEST

continued from page 24

Bosch's Improvements Put Jigsaw in the Winner's Circle

In our November 2003 review of orbital jigsaws, the Bosch unit we tested was about to be upgraded and we weren't able to include the new version. That's too bad, because this tool would have been a contender.

Available in top-grip (1590EVS, tested) or barrel-grip design (1591EVS) the new models include the highest-amp motor in the class (6.4 amps), providing great power through any cut. Its variable-speed motor with soft-start and constant-response circuitry keeps the blade speed up even during tough cuts.

We're glad to see the blade-changing system upgraded. The new model is user-friendly, with snap-in loading and a simple lever to eject the blade. Plus, Bosch has added a precision control guide in front of the roller-bearing guide



that can be engaged to provide consistent side pressure on the blade to keep it from wandering off cut. In testing, we noticed some deflection ($\frac{1}{32}$ " in a $\frac{5}{8}$ "-radius turn in 1" maple), but it's a very stout guide system.

Other features include a switchable blower, four orbital blade settings and a toolless beveling footplate. Welcome back to the top of the list, Bosch. —DT

For more information, circle #172 on Free Information Card.

SPECIFICATIONS

Bosch 1590EVS Jigsaw

Street price: \$170

Motor: 6.4 amp

Speed: Variable, 500-2,800 strokes per minute

Stroke length: 1"

Weight: 6 lbs.

Performance: ●●●●●

Price range: \$\$\$\$

Bosch Tools: 877-267-2499 or boschtools.com

Magnetic Featherboards Offer a Quick Extra Hand

Featherboards keep your work tight against fences and machine tables to reduce kick-backs and keep your hands away from cutting edges – always a good thing. The trick has always been to make the featherboard easy enough to attach so you'll actually use it.

The Grip-Tite magnetic featherboards from Mesa Vista Design offer the ease, convenience and strength to make using featherboards a routine practice rather than a chore. Because they're magnetic, you don't need to locate them near a miter slot.

The basic unit offers a strong magnetic base (up to 100 pounds of holding power) and Lexan side fins on the sides that hold wood against a table saw's rip fence, jointer fence or any fence as long as the table is metal. If you want to use it as a hold-down, the unit also includes an "L"-shaped fin that mounts in the handle. Or, as an upgrade set, the company offers an auxiliary metal fence plate that will allow the magnetic units to attach directly to the fence for very strong hold-down control and an unobstructed saw table.



SPECIFICATIONS

Grip-Tite Featherboards

Street price: \$40 each, or upgrade kits for about \$140

Performance: ●●●●○

Price range: \$\$\$\$

Mesa Vista Design: 800-475-0293 or grip-tite.com

Other features include a cam-release lever at the rear of the featherboard that forces the unit off of the table. That's a good thing because the magnet is strong enough to make release difficult. While you may not think you need one of the upgrade kits, by the time you buy two basic units, the extras are worth the higher price. —DT

For more information, circle #173 on Free Information Card.



VERITAS GAUGE ADDS FINE ADJUSTMENT

The Veritas Wheel Marking Gauge always has been an excellent tool for marking out tenons and dovetails. And now this Canadian company has made some improvements to the gauge that make it easier to dial in your setting.

The gauge now has essentially three rings that ride the 8"-long stainless-steel rod. First get your setting close by moving the head where you want it. Then lock the two knurled rings against each other and dial in your exact setting by rotating the head. Every turn of the head moves it $\frac{1}{32}$ ". Also, Veritas made it possible for the cutter to be recessed into the head of the tool to protect it. Plus the cutter itself has been upgraded. These changes make the gauge a lot like the excellent Tite-Mark gauge from Glen-Drake. The Tite-Mark is more intuitive to adjust and has more accessories, but the Veritas is less expensive: \$26-\$33, versus \$79 for the Tite-Mark. —CS

For information, circle #174 on Free Information Card.

Performance : ●●●●○

Price range: \$\$

Lee Valley Tools: 800-871-8158 or leevalley.com

TOOL RATINGS

Performance is rated on a one-to-five scale. You won't see a low rating ("one" or "two") because we don't publicize inferior tools. "Five" indicates the leader in the category. Five dollar signs indicates highest price in the category. Three indicates an average price. If you have tool questions, call me at 513-531-2690 ext. 1255, e-mail me at david.thiel@fwpubs.com, or visit our web site at popwood.com to sign up for a free, e-mail newsletter.

—David Thiel, senior editor

Flexible Fence Fixture

This accessory will rise to the occasion to make cuts safer and easier.

Now and again you may have to turn a board on its edge to work it – cutting a groove, drilling a series of holes in the edge, sawing a raised panel, resawing and so on.

During these operations, a tall fence provides better control than the short fence that accompanies most power tools. However, if the fence is too tall, it actually can hinder your work as much as it helps, restricting access to the workpiece and getting in the way of the machinery. (This is especially true when you're resawing on the band saw – if the fence is taller than the board you're cutting, you can't position the machine's upper blade guide properly.)

You can deal with this problem by making fences of different heights, but this uses up materials and storage space, and it still doesn't guarantee that you'll have the height you might need for a specific operation.

That's why my adjustable-height fence is a better solution. It consists of just three hardwood rails held together with braces and guides. Loosen the screws that hold everything together and you can change the height from 6" to 12" and anything in between.

Making Your Own Fence

Because you want this fence to be perfectly flat no matter where you adjust the height, you need to make it out of straight, stable wood. The one you see here is made from straight-grain quartersawn ash. Quartersawn



Photos by Al Parrish

wood (in which the annual rings run from face to face) expands and contracts half as much as plain-sawn wood (in which the annual rings run from edge to edge).

Also, I was careful to "shop-dry" the wood. That is, I left the boards in my shop for several weeks until they reached an equi-

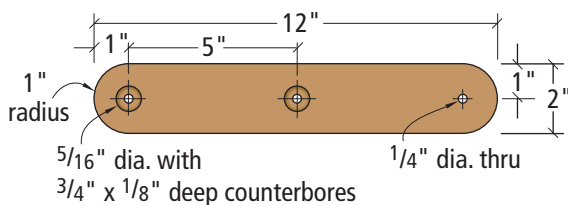
librium with the relative humidity in their new environment. This made the wood more stable as I machined it.

The first thing you'll want to do is to cut the parts to size according to the cutting list, then joint and plane them straight and flat. Carefully lay out the holes, slots and dados according to the illustrations, then cut the joinery using your router.

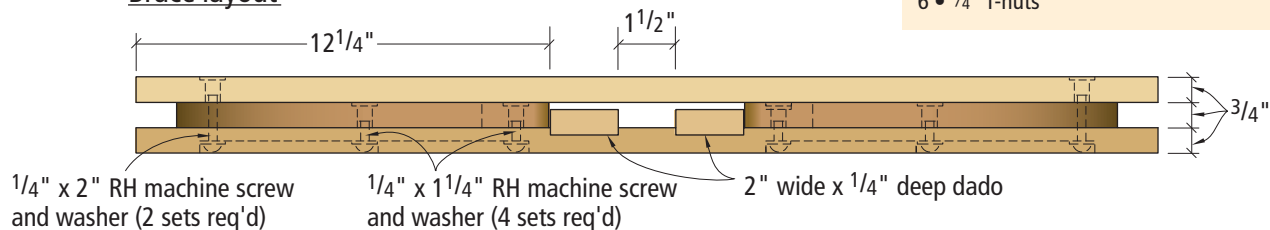
Note that the slots in the rails are counterbored so that the heads of the machine screws rest below the surface. To make these, you must rout two slots, one on top of the

by Nick Engler

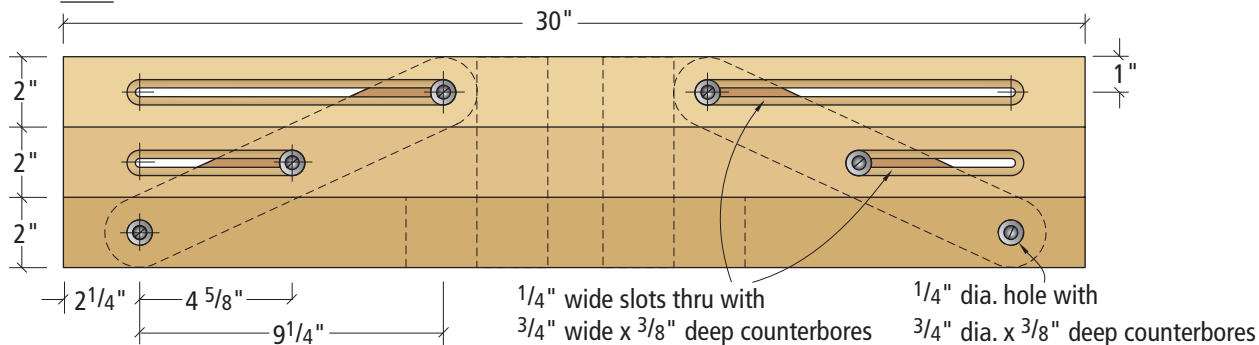
Nick Engler, the author of more than 50 books on woodworking, has built and flown a replica of the 1903 Wright Flyer, the first true airplane. He is now working on the 1905 version.



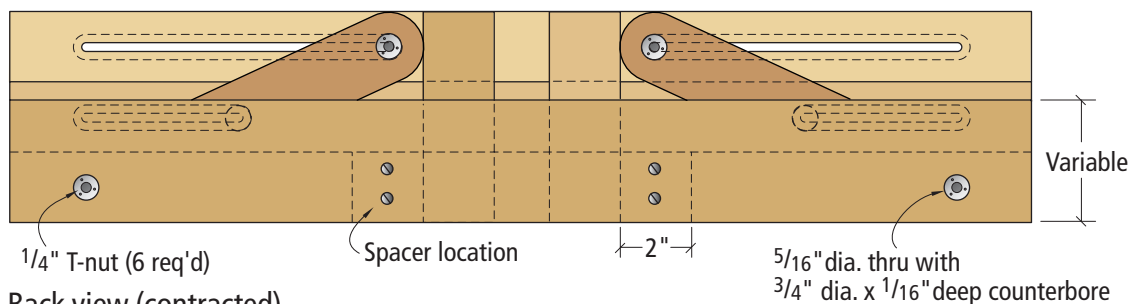
Brace layout



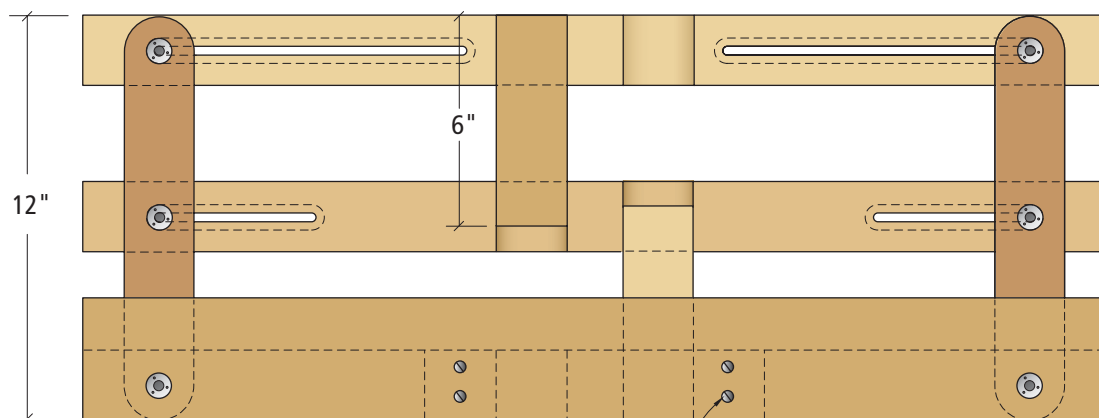
Plan



Elevation



Back view (contracted)



Back view (extended)

#8 x 1 1/4" FHWS (4 req'd)

SUPPLIES

Home-supply store

- 4 • #8 x 1 1/4" flathead wood screws
- 4 • 1/4" x 1 1/4" roundhead machine screws
- 2 • 1/4" x 2" roundhead machine screws
- 6 • 3/16" flat washers
- 6 • 1/4" T-nuts

other. Rout the wide slot (the counterbore) first, cutting only partway through the wood. Then switch to a smaller bit and – without changing your setup – rout the narrow slot through the wood. The narrow slot should be centered in the wide slot.

Next, glue the spacers to the bottom rail. Then glue the vertical guides in the dados – the right one goes in the bottom rail and the left one goes in the top rail. Be sure to widen the other dados slightly (I use a file) so the guides slide through them easily.

Assemble the rails and braces with machine screws, washers and T-nuts, then fasten the mounting board to the back of the assembly using wood screws.

When all the parts are assembled and the machine screws are loosened, the fence should extend and collapse easily. Tip: To make the parts slide together as smoothly as possible, finish the wood with a penetrating finish (such as tung oil), then wax and buff the parts. The wax will serve as a lubricant, helping the wood surfaces slide against each other.

Anywhere and Any Height

You can mount this fence to almost any power tool using one of these three methods:

- Clamp the mounting board to the existing fence on the tool.
- Drive wood screws through holes in the existing fence and the jig's mounting board.



The fence is 6" tall when contracted and can be used with any machine that has a fence.



Just loosen the machine screws and the fence can be adjusted to any height.

- Install T-nuts on the inside surface of the mounting board that correspond to holes in the tool's existing fence, then attach the mounting board to the fence with bolts or machine screws.

Once the adjustable-height fence is mounted, it's very easy to adjust. Just loosen the machine screws and move the fence to the height you need. Then tighten the screws and you're ready to make your cuts. **PW**



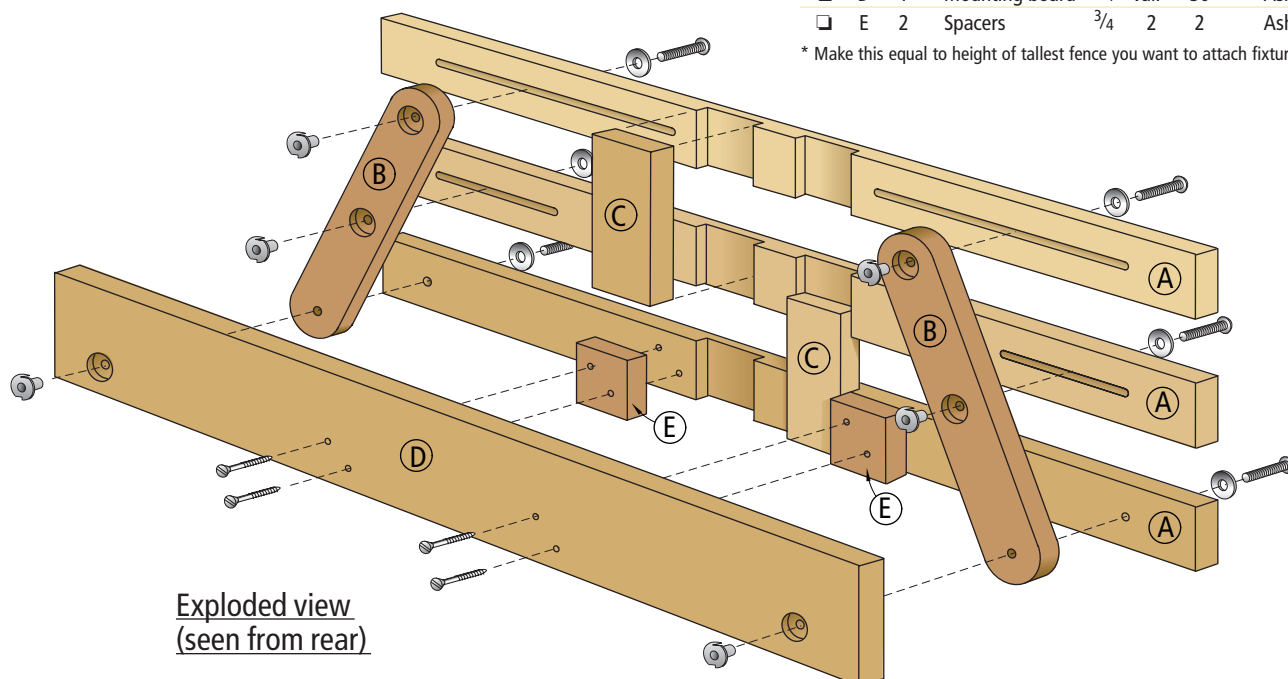
With all parts extended and the screws retightened, the fence is now 12" tall.

Be sure to check out the next installment of "Ingenious Jigs" to learn about the Long Fence Extension.

ADJUSTABLE-HEIGHT FENCE

LET. NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
A 3	Rails	3/4	2	30	Ash
B 2	Braces	3/4	2	12	Ash
C 2	Guides	3/4	2	6	Ash
D 1	Mounting board	3/4	var.*	30	Ash
E 2	Spacers	3/4	2	2	Ash

* Make this equal to height of tallest fence you want to attach fixture to.



Exploded view
(seen from rear)

Simple, Useful Cabinet Scrapers

The cabinet scraper is an effective weapon in the war against tear-out.

The cabinet scraper (also known as a card scraper) holds a remarkable place among the traditional woodworking tools that are used to deal with especially dense timbers and difficult grain.

When woodworkers discuss hand planes that are able to deal with such woods, the talk invariably turns to earnest consideration of tiny mouth apertures, secure iron bedding, carefully considered angles, flat soles and a fine depth of cut.

The cabinet scraper gets included in such discussions, even though the tool – essentially a piece of thin steel usually cut into a rectangular shape – doesn't exhibit any of these traits. Its inclusion is based on the fact that it's capable of taking fine shavings while hardly ever tearing out the wood fibers. Further, the denser and harder the timber, the better the tool seems to perform.

The cabinet scraper is capable of this performance because, despite the fact that it's called a scraper, it actually is a self-limiting cutting tool when it's properly prepared, sharpened and manipulated.

Scraper Actually Slices

Without getting into a tedious analysis, this self-limiting cutting action is determined by the geometry and scale of the tool's burr, or wire edge, which enables it to perform as if it was a very finely set, high-angle smoothing plane with an extremely short sole. This has consequences that place some limits on its usefulness, however, which we'll touch on in a moment. But first, a little about its traditional role in furniture making.

I was introduced to the cabinet scraper during my apprenticeship in traditional cabinetmaking, as part of a general approach to preparing surfaces for finishing. This ap-



Photos by Al Parrish

In trained hands, a cabinet scraper can prepare a surface for final finishing and remove localized areas of tear-out left behind by a hand plane or machinery.

proach consisted of truing up a surface with a try plane, addressing any localized areas of tear-out and tool marks with a smooth (or smoothing) plane, then following that up with the cabinet scraper only if there were areas of tear-out that the smooth plane could not address. The idea was to eliminate any surface defects with cutting tools because they remove material efficiently.

by Don McConnell

Don McConnell builds furniture and does ornamental carving in Mount Vernon, Ohio. Formerly at the cabinetmaker's shop at The Ohio Village, he remains an avid student of the history of the trade, tools and shop practices.

Any noticeable differences in surface texture or minor marks left from the cutting tools were removed (some might say obscured) by subsequent hand sanding. The argument was that sanding was less tedious (more efficient) for removing the very small amounts of material necessary to produce a uniform surface texture for finishing.

Many hand-tool woodworkers today are drawn to finishing right after cutting – avoiding sanding altogether. But for them, the cabinet scraper may actually complicate things.

For one thing, if the surface texture from the scraper is different than from their smooth plane, they may not be able to use it on a small area of tear-out without having to scrape the

entire surface. Also, because the tool performs as if it has an extremely short sole, it can be difficult to use over an entire surface without leaving obvious marks. This is particularly true at the ends of pieces (starting and stopping cuts) and in curly grain where it's possible to wind up with a "washboard" surface.

With enough skill and care, it may be possible to produce a scraped surface with nearly the same qualities you get with a finely tuned smooth plane, but it's definitely going to be more tedious. In this instance, it may be more productive to lavish the same care and attention on a smooth plane to make it capable of handling the difficult woods.

Qualities of a Good Tool

So, what should you look for in a cabinet scraper? The choice of sizes and thickness depends to a large extent on each person's preferences and the type of work intended.

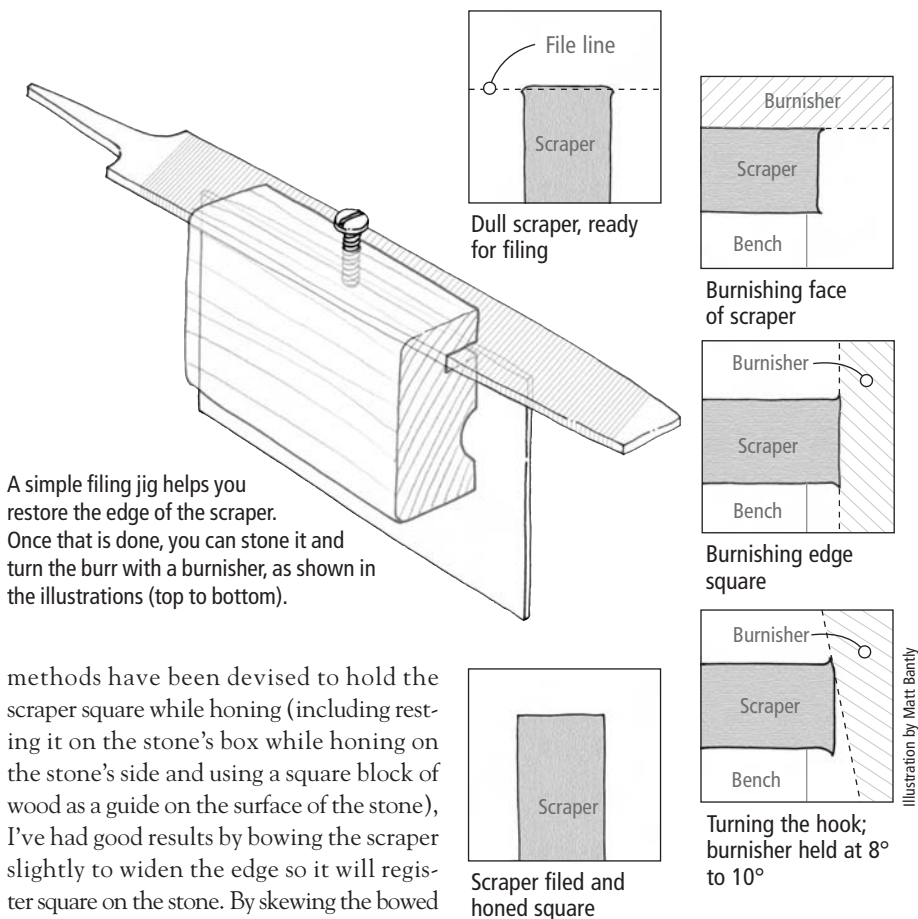
I think a good place to start is with a 3" x 5" scraper with a thickness between $\frac{3}{64}$ " and $\frac{1}{16}$ ". It needs to be good quality steel so it will take a decent edge. It must be hardened and subsequently tempered so it's soft enough to be filed. And it must be ductile enough to allow you to form the burr with a burnisher, also called a ticketer. This hardness (about 53 to 55 on the Rockwell "C" scale) is in the same range that you find in good hand saws. In fact, many cabinet scrapers have been made from damaged saws.

Sharpening the Scraper

When new, the scraper may need to have at least a narrow strip at each edge of its faces honed and polished prior to any sharpening. Some commercial scrapers have been honed and may require only a bit of polishing on a fine stone. Others come straight from the final grinding used in producing the steel plate and will require more work.

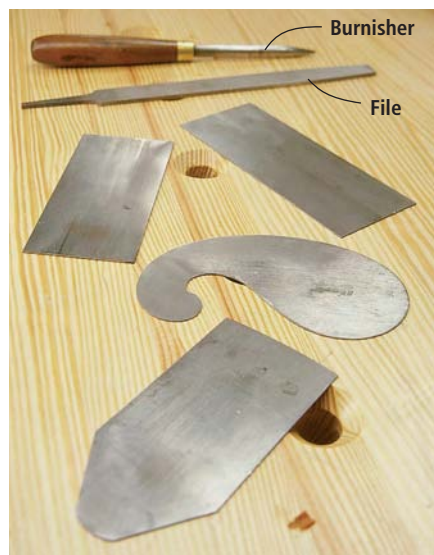
First, file each of the long edges with a single-cut file to remove blemishes and produce a straight, square edge. This can be done by drawfiling freehand, or with a file held in a commercial or shopmade saw jointer. I've been successful with both methods, but I have come to appreciate the speed and predictability of using a file in a special jig, as shown in the illustration above.

Next is to hone and polish these filed edges on a sharpening stone. While a number of



A simple filing jig helps you restore the edge of the scraper. Once that is done, you can stone it and turn the burr with a burnisher, as shown in the illustrations (top to bottom).

methods have been devised to hold the scraper square while honing (including resting it on the stone's box while honing on the stone's side and using a square block of wood as a guide on the surface of the stone), I've had good results by bowing the scraper slightly to widen the edge so it will register square on the stone. By skewing the bowed scraper in this fashion, I have found that I can hone all of my cabinet scrapers on waterstones and avoid the localized wear that would otherwise occur.



Scrapers come in a variety of sizes and shapes to allow you to clean up mouldings and other curved work.

After the edges are polished, it is customary to hone the adjacent faces on a stone, as shown in the photos on page 34. You want to arrive at four crisp, clean arrises at the juncture of two polished right-angle surfaces, as shown above. This largely determines the quality of your wire edge.

Burnishing Turns the Burr

The last steps in forming the cutting/wire edge involve the use of a burnisher. The burnisher needs to be polished and harder than the scraper. New ones are relatively inexpensive, but my favorites are a couple of older ones I've found at flea markets.

The burnisher is used to deform, on a very small scale, the square arrises into a "burr," or wire edge. The standard approach is to first lay the scraper flat on your bench surface and run the burnisher along both faces near each edge, keeping the burnisher flat on the face with moderate pressure near the edge.

Then, the burnisher is passed along the edge of the scraper to turn the wire edge.



To drawfile a scraper edge, hold the file at an angle as shown and push it across the tool's edge. Cut only on the push stroke.



If you stone the edge freehand, bow the tool slightly to keep it flat on the sharpening stone.



After the edges are polished, you can hone the faces of the scraper, as shown.



The first step in burnishing is to consolidate the edge by running the burnisher flat on the face.



Next hold the burnisher square – perpendicular to the face – and rub the edge.



Finally, to turn the hook, tilt the burnisher 8° to 10° and rub the edge with light pressure.

One way to do this is to hang an edge of the scraper off the edge of the bench and burnish in two steps. The first stroke is kept perpendicular to the face to consolidate any small burr already in existence. Then, the burnisher is held at about 8° to 10° from vertical to form the burr – your cutting edge.

The amount of pressure you should use during burnishing is a matter of debate, and a real sense of this can be developed only through experience. I think the tendency of many beginners is to use too much pressure. After all, you are using a curved burnisher on a very narrow portion of the edge, so the pressure is very localized. I think it's better to start with a lighter touch and slowly increase pressure until you are satisfied with the results you're seeing. Too much pressure may prevent you from being able to renew your edge with just burnishing.

It would be logical to ask whether it is

absolutely necessary to file the edge of the scraper at the beginning of each resharpening session. While theoretically it would be possible to remove burnished metal from the previous sharpening on a bench stone, it is simply easier and faster to do it with a file.

There are any number of methods to sharpen cabinet scrapers, including special devices for burnishing the edges. I suggest you explore the various options before settling on one because you should develop an approach you find comfortable and predictable. Otherwise, the tendency is to wait too long to resharpen, resulting in a loss of efficiency (producing "dust" rather than shavings) and a poor surface quality.

On the other hand, it is possible to renew the cutting edge of the tool a couple of times by going back through the burnishing process before you get ready to begin the entire resharpening regime. It's your call.

Using the Scraper

Using a cabinet scraper takes a little practice. Each species of wood can require a slightly different angle of attack. When you're just starting out, you will want to flex the scraper a bit with your thumbs and hold the tool at about 60° to your work. Make minor adjustments in the angle and curvature until you produce fine shavings. After some practice, your hands will fall naturally into the correct position quickly.

When dealing with some of the more difficult grains, particularly in hardwoods, the cabinet scraper can be invaluable to a woodworker who has taken the time to learn how to sharpen and to use it correctly. It even can be useful for removing powered-planer marks in these difficult woods, without risking tear-out from a hand plane or needing to resort to some of the more heavy-handed power sanding techniques. **PW**

Cerritos College: An Orderly Education

Attention to detail is essential for building furniture and running a woodworking school.

Some woodworkers will tell you that an organized shop is one that doesn't produce a lot of work. But it's an almost astonishing level of organization that saved the Cerritos College woodworking department from extinction and continues to ensure its students get a complete education.

Founded in 1955, Cerritos is a community college serving southeastern Los Angeles County. The Woodworking Manufacturing Technologies Department offers a comprehensive woodworking program (30 rotating courses are offered, with about 15 more currently in development), including classes on various tools and how to use them, 32mm system cabinetmaking and traditional woodworking machinery.



Steve Lacey, one of the school's alumni and now an instructor, proudly perches on a piece of work that adorns his company's web site.



Turning is a very popular class for the college. Initially it wasn't a priority, but then an instructor brought in a list of 68 people who wanted to take a turning class. It wasn't long after that they bought 10 lathes. The classes continue to be well-attended, as are bobbin-turning classes, seen here.

The program started in the 1960s with about 4,500 square feet of space. While educational, it wasn't thriving. About 10 years ago there was even talk of shutting it down.

Then Bob Colgan was hired to teach a woodworking class. Within a year, he was being considered to head up the entire program. He went to the college's Board of Trustees and explained that if the program was run more like a business, it could succeed. The board decided to make him department chairman and gave him one year to turn the program around.

Colgan responded by making the program invaluable to the school by teaching his students to build furniture and cabinetry

for the college's other departments. He even played the public-relations card by setting up ribbon-cutting ceremonies to unveil all of the woodworking projects they built for the college. Eventually, one of the board's vice presidents took notice of the quality work and challenged the group to design and build 300 tables for the library.

Colgan decided there was only one way to face the challenge – he pored over the numbers and requested some dramatic increases in equipment, tools and classrooms. The college said it wasn't going to be possible, and Colgan replied that if that was the case, then the tables weren't going to be possible. Shortly after that, space and equipment became readily available and the tables came soon thereafter. The woodworking facilities now cover about 30,000 square feet, and continue to expand.

by David Thiel

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com.

Everything has its Place

Organization also plays an important role in the school's success. The facility is extremely tidy (compared to our shop), so it was pretty funny when the staff apologized for the mess during our visit.

The adage "A Place for Everything and Everything in its Place" should be hanging over the entrance door. Each machine, tool, jig and broom not only has a place where it belongs, but that place is outlined and labeled so that when the item isn't there, anyone can see what belongs there. Even the dado sets are hung carefully above the table saws, with each piece properly identified.

On our visit, Anthony Fortner, who has been a furniture instructor at Cerritos since 1996, showed us around. In addition to teaching, he owns and operates A. Fortner Woodshop, creating handcrafted Arts & Crafts furniture and cabinetry. He has worked on many Greene & Greene homes in nearby Pasadena, and built a commissioned piece of furniture for the Blacker House (a famous example of Arts-&-Crafts-style architecture owned by the city of Pasadena and operated by the University of Southern California).



These cabinets (and another not shown) keep tools organized so they're always available. If a tool is being used or missing, it's obvious. All classes take responsibility for keeping tools where they belong.



To keep costs down, inventory organized and students productive, a vending machine offers many "last-minute" project supplies priced affordably so nobody has to make an emergency trip to the store.

Fortner first led us into the plain-looking industrial building. There you first come upon the bench room. On this day, the room was set up with 20 benches, along with a good selection of mini-lathes, for a class on turning bobbins (cylindrical spools or reels that you can wrap thread, yarn or rope around), taught by Valerie Simms and Stuart Johnson, both of England. The amount of light in the room is excellent and a TV camera and monitor are set up in the corner to ensure every student can clearly see all the the important steps, as shown in the photo on page 35.

As you move further into the room, a wall of blue cabinets on the left hides one of the most astonishingly organized displays of tool storage we've ever seen.

With about 60 to 80 students in the shop on any given day, organization and strict adherence to the rules is mandatory and important. Each tool has its location identified along with how many are supposed to be there. Each student is informed at the beginning of the program that if a tool goes missing, the entire class is responsible for

coughing up the replacement cost – and it must be paid that day.

Through a doorway to the left is an assembly room with low benches and side rooms. These rooms are for tool storage and maintenance. One item you don't expect to see here is a vending machine, but there it is in the corner. As you approach it you realize it doesn't dispense candy – it's stocked with European hinges, screws and "must-have" supplies so the students are never in need.

The program guards costs and adds efficiency by buying its supplies in bulk, storing them on site and making them available for the students to purchase. They also save time by employing a full-time maintenance technician for the tools and machinery, leaving the students (and instructors) time to concentrate on their woodworking.

Instructors have a teaching aide who is responsible for shop safety and selling lumber and hardware to the students for their projects. The aide also keeps track of tool maintenance – if any machine needs attention, it's logged and tagged for service.

A Well-stocked Library

Another small room off the assembly room is the resource library (with wainscoting and a coffered ceiling, completed by the students). This also serves as the computer room (at least for now – they're planning to add a 500-square-foot design room) where students can go online or do computer design work.

The school's philosophy is to teach students the building process first, then allow them to design on paper or with computer-aided design programs. There is a "sketching" period before construction, but actual design follows functional building training.

The school uses CabinetWare (cabinetware.com) as its computer-drafting software. Fortner says many students are engineers and because there's usually a variety of design software in use, standardization is good.

Big Blue

As you move out of the assembly area past a 20" planer and 12" jointer, you encounter three 10" cabinet saws carefully set up with outfeed tables for specific machining steps. Beyond these saws is an Altendorf 12" table saw with a sliding table, directly in front of the garage door. This is where the plywood and lumber first enter the shop.

Looming outside the windows is a huge blue dust collector that would make any

woodworker envious. With as many machines as the program can have running at one time, size does matter.

The program has safety guidelines in place that are universal for students and instructors. Every student must go through the safety lecture each semester and has to pass a safety test. Every saw and tool has a power disconnect (an actual power shut-off box, not just a plug) to ensure it is without power before any service or tooling changes occur.

As you move into the next room, the machines are similar – more cabinet saws – but the purpose is slightly different: These saws are set up for joinery work and cutting project parts' finished sizes.

Next to that is the burgeoning CNC (Computer Numerical Control) program. Most of the instructors are woodworking purists and are not all that fond of having the large robotic machines in the school. But the reality is that much of the furniture-making industry uses this type of machinery, so to produce marketable students, the CNC training is a must.

Post-graduate Work

While some students simply are learning to please themselves, many are looking for a career in woodworking after graduation. They routinely compete in (and often win)



Every tool is hooked to a central dust collection system, which feeds into this huge collector around back. Associate Editor Michael Rabkin (6 feet 3 inches tall) stands in to provide scale to an impressive machine.

juried competitions around the country. The program itself even won the prestigious Woodworking Machine Industry Association's Educator of the Year award (2000).

During a recent ceremony for the woodworking program, executives from Gulfstream (a premier manufacturer of luxury private aircraft) were invited to view the students' projects. Thirteen students ended up being hired by the company to help it produce some of the most exacting high-end woodworking on the market today.

Other students go on to be instructors themselves. Steve Lacey took courses at Cerritos taught by Fortner, who instilled an appreciation for the Arts & Crafts style in him. Lacey now owns his own custom woodworking company (redbarnfurniture.com) and gives back by teaching aspiring woodworkers at Cerritos.

The extremely organized shop at Cerritos College continues to be productive and grow. While it may seem like a strict schooling process, the enthusiasm, excitement and success of the students prove that the process works well. **PW**

FOR MORE INFORMATION

To learn more about the woodworking program at Cerritos College, visit the program's web site at www.cerritos.edu/wood



Above, one of three cabinet saws (front) and an Altendorf sliding-table saw (rear) are positioned near the garage door. The cabinet saws are outfitted with tables to reduce large materials into manageable pieces. Right, the second machining room is set up for joinery and finished sizing.



FEDERAL INLAY TABLE

If you can rout a mortise for a hinge,
you can handle the inlay on this table.

This table will test and improve your inlay skills, not to mention your mastery of turning and traditional joints. It's based on a Massachusetts piece from 1805 that displays many of the characteristics of cabinetmakers from that area and period.

The finely turned legs with reeded detail lead up to a scalloped-edge tray. From there you move up past the exceptional figured panels toward the drawer front that boasts mahogany crossbanding and band inlay that matches the front edge of the top.

This project is going to put to use a lot of tools in your workshop, particularly your table saw (for the joinery) and your router (for the details). And though

the inlay and banding might look like a nightmare, let me assure you that it's quite straightforward if you simply follow the photos.

Legs: Turned, Routed & Carved

Joint and plane your leg blanks and chuck one up on your lathe. The first step is to turn the simple profile shown in the scaled pattern on page 41. Once your calipers confirm that the leg is the right size, you need to mark the circumference into six sections so you can rout the reeded detail while the leg is still in the lathe.

Follow the directions in the photographs below to lay out the reeding and build a simple jig that holds

by Glen Huey

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Turn the lower portion of the legs according to the plan. To create the reeds, wrap a strip of paper around the largest diameter and mark the overlap. Remove the paper, trim it to that mark, then lay out six equal spaces. Rewrap the paper in the same place and transfer the six marks to the turning.



How you cut the reeds on this project depends on the lathe you use. The jig I have is an "L"-shaped bracket that my trim router sets into. Adjust the point of the bit so it's at the center of the lathe's drive spur. Run the cut the length of the post, stopping before touching the bead at the top and bottom.

Step photos by the author



Photo by Al Parrish



Mark and cut the mortises for all the rails. Also, you can see the finished carving from the previous step.

a router or trim router so you can shape the leg. My jig has an “L”-shaped base, which allows me to slide it along the lathe’s bed during routing. Rout as close as you can get to the beads you turned on the leg, then stop and complete the reeding by carving it into the turned bead on the leg. Complete the other three legs the same way, then cut the mortises for all the table’s rails.

I use a hollow-chisel mortiser with a sliding table, which makes the twin mortises on the front legs a snap. All the mortises are made using a $\frac{1}{4}$ " mortising bit and are $\frac{3}{4}$ " deep.

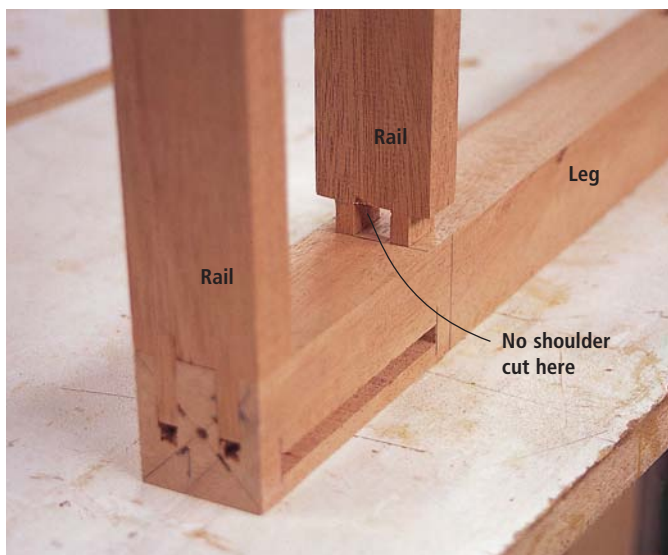
Make Your Rails Ready

With the exception of the curvy detail on the lower rails, the table saw handles most of the work on the rails. Begin by cutting the tenons. First use your miter gauge and fence to define the edge and face shoulders, as shown in the photo above right. All the tenons on the rails are $\frac{3}{4}$ " long.

Once all your shoulders are defined, cut the edge and face cheeks on the two side rails and one rear rail. Then finish up the cheeks on the front rails and remove the waste between the two tenons to match the twin mortises on the front legs.



To cut the tenons on the side and rear rails, first define the shoulders as shown, then come back and cut the cheeks.

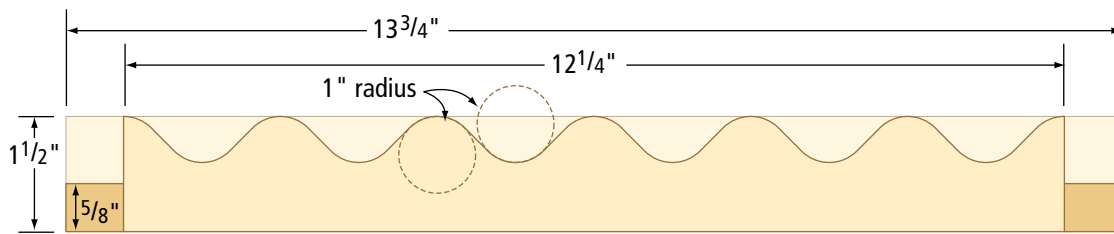


To create the twin tenon on the front rails, make the shoulder cut on the $\frac{5}{8}$ " sides only. Using a tenoning jig, make the cheek cut for both edges and reset the jig to remove the waste between the tenons.

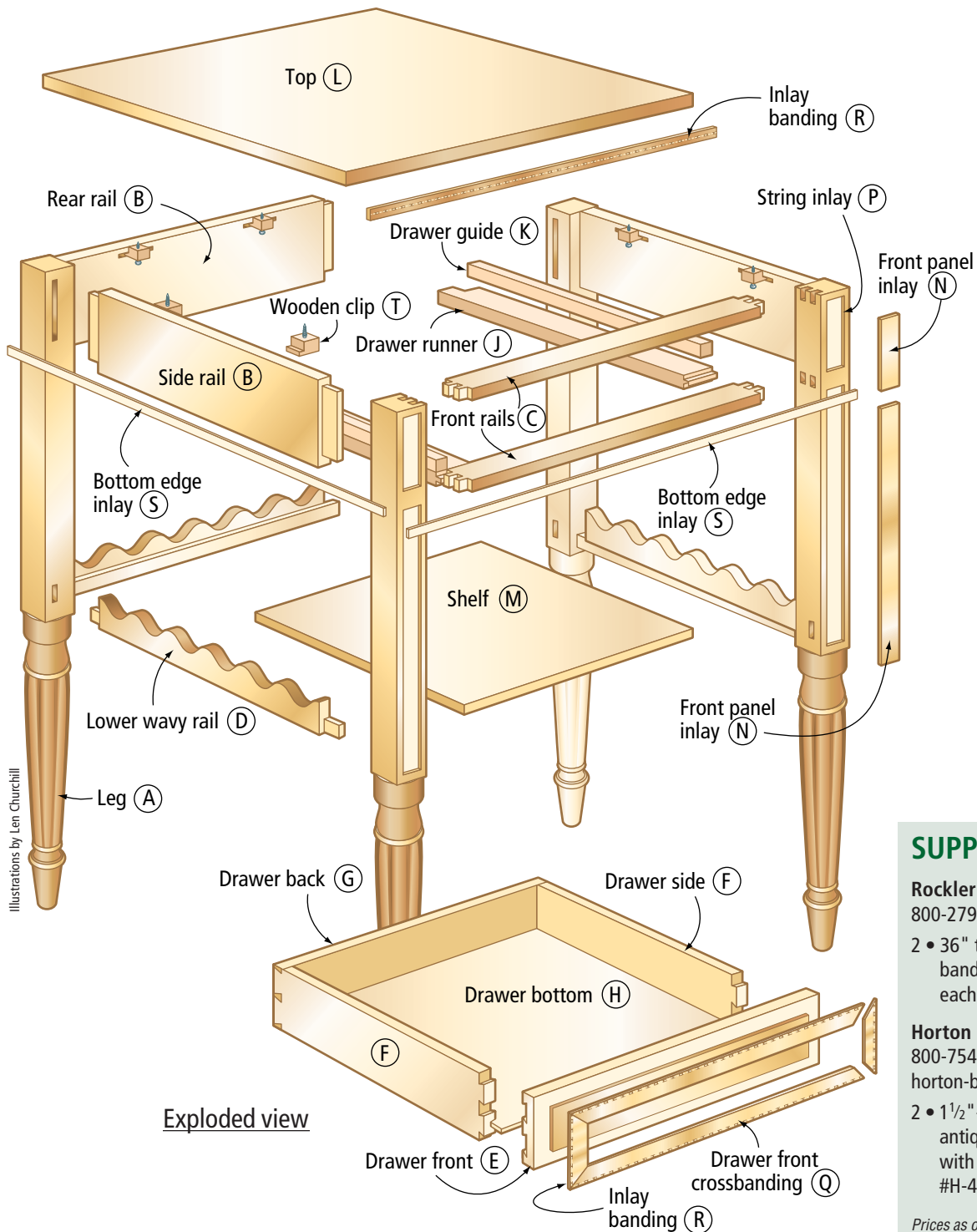
FEDERAL INLAY TABLE

	NO.	LET.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
				T	W	L		
☐	4	A	Legs	1½	1½	27⅞	Mahogany	
☐	3	B	Side and rear rails	¾	4¼	13¾	Mahogany	¾" TBE
☐	2	C	Front rails	⅝	1½	13¾	Mahogany	¾" TBE
☐	4	D	Lower wavy rails	½	1½	13¾	Mahogany	¾" TBE
☐	1	E	Drawer front	⅞	3	12⅜	Bird's-eye maple	
☐	2	F	Drawer sides	⅞	3	13⅝	Pine	
☐	1	G	Drawer back	⅞	2⅜	12⅜	Pine	
☐	1	H	Drawer bottom	½	11¾	13⅝	Pine	
☐	2	J	Drawer runners	⅝	1⅝	13¼	Pine	⅜" TOE
☐	2	K	Drawer guides	⅝	¾	12¼	Pine	
☐	1	L	Top	¾	16½	16¾	Mahogany	
☐	1	M	Shelf	½	14¾	14¾	Mahogany	
☐	1	N	Front panel inlay	¾	4	24	Bird's-eye maple	4 inlay pieces from board
☐		P	String inlay	⅛	⅛	7 lf	Ebony	
☐		Q	Drawer front crossbanding	⅜	¾	3 lf	Mahogany	
☐		R	Inlay banding		9/32	5 lf	See "Supplies" for information	
☐		S	Bottom edge inlay	⅜	¼	4 lf	Tiger maple	
☐	6	T	Wooden clips	½	⅞	4	Pine	

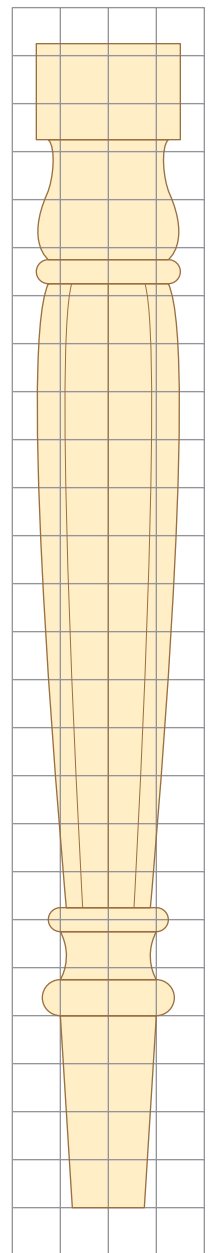
TBE = tenon both ends; TOE = tenon one end; lf = linear feet



Lower wavy rail template



Exploded view



1 Square = 1/2"

Leg pattern

SUPPLIES

Rockler

800-279-4441 or rockler.com

2 • 36" traditional inlay banding, #18812, \$6.99 each

Horton Brasses

800-754-9127 or horton-brasses.com

2 • 1 1/2" -dia. Sheraton antique-finish knobs with bolt fitting, #H-46, \$5.25 each

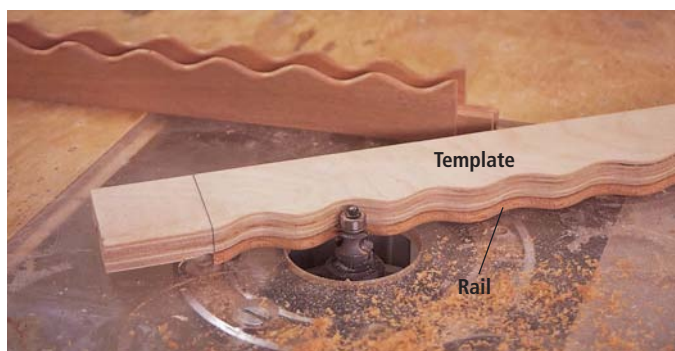
Prices as of publication deadline.



Cut the rabbet on the lower rails in two passes on your table saw. Define the shoulder, then set the fence to $\frac{1}{4}$ " and raise the blade to remove the $\frac{7}{8}$ " waste. This produces an L-shaped profile.



Next, make the cheek cut that leaves the necessary $\frac{1}{4}$ "-thick x $\frac{3}{4}$ "-long tenon on the ends of the lower rails.



Fit the stock into the groove in the pattern, with the ends of the stock located at the top of a wave. With a $\frac{1}{4}$ " beading bit set to the correct height, make the cut, creating the wavy design. You should make this a climb cut or move against the rotation of the bit.

While you're working on these rails, it's smart to cut the $\frac{3}{8}$ "-deep mortises on the back edge of the front rail (see the photo at the top of page 43) that will join the drawer runners.

Next turn your attention to the lower wavy rails. These rails are thinner at the top than at the bottom, so you need to rabbet away the top edge. Cut the $\frac{1}{4}$ "-deep x $\frac{7}{8}$ "-wide rabbet using your table saw, as shown above.

Then you can finish up the tenons on the ends of the lower rails by making the cheek cuts.

Cutting the wavy pattern is simple if you make the $\frac{1}{2}$ "-thick plywood template shown on page 41. Cut the pattern on your band saw and sand it to finished shape.

Then cut a $\frac{1}{4}$ "-deep x $\frac{5}{8}$ "-wide groove in the template that allows each rail to rest snugly in it.

Secure the rail and template together (a screw through each tenon could be extra insurance). Rout the shape on the rail with a $\frac{1}{4}$ " beading bit in your router table. Fit your rails and legs together without glue to see if you've got everything correct.

Fit the Shelf, Get the Glue

Fitting the shelf around the legs takes some care because this joint is quite visible.

With your shelf cut to the proper size, cut a $\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet on the underside of all four edges of the shelf. Mark where the notches should go. Use the table it-



Notch the corners of the shelf so it fits around the legs.

self (not your measurements) to mark the notches. Cut them on your band saw and fit the shelf in place. Once everything fits, sand the inside pieces of your case and assemble the base with glue. Secure the shelf in the rabbet with a couple of brads. Place them to allow for wood movement.

Drawer Runners and Guides

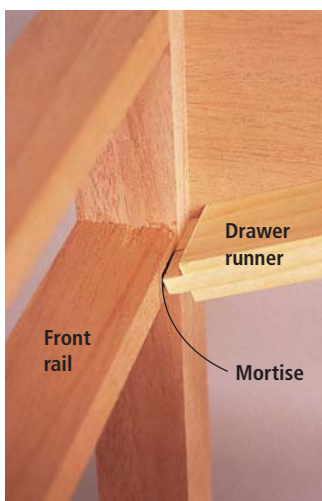
The table's drawer slides while riding on the runners; the guides keep it centered in the case. First cut a $\frac{1}{4}$ "-thick x $\frac{3}{8}$ "-long tenon on one end of each drawer runner. Then notch the other end to fit around the rear leg.

Fit and glue the drawer guides on top of the runners. These should fit snugly between the legs and flush to the inside of the cabinet. This will keep the drawer moving smoothly.

While you're tinkering around in that part of the case, use your biscuit joiner to machine some slots in the rails to attach the top to the table's base with clips, as shown in the photo on page 43.

One Piece at a Time

Inlay and banding intimidates many woodworkers, but it really is no more difficult than cutting a shallow mortise for a hinge.



Cut a tenon on one end of each runner and notch the other end to fit around the rear leg. Glue the tenon in place and nail it into the rear leg to secure it.

With that approach in mind, the obvious place to begin is to create templates that you can use to rout out the four recesses in the front legs.

Make the template by biscuiting together four pieces of $\frac{1}{2}$ "-thick plywood to create the proper opening for both the long piece of inlay and the shorter one. The opening must take into account the guide bushing in your router. In the end, you want the recesses that you'll rout to measure $\frac{1}{8}$ " x $9\frac{7}{8}$ " x 1" for the large piece of inlay and $\frac{1}{8}$ " x

$3\frac{1}{4}$ " x 1" for the shorter one.

I approach this particular piece of inlay on the legs in two stages. First I rout out the shallow inlay mortises in the legs and fill the entire mortise with a piece of bird's-eye maple. Then, when the glue is dry, I come back and rout out only the edges with the same template. I square up the corners of the new mortise with a chisel and fit the ebony string inlay around the piece of maple.

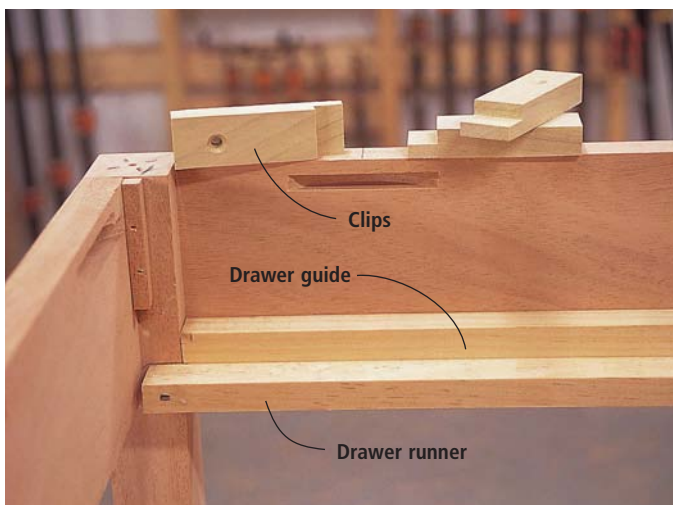
With that complete, mill an $\frac{1}{8}$ " x $\frac{1}{4}$ " groove on the sides and front of the case and glue tiger

maple inlay into that recess.

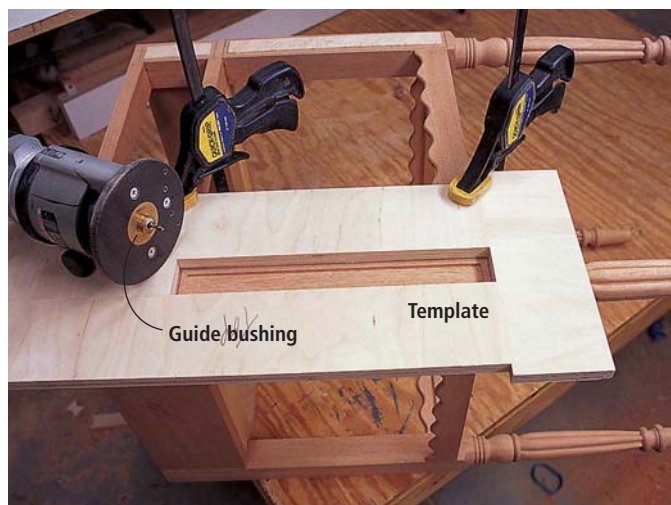
Before you can work on the drawer's inlay, you should build it and dry-fit it. I cut my dovetails by hand and use half-blind dovetails to join the sides with the front and through-dovetails to join the sides with the back.

The bottom is a solid piece of wood that fits in a $\frac{1}{4}$ "-wide groove in the sides and front, and slips under the back piece. The bottom panel is "raised" like a door panel to fit in the grooves.

Before you assemble the drawer, use your table saw to cut a shal-



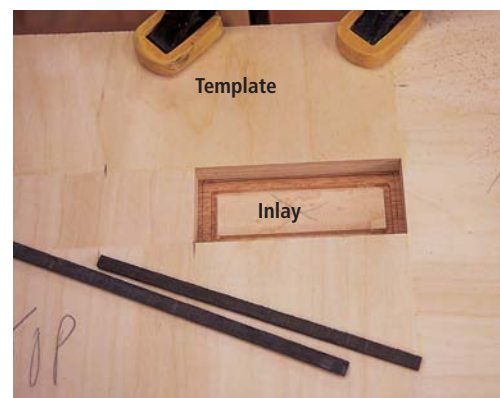
Glue and nail the drawer guides into place. Then use a biscuit joiner to cut the slots for the wooden clips that will attach the base to the top. Set the cut to begin $\frac{1}{4}$ " down from the top edge.



Make a template for cutting the inlay by using $\frac{1}{2}$ "-thick plywood and biscuit joints. Compensate for your router's guide bushing when sizing the template. Mark the edges of the inlay template carefully.



Cut the material for each of the front panel inlay areas and glue them in place.



Place the template back at the layout marks created earlier. Carefully cut a $\frac{1}{8}$ "-deep groove around each inlay for the ebony string inlay. Mill the string inlay to size and glue it down. When dry, sand the inlay smooth.



Cut a $\frac{1}{8}$ "-deep x $\frac{1}{4}$ "-wide groove on the front and both sides, even with the bottom edge of the rails. Cut an inlay of tiger maple to fill the groove and glue it in place. The front should overlap the sides to hide the end grain.

low $\frac{1}{8}$ " x $\frac{3}{4}$ " rabbet in the drawer front as shown below. Miter the crossbanding to fit the rabbet and glue it in place with a quick-setting cyanoacrylate glue (also known as Super Glue). Repeat the process to install the decorative banding around the perimeter of the drawer front. Cut a rabbet to house the banding on the outside edge of the drawer front and miter and glue it in place.

For your last act of inlay, rout a shallow groove in the front edge of the top piece and glue the same banding there, too.

Finishing Up

The rest of the project is cleaning up the details. Glue up the drawer and fit it to the case. Install the knobs. Sand everything to its final grit and finish the table. I used four coats of an oil/varnish blend and paste wax.

This small table does tend to catch your attention (Bosch Tools used it in a recent magazine advertisement). I tend to think it's got a little bit of everything: Classic lines, plus the little details that show you care about high-quality workmanship. **PW**



Begin building the drawer by laying out the dovetails on the drawer front. Cut the lines down to a line scribed $\frac{7}{16}$ " from the inside of the drawer front. Overcut toward the center of the interior face of the front. A front this size has two full tails, one pin and two half pins.



With the drawer apart, set the saw blade's height to $\frac{3}{4}$ " and cut a rabbet in the front on all sides, creating the shoulder for the crossbanding.



Cut the crossbanding on the band saw, noticing the grain direction, and fit to the drawer front with mitered corners. Use cyanoacrylate glue to bond the banding to the drawer face.



Repeat the process to install the decorative banding.

WOODWORKING ESSENTIALS

BY NICK ENGLER

CHAPTER

6

Edge & Surface Treatments

Routers were developed to cut moulded shapes in wood. Although their workshop role has expanded (greatly) during the last century to include joinery and other operations, moulding is still what they do best. They remain the chief woodworking tools for edge and surface “treatments” – cutting decorative shapes.

Before we get into the techniques for making decorative moulded shapes, let’s review these shapes and how they’re combined. In many woodworkers’ minds, this is muddy water. Open any tool catalog to the router bit section and you’ll find whole pages of shapes, all in a jumble. But don’t worry. There is some order to this chaos.

Despite the profusion of moulding bits, there are really only three shapes in decorative woodworking:

- Bead (convex curve)
- Cove (concave curve)
- Flat (straight line)

Every moulding, no matter how complex, is comprised of beads, coves and flats. If you had only three router bits – one for cutting beads, one for cutting coves, one for cutting flats – you could still produce any shape of moulding, no matter how intricate the shape.

Basic Moulded Shapes

Of course, there’s a little more to it. Each of these three main categories is subdivided into a few basic moulded

shapes that can be cut with a common bit. All mouldings are variations or combinations of these basic shapes, shown on the following page.

There are no hard and fast rules dictating how you combine these shapes or how you use them. However, you may find these guidelines useful:

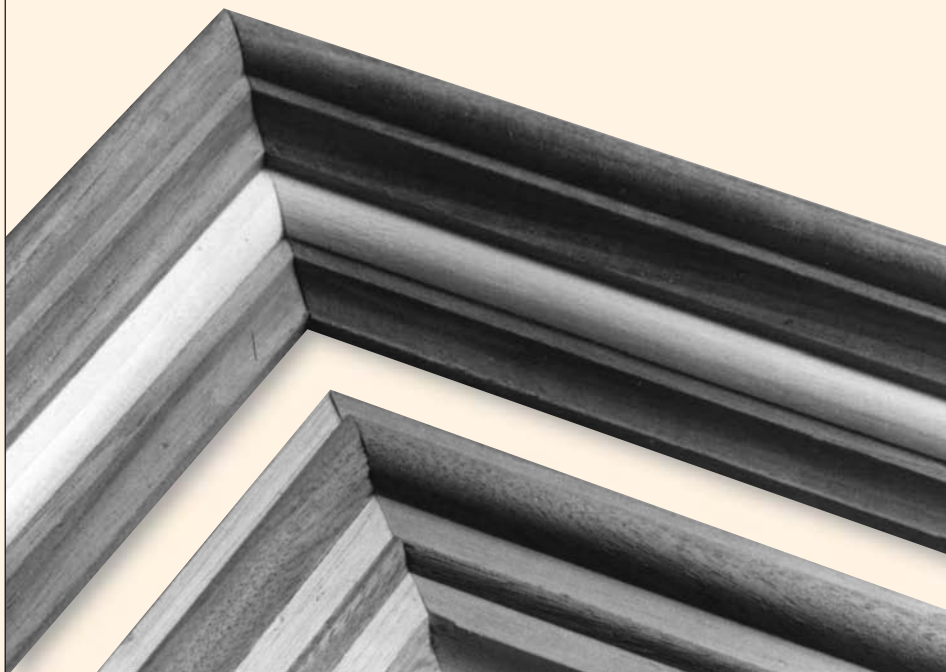
- Consider where people will stand when viewing the shapes and present these features at an angle that makes them easy to be seen and enjoyed.

- Vary the shapes in a complex moulding – don’t just repeat the same shapes over and over. The classic bead moulding, which incorporates a cove and a bead, has been a favorite of cabinetmakers for hundreds of years – you

PRO TIP:

Safe Small Profiles

Small ($\frac{1}{2}$ " wide or less) profiles and edge treatments can be dangerous to run. To avoid this, use a two-step process. By preparing a slab of wood the appropriate thickness of your profile (let’s call it a $\frac{1}{2}$ " x 10" x 24" piece of cherry) you can safely run the profile on one long edge, then head to the table saw to safely cut off the thin edge piece. Then head back to the router table and repeat the process. It adds a couple of steps, but it also adds a lot of safety.



TIPS & TRICKS

PRO TRICK:

Two Sides of Grooves Make Pretty Decorative Panels



Cut a set of grooves in a board that are parallel to each other. Make each groove a little more than half as deep as the board is thick. Then turn the board upside down and cut another set of grooves at an angle to the first set. Where the grooves intersect, they will create openings. The size, shape and spacing of these openings depends on the size, shape and spacing of the grooves.

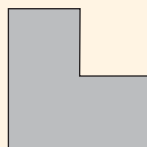


PRO TRICK:

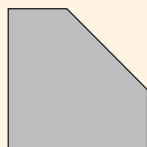
Simple Cock Beading



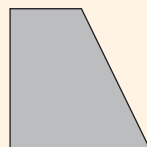
Cock beading is a simple edge detail that can dress up doors, drawers and much more. But cutting this detail on a door panel can be a lot of work. The simple option is to run a quantity of 1/8" hard-wood through your router table adding a bullnose detail to one edge. Then, simply glue this edging to your panel. Presto – simple cock beading.



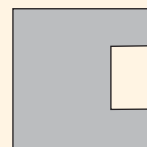
FILLET OR LISTEL
Use straight bit



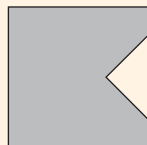
CHAMFER
Use chamfering bit or V-bit



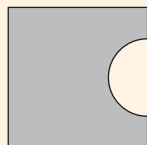
BEVEL
Use chamfering bit or V-bit



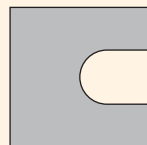
FLAT-BOTTOM GROOVE
Use straight bit



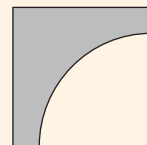
V-GROOVE
Use V-bit



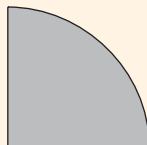
FLUTE
Use fluting bit



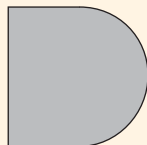
ROUND-BOTTOM
Use fluting bit



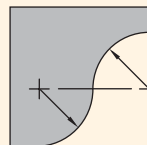
COVE OR CAVETTO
Use cove bit



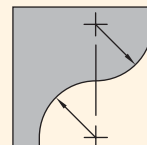
QUARTER-ROUND BEAD
Use roundover bit



HALF-ROUND BEAD OR ASTRAGAL
Use beading bit for small beads, nosing or roundover bit for large beads



CYMA RECTA
Use ogee bit (centers of curves are aligned horizontally)



CYMA REVERSA
Use ogee bit (centers of curves are aligned vertically)

Illustrations by Mary Jane Favorite

Basic moulded shapes

hardly ever see a moulding with a double cove or a double bead.

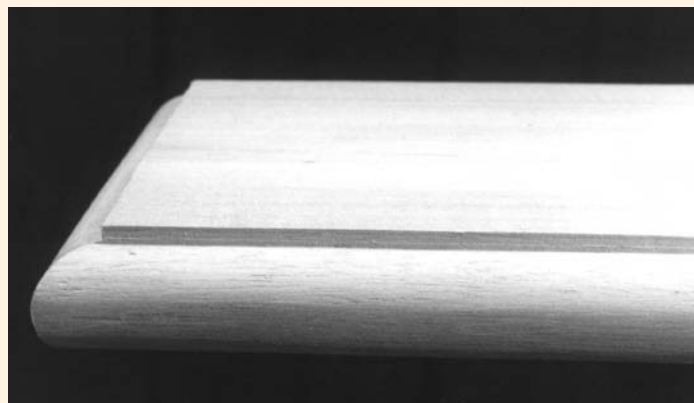
- To make mouldings more dramatic, use sharp, crisp transitions between the shapes. Make the curves and flats meet at distinct angles, or you can use fillets to separate shapes.

- If the structural strength of the piece is important, use simpler shapes.

Once you have designed a moulding,

you need to plan how you'll make it – what bits to use, how many passes you'll need to make, etc.

Then, consider how to incorporate the moulded shapes in the project you're building. You have two choices: You can cut the shapes into the surfaces of the structural parts, or you can make separately shaped parts (mouldings) and apply them to the piece.



This tabletop will see a lot of use, so the woodworker who made it cut a thumbnail moulding in the edge. This relatively simple shape preserves the strength of the edge, while a more complex shape would weaken it and the edge would soon show the wear.

Each of these choices has trade-offs. If you make applied mouldings, you may not be able to match the wood grain and color of the larger piece, but you can use moulding to disguise seams and joints. If you cut the shapes in a large structural piece, you don't have to worry about matching the wood, but you do have to worry if the shape will weaken the piece. Choose whichever moulding design works best for the piece.

Cutting with the Router

Woodworkers usually shape the edges of a piece. The reasons for this are both aesthetic and practical. Because the edges often trace the outline of the project, shaping the edges emphasizes and enhances the design. Also, the edges are easier to cut than the faces.

The technique for routing moulded edges is simple and straightforward; there's little here that hasn't already been explained in previous chapters. However, a few additional considerations are worth mentioning.

Before you rout a shape in a straight edge, make sure that the edge is as smooth and even as possible. Joint it and remove all the mill marks. If the edge is contoured, make sure all the curves are "fair" – smooth and even. Because one of the purposes of a moulded shape is to emphasize the edge, the shape also will emphasize any imperfections in the edge.

When you're ready to shape the piece, cut the ends (end grain) first, then cut the edges (long grain).

Cut the large parts with a hand-held router, and cut the smaller parts on a router table. With very small parts, leave them attached to a larger board, rout the edge of the board, then cut the parts free. This last technique is particularly important when making mouldings. Most mouldings, when ripped to their final dimensions, are too slender to rout safely. The cutting action of the router may actually tear the thin stock apart.

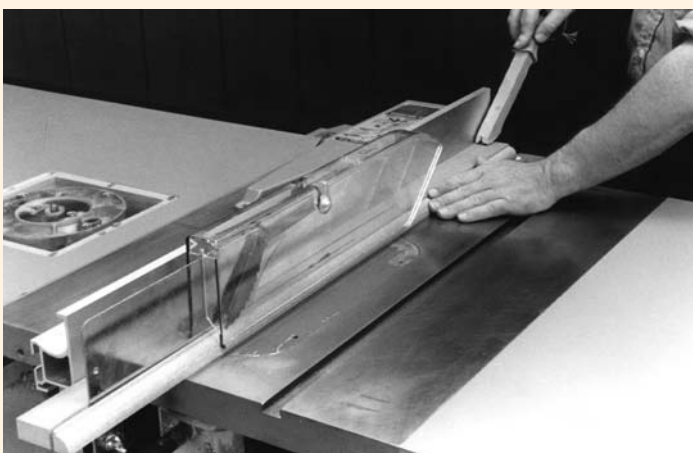
If you use a large bit such as a panel-raising bit, slow down the speed of the router. The larger the bit, the slower you should run the router – otherwise the bit



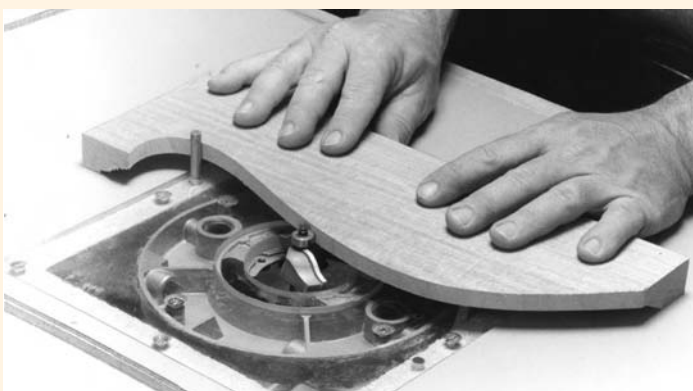
When you're ready to shape your workpiece, first cut the end grain along the ends ...



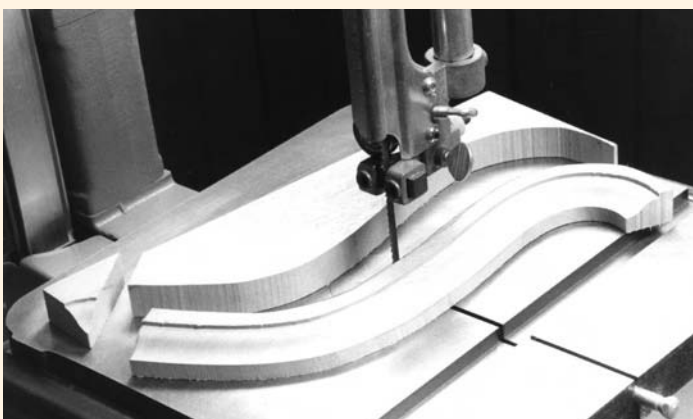
... then cut the long grain along the edges.



To make an applied moulding or picture frame stock, cut the shape you want in the edge of a wide board, then rip it to the proper thickness, which I'm doing here on my table saw. Don't try to rout a shape in narrow stock – it may chip, splinter or kick back at you.



This safety consideration also applies to making curved mouldings, such as a classic "goose-neck" moulding. Cut the inside curve in the wide moulding stock, sand it so the curves are fair, then rout the shape in the edge.



When you've shaped the inside edge of the stock, you can cut the outside edge to free the moulding from the piece, as I'm doing here with my band saw.

TIPS & TRICKS

PRO TIP:

Subtle Refinement

Edge treatments don't have to be complicated to be effective. A simple roundover bit or chamfering bit in the right locations can soften the look and feel of a piece of furniture, adding an extra level of elegance. And either of these bits work well with a bearing guide in an easy-to-manage trim router.

GREAT TRICK:

Keep That Piece Clamped Down Tight



Whenever you're routing something, make sure that either your workpiece or your router is stable and secure – they can't both move. If you choose to move the router across the work, clamp the work to your bench. If a clamp interferes with the operation, rout up to it and turn the router off. Then move the clamp to an area on the workpiece that you've already cut and resume routing.

GREAT TIP:

Back-routing (Also Known as Climb-cutting) Can be Tough

Occasionally you must back-rout a piece to reduce tear-out. This means you are cutting with the bit's rotation, rather than against it. It's much more difficult to control your work this way, so be sure to take shallow cuts and feed very slowly. Keep the router and the work steady, making sure the bit doesn't chatter.

may burn the wood. If you can't vary the speed of the router, you shouldn't use bits larger than 2" in diameter. Even bits larger than 1½" can be troublesome.

Surface Treatments

In addition to cutting edges, you can create a variety of decorative shapes in the face of your workpiece. Surface treatments can be cut pretty easily with either a hand-held or a table-mounted router fitted with either an unpiloted or a point-cut bit.

The most common surface decoration is a simple groove – flat-bottom, round-bottom or V-bottom. If the groove is straight, use a straightedge, fence or miter gauge to guide the cut. If the groove is irregular, you'll want to use a guide collar and a template.

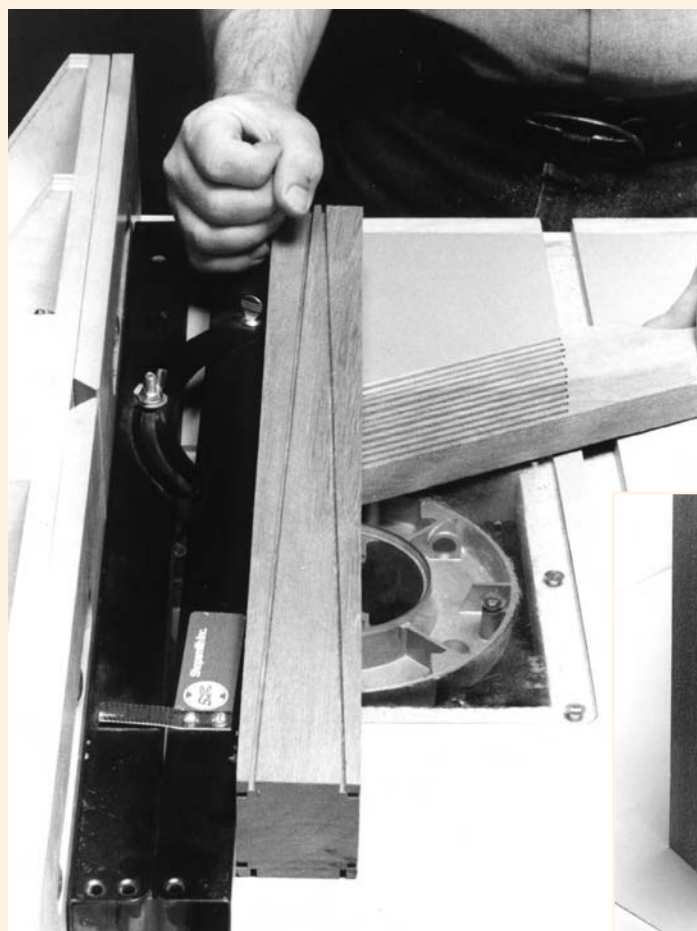
For decorative grooves with a more-complex geometry, you can make multi-

ple passes – or use a more-complex bit. For example, by making multiple parallel passes with a point-cut roundover bit (sometimes called a "beading" bit), you can form cock beads and reeds. Or, you can make cuts with a veining bit or a round-nose bit to create flutes. Also, a point-cut ogee bit will rout a wide groove with a double-ogee shape.

Making Complex Mouldings

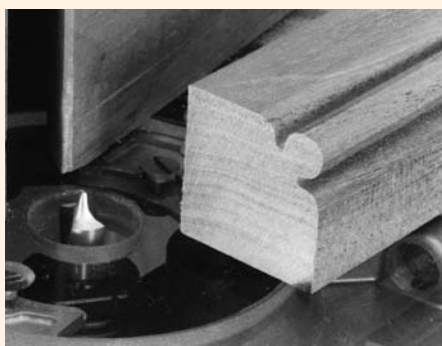
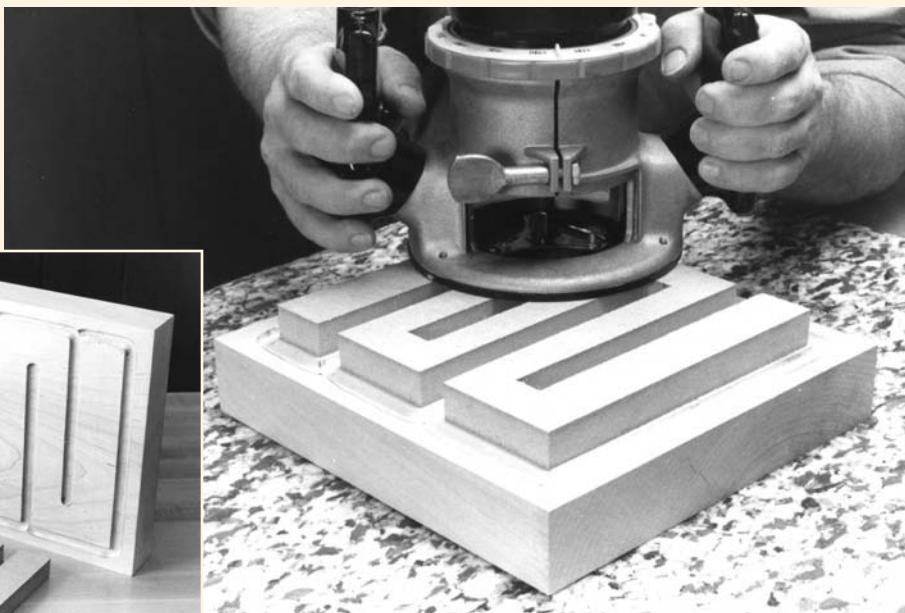
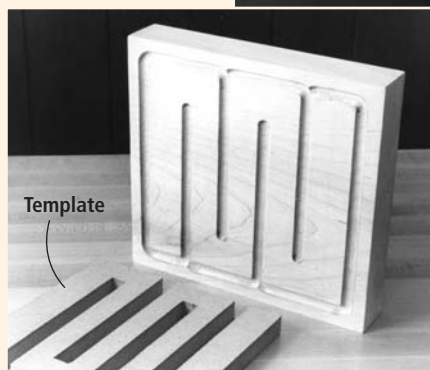
When you produce complex mouldings, you often make multiple cuts, combining edge and surface treatments. It isn't difficult, but there are tricks to help you.

- First, you will need to decide which router bits to use to cut the different shapes. Often this is more of an art than a science. There may be three or four bits in your selection that will produce a single shape. Knowing which one will work best is a matter of experience.



When cutting straight grooves, you can use a variety of jigs to get a decorative effect. Here, a tapering jig produces a pattern of angled grooves in a table leg. The grooves create the impression of a tapered leg, even though it's straight.

Some surface grooves are simultaneously decorative and practical, such as the groove around the perimeter of this cutting board. Not only does it collect liquids, but the groove also adds visual interest to an otherwise uninspiring piece. To make this groove, cut a template from hardboard and secure it to the cutting board with double-sided tape. Then you can cut the groove using a guide collar and core-box bit, keeping the collar firmly pressed against the template.



Make multiple passes with a beading bit to create decorative reeds and beads in the surface of a board. Because the beading bit is actually a small point-cut quarter-round bit, each pass cuts a 90° arc – one-quarter of a circle. Half-round beads require two passes. The corner bead or reed on this table leg requires three passes because it is three-quarters round.



Point-cut bits with a complex shape, such as this pilotless ogee bit, cut a broad groove with an interesting shape. The sides of the grooves are mirror images of each other.

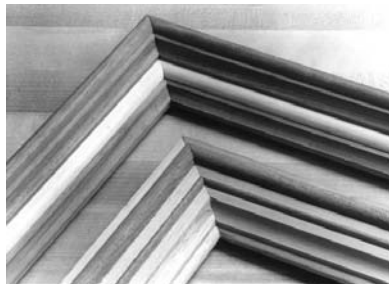


A flute is just a half-round groove – the opposite of a half-round bead. Often, it's blind at one or both ends. Use a veining bit to cut the flute and a straightedge to guide your router. If the flute is blind, it helps to have a plunge router. Attach stops to the straightedge to halt the cut when the flute is the correct length.

TIPS & TRICKS

PRO TRICK:

Layers Can Help if You Want Complex Mouldings



Instead of making multiple passes to create a complex moulding, just glue up several simpler shapes. The easiest way to do this is to “lamine” the shapes – or build them up in layers. But you can also “join” the shapes by cutting dados, rabbets or grooves in the moulding stock, then glue smaller strips of wood in these joints. The strips that you glue together don’t have to be the same species – you can use contrasting wood, if you want.

GREAT TIP:

How Much is Enough?

To make sure the collet is safely gripping a router bit, insert $\frac{3}{4}$ " of the length of a $\frac{1}{4}$ " shank bit into the collet and insert a full 1" of every $\frac{1}{2}$ " shank bit.

PRO TIP:

Bits Pull Double Duty

Most edge-profile router bits are designed to be run in a specific orientation to the edge. However, if you’re looking for an unusual alternative, don’t hesitate to think in a different dimension. By running the wood past the bit in a vertical rather than horizontal attitude, the profile is changed subtly. And you get two profiles out of one bit.

- Second, when you know which bits you’re using, carefully plan the cuts. Each cut should leave enough stock to adequately support the workpiece during the next cut. If possible, make small cuts before large ones, and remove stock from the interior or middle of the surface before taking it from the sides.

- Third, when you make each cut, use constant, even pressure to feed the work (or move the router) and keep it firmly against the guides. If the pressure isn’t constant or if the work wanders slightly, the cut may not be even. If the problem continues over several passes, there may be considerable variation in the moulded shape along the length of the board.

- Fourth, make more moulding than you think you’ll actually need, because if you run short, it will be difficult to reproduce the exact same setups you went through.

Inlaying Banding

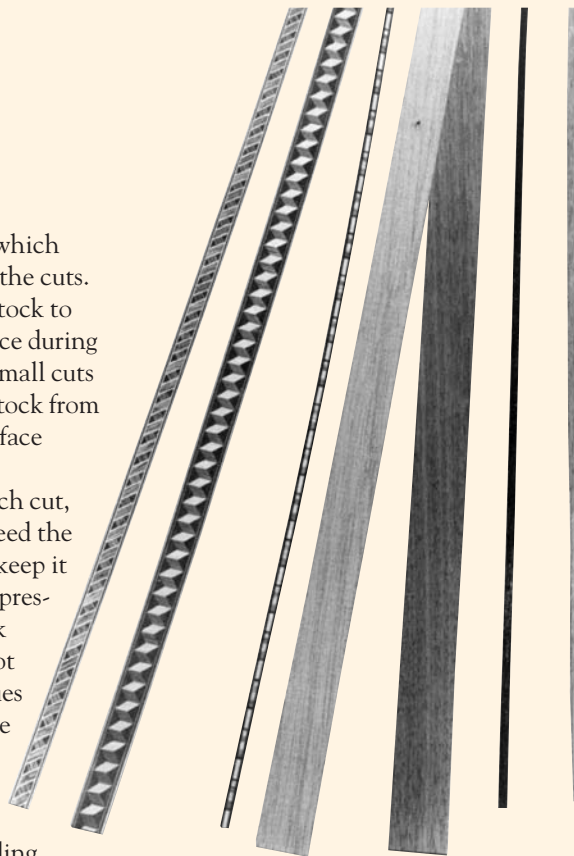
You can decorate wooden surfaces by cutting shallow mortises and filling them with inlaid strips of veneer, patches of marquetry and parquetry, slabs of mother-of-pearl, strands of wire and so on.

Because these inlaid objects often are small and intricately shaped, cutting mortises to fit them requires precision. Not only must the shape be correct, the depth must be accurate and absolutely uniform. That’s why one of the best tools for making these small cuts is the router.

Perhaps the simplest type of decorative inlay is the inset wood banding. These simply are ribbons of wood sliced from a board or a sheet of veneer.

They also may be made up of several contrasting colors of wood, forming long strips of marquetry (designs that are made with multiple pieces of wood arranged with the long grain showing) or parquetry (multiple-piece designs with the end grain showing). They are usually straight, but they also may be curved.

To inlay straight banding, first measure its width and thickness. Then rout a shallow rabbet, dado or groove to fit it,



Some banding inlays simply are thin pieces of wood ripped from boards or cut from sheets of veneer. You can make these simple bandings in your workshop, using a saw or a knife. Other inlays can be intricate pieces of marquetry. These are made by arranging different colors of wood in geometric patterns, gluing them together and slicing them into long ribbons. You can make these yourself, too, if you have the patience, but there are many ready-made marquetry bandings available from mail-order suppliers.

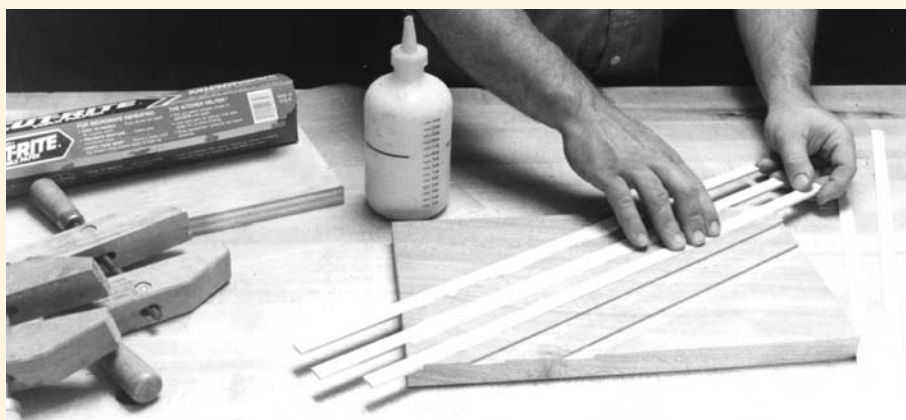
using either a hand-held or a table-mounted router. After cutting the recess, just glue the banding in place. For more details, check out the photos at right.

If the inlaid materials are fairly thick, you’ll want to rout a recess that is slightly shallower than the inlay is thick. This will make the inlay “proud” when you glue it in place – meaning it will protrude slightly above the surface of the wood. After the glue dries, scrape or sand the inlay flush with the surface.

If the inlaid materials are thin, you risk sanding through them if you mount them proud, as explained above. Instead, you will need to rout the recess to precisely the right depth. Use dial calipers to measure the thickness of the inlay, then carefully adjust the router’s depth of cut to match. **PW**



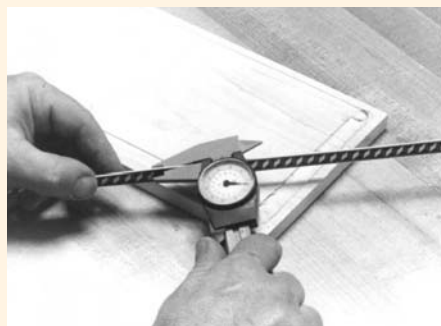
Cut recesses for banding with the same setup you would use to cut simple rabbets, dados and grooves. If the workpiece is small, cut it on your router table using a fence to guide the board. If the workpiece is too large to handle on the table, use a hand-held router and clamp a straightedge to guide the router. Either way, a straight bit is the best choice.



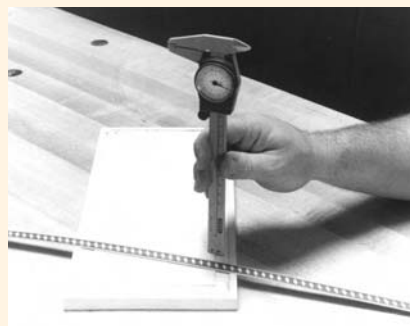
Next, test-fit the banding in its recess. When you're satisfied with the fit, spread glue in the recess and press the banding in place. Wipe away any excess glue, place a piece of wax paper or plastic wrap over the banding and clamp a straight, thick board to the piece over the covering. The board helps distribute clamping pressure evenly, and the covering keeps it from sticking.



When the glue is dry, remove the board and the covering, then scrape away any glue that remains on the surface. But be careful you don't scrape too deeply – you don't want to scrape through the banding.



When inlay materials are thick, you can rout a recess to make the inlay "proud," then sand it flush. When inlay materials are thin, you risk sanding through them if you mount them proud. Instead, use calipers to measure the inlay thickness, then adjust the depth of cut to match.



A BIT OF ADVICE

A router bit consists of a cylindrical shank ($\frac{1}{4}$ " or $\frac{1}{2}$ " in diameter) and one or more flutes or cutting wings, usually comprised of a piece of carbide brazed to the metal body of the bit. Throughout this series, we will provide a closer look at many of the common and specialized bits to use with your router. These bits are great when using your router to make edge & surface treatments.

Panel-raising Bit

This bit combines two small wings (which cut downward to shear the top edge) with two large wings (which shear upward for a smooth finish). It's ideal for creating decorative tops and should be used in a router table.



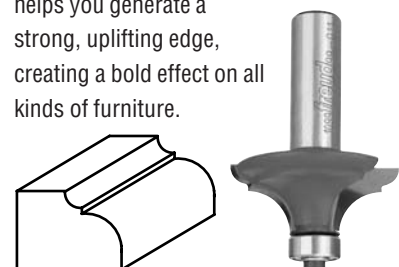
Beading Bit

These bits add an attractive profile to furniture and millwork. They can be used to cut all kinds of material – plywood, hardwood and softwood. They're also available with steel pilots or bearings for similar designs.



Table Top Bit

This bit, designed with sharp curves, helps you generate a strong, uplifting edge, creating a bold effect on all kinds of furniture.



Dado & Rabbet Jig

This jig simplifies the set-up and the operation necessary to make repetitive cuts. Just lock the board between the base and clamping bar, then guide the router along the bar. The stock doesn't move, so you don't have to worry about controlling a large piece of wood, and the straightedge doubles as the clamp, so the set-up is very simple.

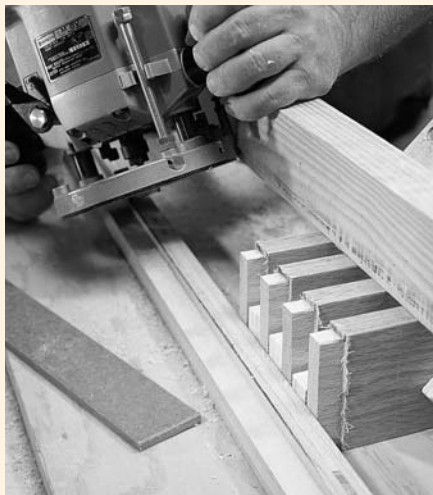
The jig is just two pieces of wood (a base and a clamping bar) with the sizes determined by your needs. Make the base from $\frac{3}{4}$ " plywood and the clamping bar from a hard, dense wood such as oak or maple. The bar should be fairly thick so it doesn't bow when tightened. I crowned the top and bottom surfaces of my clamping bar, making it $\frac{1}{32}$ " to $\frac{1}{16}$ " thicker in the center than at the ends.



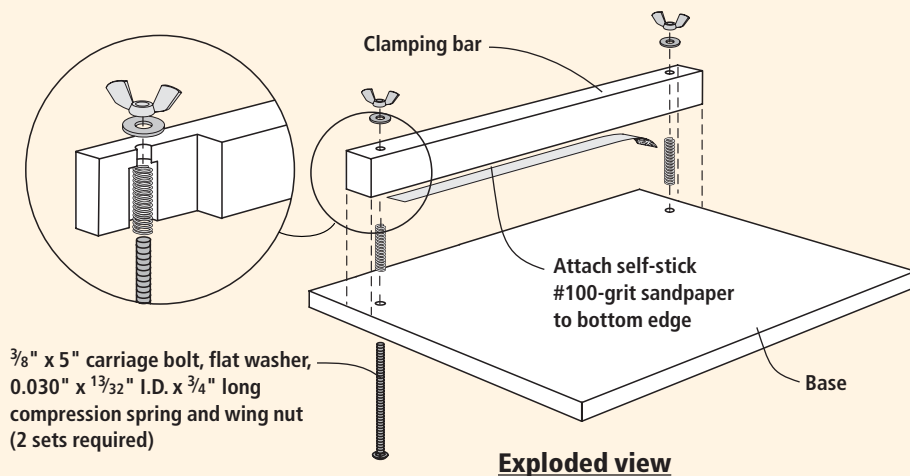
Use the positioning gauge to align the stock underneath the clamping bar. The edge of the gauge indicates the inside edge of the cut.

Even though the bar flexes, the clamping pressure remains even.

To use the jig, position the stock on the base under the clamping bar. To do this quickly and accurately, it helps to make a positioning gauge from a scrap of thin plywood or hardboard. Lock the bar down on the base and place the scrap so that one edge rests against the side of the bar. Rout all the way through the scrap, creating a strip about as long as the bar. The width of this strip is the distance from the edge of the router to the bit's cutting edge.



This jig also is a timesaver for making identical cuts in multiple parts. To make multiple identical cuts, such as the cheeks and shoulders of tenons, clamp a short fence to the base to position the parts.



$\frac{3}{8}$ " x 5" carriage bolt, flat washer, 0.030" x $\frac{13}{32}$ " I.D. x $\frac{3}{4}$ " long compression spring and wing nut (2 sets required)

Exploded view

Everything you need to know about the router in our special series!

For many woodworkers, one of their first tools is the router, but there often isn't enough instruction about how to use it. This series aims to fix that by giving you everything you ever wanted to know.

Chapter 6 Edge & Surface Treatments

Spice up many of your rout made projects with these special edge shapes, surfac treatments and some complex mouldings.



COMING IN FUTURE ISSUES

Chapter 7 (Issue #142) Advanced Techniques

We comb our resources to give you some special tips and projects to work on.



IN PAST ISSUES

Chapter 1 (#136) Fixed-base Router

The basics of router set-up and rules every woodworker should know.

Chapter 2 (#137) Plunge Router

An in-depth look at versatile plunge routers.

Chapter 3 (#138) The Router Table

Learn which routers work best in a table and get lots of table tricks.

Chapter 4 (#139) Router Joinery

Learn how to rout all kinds of tight joints.

Chapter 5 (#140) Build Boxes & Drawers

An excellent application for any kind of router.



The *SPEED DEMONS* of **SHARPENING**

We test three new machines that try to replace grinders and traditional sharpening stones.

For hundreds of years, the best way to get the keenest edge on a woodworking tool has been to rub it on a series of progressively finer abrasive stones. This hand skill is one of the last holdouts of woodworking from before the Industrial Revolution, which drove craftspeople to use their moulding planes as firewood when they traded up to electric routers and shapers.

Sharpening by hand has held on because traditional motorized grinders are – in general – too coarse and aggressive to get a truly keen edge for fine woodworking. And water-cooled grinders, such as the Tormek and Makita models, are slow and don't offer the full range of grits that waterstones, diamond stones, sandpaper or oilstones do.

So sharpening is generally a two-step process. Once you shape the tool's edge on a motorized grinder, you finish up by honing the tool

by Christopher Schwarz

Comments or questions? Contact Christopher at 513-531-2690 ext. 1407 or chris.schwarz@fwpubs.com.



Photo by Al Parrish

on sharpening stones. As a result, proper sharpening is an expensive and time-consuming process.

But in the last 12 months, three manufacturers have introduced machines that try to make sharpening simpler and faster. These machines both grind and hone the tool's edge using progressively finer grits of sandpaper. The coarse sandpaper shapes the tool's edge much like a grinder, while the fine grits polish it to a mirror, similar to a set of sharpening stones.

For the last few months, I've sharpened dozens of tools on these machines and have been impressed with their speed and accuracy. But each machine is radically different in the way it approaches its task. And each has strengths and weaknesses. If you're considering one of these machines, here's what you should know about the Jet Multitool, the Veritas Mk. II and Jooltool's Warrior.



Jet JBG-82

Jet Grinder & Multitool Jig

To create its sandpaper grinder, Jet Equipment & Tools combined a traditional Chinese-made grinder with a rugged Australian-made jig that spins a 2"-wide x 36"-long sandpaper belt. The jig part of this machine, called the Multitool, has been for sale for years as an aftermarket accessory in Australia and is now imported here by Multitool USA (800-660-0880 or ausmultitool.com). In Australia, the Multitool jig is popular with

Multitool jig

The JET JBG-82 combines the Multitool jig with an 8" grinding wheel and a 7" disc sander. It's a complete sanding and grinding station. The sharpening jig (shown at right) screws into place on the Multitool jig. Use a light touch when sharpening – this thing is aggressive.



TRUE GRIT – THE DIFFERENT SYSTEMS

One of the difficulties in understanding sharpening is knowing how the size of the grit is measured. The Japanese have one system, sandpaper in the United States is measured using another system (called CAMI, the Coated Abrasives Manufacturers' Institute), and the abrasive in really fine sandpaper is measured in microns (one micron is equal to one millionth of a meter). It's all quite confusing.

Here are the rough equivalents for the three systems, from coarsest (at the top) to finest.

Japanese grit	CAMI grit	Microns
—	36	535
—	80	192
150	100	141
—	120	116
—	150	97
—	220	60
240	—	58
360	320	36
1,000	700	14
2,000	—	7.5
4,000	1,500	3
6,000	—	2
8,000	—	1.2
10,000	2,000	1

hobbyists and professionals who use it for a variety of woodworking and metalworking tasks.

In fact, sharpening is one of this machine's side duties. It comes with a traditional 6" or 8" grinding wheel on one end of its arbor. On the other end is the Multitool jig and a disc sander. You can sand curved work, grind, polish and even clean up welds on the belt (we're told that auto enthusiasts love this machine).

To sharpen tools, you must purchase a separate \$75 accessory tool rest from Multitool USA. This tool rest sets the angle of the bevel on your tool and holds it square against the belt as you sharpen the edge.

One of this machine's virtues is how easy it is to change the belts to finer grits. It takes about five seconds total. Just press the front wheel forward until it locks in a retracted position. This slack-

ens the belt. Then you remove one belt, slip the next one on and flip a switch to engage the tension. It's very smart.

Sharpening is also remarkably fast. The grinder's motor spins at 3,450 rpm, while the small 3½"-diameter wheel spins at 5,557 rpm, according to our tests. This translates into 4,280 feet of sandpaper passing under your tool every minute. In other words, you need to be careful about your tool heating up to the point where it turns blue and loses its temper, rendering it unable to hold a sharp edge. You need to use light finger pressure and touch the tool to the sandpaper for only a couple of seconds at a time. If you bear down on the tool even a little bit, you will cook its edge instantly. We destroyed several chisel edges before getting the hang of it.

The Multitool has a few drawbacks, though. There isn't a way



On the JET JBGS-82, set the angle of your tool's bevel by lining up its front edge with marks on the jig. Three common angles (25°, 35° and 40°) are called out.



Changing the belts on the JET JBGS-82 is extraordinarily fast. Push the front wheel forward and it locks with the belt in a slack position. Replace the belt, push a switch and you're done.

to remove the burr on the backside of a tool's edge as you move to finer grits. It may be tempting to remove the burr by touching the backside to the flat platen of the jig, but because it's moving so quickly, I wouldn't recommend it. You'll have to remove the burr on a fine sharpening stone or on fine sandpaper. That's not a big deal, but it is an extra step and another thing to purchase.

Second, because the wheel you sharpen on has a small diameter, you will grind the edge quite hollow. In other words, the bevel is very concave, even compared to the hollow that's created on a 6" grinder. Sharpening experts assert that a hollow-ground edge isn't as durable as one that is ground with a flat bevel (which is what you get when grinding with a flat sharpening stone).

Also, the jig will hold most Western chisels and plane irons

up to 2⁷/₁₆" wide. But it won't hold short-bladed tools such as Japanese chisels, butt chisels and spokeshave blades.

So how does the edge look? We sharpened several chisels on the Multitool using 3M's Trizact abrasive, available from Multitool USA. This high-tech sandpaper is made up of consistent pyramid-shaped structures instead of paper coated with randomly arranged grit, which is how traditional sandpaper is made.

We used the Trizact A6-grade paper as the final grit. This abrasive is equivalent to 6-micron sandpaper. In the world of abrasive grading, that puts it near a 2,000-grit Japanese waterstone. By way of comparison, most waterstone sharpeners finish chisels on a 4,000-grit stone. Some, like me, take their edges up to 8,000 for an ultimate polish.

Looking at the edge from the

Multitool under a 30x jeweler's loupe (see "\$10 Magnifier Improves Edges" on page 57) it was amazingly consistent, but it didn't look as polished as you'd get from a Japanese waterstone.

Veritas Mk. II Power Sharpening System

As the name implies, this is the second generation of this sharpening machine. The first version was bigger, more complex, more expensive and (some claimed) a bit underpowered.

Unlike the Jet Multitool, the Canadian-made Veritas Mk. II is designed for one operation: sharpening plane irons and chisels. And it excels at that.

To sharpen a tool, you first place it in a jig (included with the machine) that sets it square and positions it so that the proper amount of the tool is projected.

The jig rides on a tool rest

that's suspended above a flat platter of sandpaper that spins at 678 rpm, according to our tests. That translates to 1,419 feet of abrasive passing under the tool's edge each minute – three times slower than the Jet. The height of the tool rest determines the angle you grind at – anywhere from 15° to 45° in 5° increments.

The machine comes with two platters. One is for grinding and has #80-grit Zirconia paper on one side and #150-grit aluminum oxide paper on the other. The other is for honing and has #320-grit aluminum oxide on one side and 9-micron paper on the other.

Other grits and additional platters are available as accessories for special applications.

One of the real strokes of genius with this machine is that the platter used for honing is 1 millimeter thinner than the platter for grinding. This creates a 1° microbevel on the edge of your tool, which greatly speeds sharpening.

Also, the jig holds a variety of tools, including short-bladed ones (as little as 1³/₄" long) and wide ones (up to 2¹/₂" wide). Plus there are retractable stops on the jig that allow you to wedge skew chisels in place for honing.

This is the only machine in our test that is designed to flatten the backside of the tool – the critical first step to sharpening a new tool – and to remove the burr on the backside that develops during grinding and honing. The speed of the platter is just right for this: it's slow enough to keep the tool under control, but fast

POWER SHARPENING SYSTEMS

Brand/model	Price	RPM at tool	Feet/minute	Avg. temp. increase	Amp. draw	Max. tool width	Coarsest grit available	Finest grit available	Website
JET JBGS-82*	\$435**	5,557	4,280	12°	4.3	2 ⁷ / ₁₆ "	24 grit	5 micron	www.wmhtoolgroup.com
Veritas Mk. II	\$300	678	1,419	9°	2.5	2 ¹ / ₂ "	80 grit	.5 micron†	leevalley.com
Warrior M-2000-PKG	\$350	5,463	4,288	5°	.25	2 ³ / ₈ "	80 grit	10 micron	jooltool.com

* The JBGS-62, a 6" model, also is available. ** Doesn't include the \$75 sharpening jig. † With honing compound. Prices as of publication deadline.

enough that you don't feel like you're wasting your time.

Also, while the machine is designed for sharpening tools with a flat edge, you can sharpen many carving tools freehand by resting them on the bar that the jig rides on. You also can sharpen the slightly cambered edge necessary for smoothing planes and jointer planes by alternately applying a little more pressure at the corners while grinding and honing.

In use, the machine is almost foolproof. Because of its slower speed, it's difficult to build up the heat necessary to destroy the temper of the tool (though it's still possible). And the completed edge looks good and polished under magnification, much like a hand-sharpened edge.



Veritas Mk. II

The Veritas Mk. II Power Sharpening System is designed to do one thing extraordinarily well: sharpen woodworking tools. Just set your tool in the jig with a second easy-to-use jig (right).



This jig holds the tool

This jig sets the projection of the tool

The Warrior from Jooltool

The most unusual machine in this test is the American-made Warrior, a system that utilizes an optical illusion.

Essentially, you sharpen your tools against a disc of spinning plastic covered in Trizact paper. The disc is shaped so that when it's spinning, you can see the tool's edge as it's being sharpened.

Like the other two machines, the Warrior comes with a variety of grits so you can hone a fine edge. The base model comes with grits from #80 up to 10 micron, very similar to what's available on the other two machines.

One downside to the base package is that it comes with only two of the plastic "backpads," which is what the sandpaper sticks to. It would be nice to have three or four to handle most woodworking tools. Additional backpads are available from Jooltool for \$21 each, or you can buy a package of three for \$42.50.

Unlike the other two machines, the Warrior has no jig to hold the tool square as you sharpen it. However, it was surprisingly easy to keep a reasonably square edge

while sharpening freehand. Where the tool really excelled was with shaping my carving tools. It is astonishingly simple to shape the edge the way you want because you can see exactly where you are removing metal.

Another plus is that the Warrior tended to keep the edge cooler than the other two systems. We measured the heat generated by each system by holding a temperature sensor to the chisel (at $\frac{3}{16}$ " behind the edge) and then sharpening the tool in three separate three-second pulses with a three-second pause between each pulse. With the Warrior, the temperature of the tool went up to 77° Fahrenheit on average, only 5° more than room temperature. Tools on the Jet heated up to 84°F and on the Veritas to 81°F.

You still can destroy the temper of a tool with the Warrior, however. The delicate edge of V-tools – particularly where the two sides of the "V" meet – was susceptible to heating up.

On the downside, the Warrior can't reliably remove the burr from the backside of your tool – that's something you'll have to do with a sharpening stone for



Jooltool's Warrior



The Warrior M-2000-PKG is a compact, lightweight sharpening system that allows you to see your tool's edge as you sharpen it.

flat tools and a slipstone for curved tools. Also, the widest blade you can reliably sharpen with the Warrior is slightly smaller (about $2\frac{3}{8}$ ") than the tools the other two machines can sharpen.

Another downside is the machine is lightweight, so you should screw it to a work surface to make sure you don't knock it over (holes



Tool rest

Set the bevel angle you want to sharpen with the Veritas system by adjusting the tool rest up and down.



The 3M Trizact sandpaper is attached to plastic discs (called Ninja Disc Backpads) that screw onto the machine's spindle. Swapping discs is fast and easy.



The plastic discs' shape allow you to see the tool's edge as you grind and hone it. Shaping unusual tools is remarkably easy.

\$10 MAGNIFIER IMPROVES EDGES

When someone suggested that I examine my sharpened edges "up close and personal" with a magnifying glass, I thought they were nuts. But once I tried it, I was hooked. You really can see how sharp your edge is and if your scratch pattern is consistent throughout.

I recommend a 30x magnifier, traditionally called a "loupe" by jewelers, which is used to examine gemstones for flaws. These are readily available through a number of websites for about \$10. — CS

are provided in the base specifically for this purpose).

Like the Jet, the Warrior has a lot of uses besides sharpening, including polishing, deburring and altering jewelry. You can even shape small wooden parts with it (there's a dust-collection port for your shop vacuum).

After some practice, our edges looked pretty good. They weren't as consistent as those on the Jet or as polished as those on the Veritas, but they were respectable. The more we worked with the Warrior, the more we began think-

ing about ways to add a jig that would hold the tool for us – perhaps an upside down tool rest from a traditional grinder.

Conclusions

Because each machine is different, it's difficult to make a single recommendation for all woodworkers. If you're looking for a system that is dedicated to sharpening plane irons, chisels and other curved woodworking tools, the Veritas is the clear winner. But if you also need a sanding and grinding station, or you work en-

tirely with turning or carving tools, you should look closely at the other two models.

The bigger question is, of course, if these systems replace hand sharpening. These three range in price from \$300 for the Veritas to \$435 for the 8" version of the Jet (before adding the \$75 sharpening jig).

All three systems replace a good-quality motorized grinder, which is a \$65 to \$200 expense, on average. Plus they replace some or all of the sharpening stones you need. A Japanese waterstone

system can cost \$40 to \$220 (or more). If you finished up your edges with sandpaper, the additional cost would be negligible.

So these three machines are (on the whole) more expensive than most hand-sharpening systems. But they are undoubtedly faster – in some cases much faster. And the less time you spend sharpening means you can spend more time working wood, and that is something that's almost impossible to put a price tag on. So we think these machines are worth checking out. **PW**



Light finger pressure is all it takes to hone a polished edge quickly and easily on the Veritas machine.



The Mk. II also allows you to flatten and polish the backside of your tools and remove the tool's burr on its backside while sharpening.

A mobile drill press center
with a wide, adjustable table
is an asset to any shop.



Drill Press WORKSTATION

A drill press is an important machine in any woodshop. It is available as either a floor or a bench model, and has an adjustable table or head. However, all presses lack good storage space and often have tables that are difficult to adjust or less than ideal for woodworking.

I built the storage cabinet portion of this project for use with both floor and bench models. The benchtop model can be bolted to the top of the drill press. If you own a floor-model drill press, measure the width and height of the base to ensure that the cabinet can be rolled over the ma-

chine's base before you begin construction. If the drill press base is too large, change the cabinet dimensions appropriately.

The top drawer has two full-extension drawer slides and can hold drill bits on an indexed board; the other two drawers can hold accessories, literature and other tools for the shop.

Many woodworkers will appreciate the wide adjustable table. It can be tipped forward or back for angular drilling. This is an important option that's missing on most drill presses.

Woodworkers use a fence with their drill press a great deal and

often have to clamp a board to the table for this operation, which can be awkward. This fence is good because it's adjustable, easily locked in place and quick to move wherever it's needed.

This workstation is easy to build, inexpensive, and well worth the time and money. I decided to use $\frac{3}{4}$ "-thick medium-density fiberboard (MDF) because it's inexpensive and easily machined with woodworking tools. However, any sheet material can be used, including plywood.

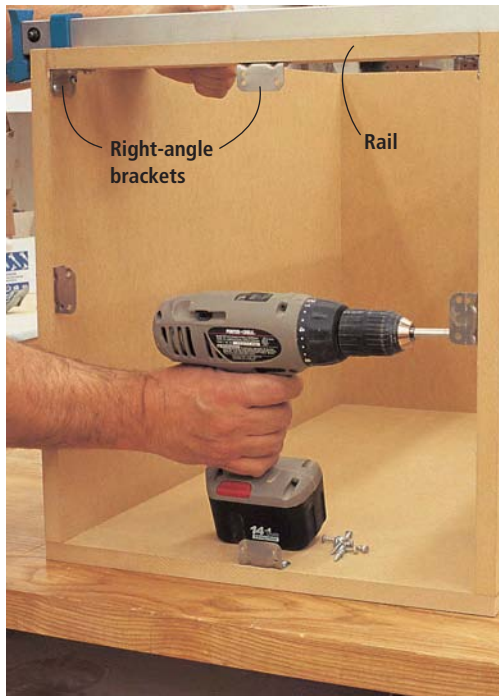
This is a great workstation, and I'm sure you'll quickly appreciate its value.

by Danny Proulx

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With the carcase assembled and lying on its back, install the right-angle brackets to hold the top and rail.



A bottom that's cut square will help keep the drawer parts aligned.

Building the Cabinet

First cut the two sides and bottom to size as detailed in the cutting list. Attach the bottom to the sides using glue and #8 x 1 1/2" screws, spaced 6" apart. Note that both sides rest on the bottom board and the screws are installed on the underside of the bottom board into the edges of the side boards.

Remember to first drill pilot holes for the screws. I know some manufacturers say their screws are self-tapping and don't need pilot holes. However, the root (or shaft) of the screw is a wedge that does very little except hold the threads in place, and that wedge needs space to work properly.

The shaft can move material out of the way and possibly split the board. Or you can provide a clear path with a counterbored hole. I prefer to clear the shaft with a pilot hole to avoid a possible stress split in my boards.

Attach the back to the sides and bottom with glue and 1 1/2"-long screws. A properly cut back will square the cabinet, so take your time cutting this panel.

Cut and attach the rail using glue, right-angle brackets and 5/8"-long screws. Apply glue to the ends of the rail and clamp securely

when installing the brackets, which also are installed on the sides and back, and will be used to secure the cabinet's top.

Round over the two sides and front edges of the top using a 3/8"-radius roundover bit in your router. Then you can secure the top to the assembled cabinet – there should be 1" of overhang on both sides and 1 1/4" of overhang at the front edge. The top's back edge is aligned flush with the back face of the back.

Three Simple Drawers

The drawer boxes are 7" high, 15 1/2" wide and 18" deep. I made mine using the same 3/4"-thick MDF used on the cabinet carcass.

Cut the sides, fronts, backs and bottoms to size, then begin the assembly by attaching the sides to the back and front using glue and 1 1/2"-long screws. Use two screws per joint, making sure the screws are kept 1" away from the tops and bottoms of the boards to avoid splitting. The bottoms

also are attached to the sides, back and front using glue and 1 1/2"-long screws.

I used 18" full-extension drawer slides to mount my drawers. The bottom drawer is installed as close to the cabinet bottom as possible. Install the remaining two drawer boxes, leaving 2" of space between them.

Round over the edges of the drawer faces using a 3/8" roundover bit in a router. Align the bottom drawer face flush with the bot-

DRILL PRESS WORKSTATION							
	NO.	LET.	ITEM	DIMENSIONS (INCHES)			MATERIAL
				T	W	L	
Cabinet							
<input type="checkbox"/>	2	A	Sides	3/4	19	30	MDF
<input type="checkbox"/>	1	B	Bottom	3/4	18	19	MDF
<input type="checkbox"/>	1	C	Back	3/4	18	30 3/4	MDF
<input type="checkbox"/>	1	D	Rail	3/4	2	16 1/2	MDF
<input type="checkbox"/>	1	E	Top	3/4	20	21	MDF
<input type="checkbox"/>	6	F	Drawer sides	3/4	6 1/4	18	MDF
<input type="checkbox"/>	6	G	Drawer front & backs	3/4	6 1/4	14	MDF
<input type="checkbox"/>	3	H	Drawer bottoms	3/4	15 1/2	18	MDF
<input type="checkbox"/>	3	J	Drawer faces	3/4	9 5/8	17 1/2	MDF
Adjustable Drill Table							
<input type="checkbox"/>	1	K	Base	3/4	5 1/4	18	Hardwood
<input type="checkbox"/>	2	L	Fixed uprights	3/4	5 1/4	4	Hardwood
<input type="checkbox"/>	2	M	Adjustable uprights	3/4	5 1/4	6	Hardwood
<input type="checkbox"/>	1	N	Tabletop	3/4	16	24	Veneer ply
<input type="checkbox"/>	2	P	Fence boards	3/4	3	24	Veneer ply

SUPPLIES

Area home-supply store

3 • drawer handles

3 sets • full-extension drawer slides

6 • right-angle brackets

1 • 36"-long T-track

2 • flat oval nuts

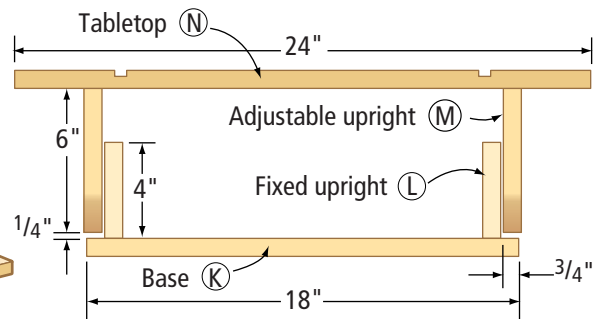
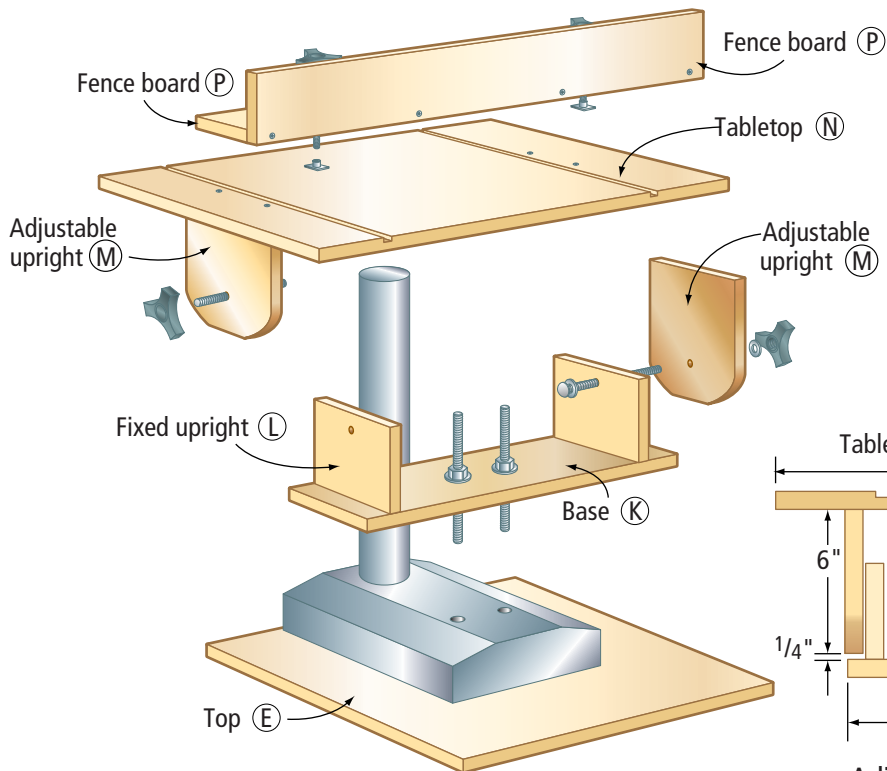
4 • knobs

2 • carriage bolts

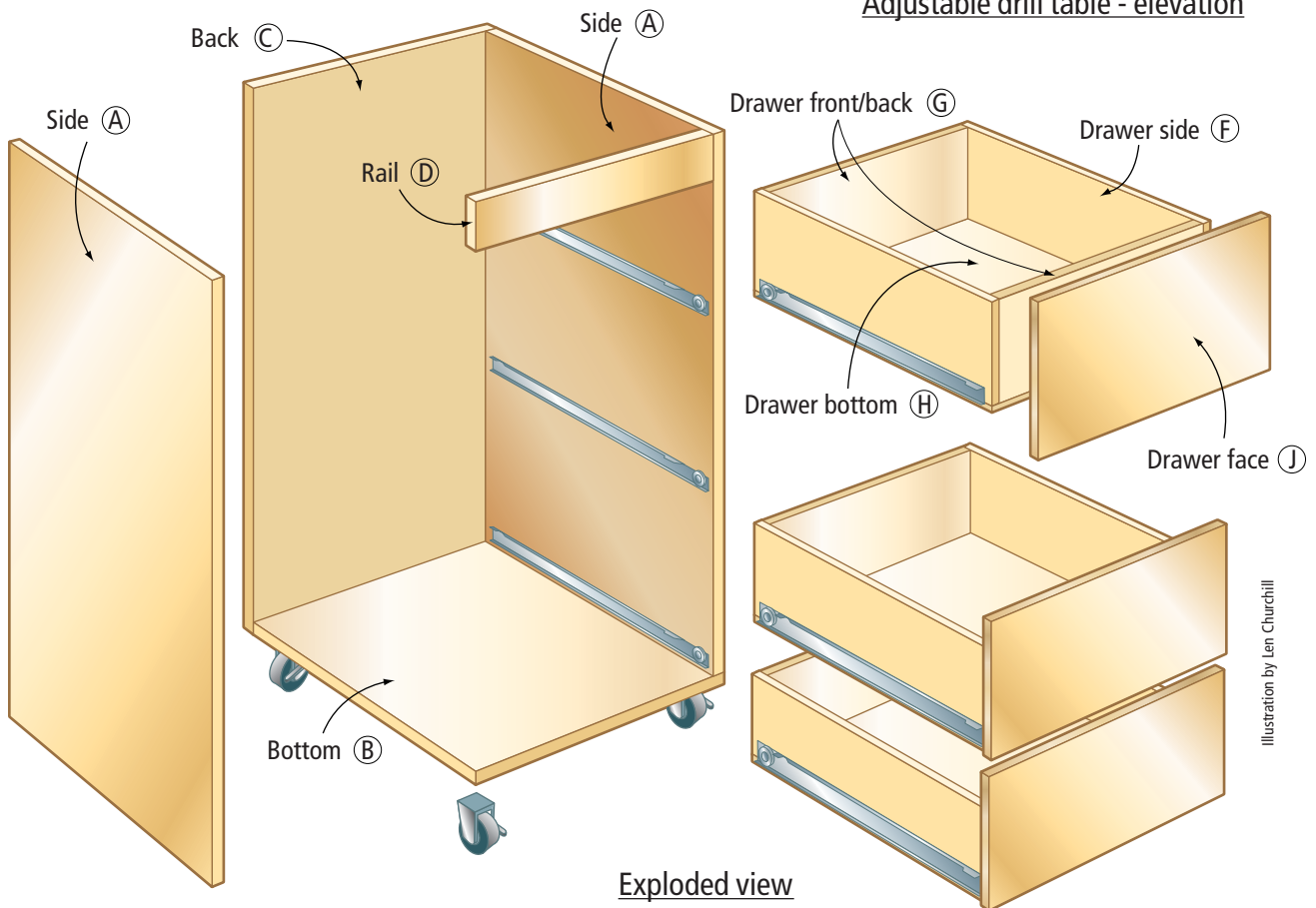
4 • fender washers

4 • casters

Bolts, washers and nuts to secure drill press to top and adjustable base

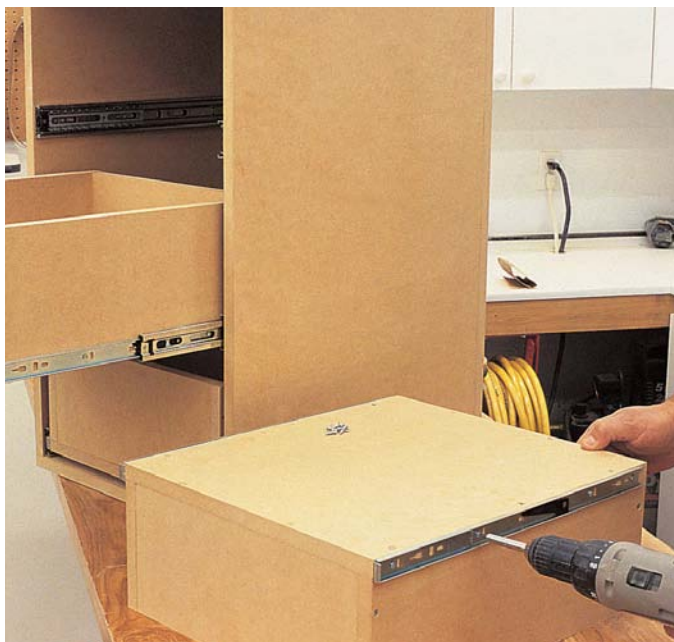


Adjustable drill table - elevation



Exploded view

Illustration by Len Churchill



Full-extension drawer slides allow complete access to the drawers.



I store and index my drill bits in the top drawer by drilling holes in a piece of $\frac{3}{4}$ "-thick MDF and sitting it in the drawer box. As my bit collection grows, I can always remove this platform and drill new holes.



Build the adjustable table's support with hardwood and screws.

tom edge of the cabinet's base-board. Leave $\frac{1}{8}$ " of space between the drawer faces. Secure the faces to the drawers using $1\frac{1}{4}$ " screws from inside the drawer. Attach handles or knobs of your choice.

I use the top drawer to store and index my drill bits. To do this, I cut a piece of $\frac{3}{4}$ "-thick MDF to size for the drill platform. Then I drilled the appropriate holes to store my bits and loosely sit the platform in the drawer box. I also can drill new holes as my bit inventory increases.

To make the workstation mobile, install four wheels on the base, setting the front pair back 2". Use medium- or heavy-duty wheels and make sure they are high enough to straddle the base if you own a floor-model drill press. If the floor is rough, use larger, heavier-duty wheels.

If you're using a benchtop drill press, mount it securely to the cabinet top with bolts or screws. If you own a floor-model press, obviously skip this step.

Adjustable Drill Table

I used hardwood for the drill table's base and the two fixed uprights. Cut them to size and secure both fixed uprights to the base with glue and 2" screws. Make sure you

attach the uprights $\frac{3}{4}$ " in from each end of the base.

Prepare the two hardwood adjustable uprights by first cutting them to size. Clip both lower corners on each board with a 45° cut that's $1\frac{1}{2}$ " from each end. Round over the corners with a belt sander, creating an arc on the bottom edge of each upright. When you've completed the rough shaping, clamp the two uprights together and finish sand them so both have the same profile.

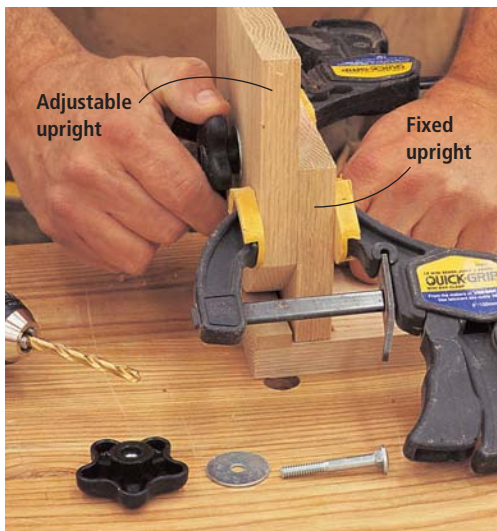
Place the adjustable uprights on the outside faces of each fixed upright, aligning the edges of all boards. Use a $\frac{1}{4}$ "-thick spacer under the adjustable uprights and drill a $\frac{1}{4}$ "-diameter hole 3" down from the top edges through both boards. Center the hole on the width of each board and insert a $\frac{1}{4}$ "-diameter carriage bolt, large washer (on the outside face) and knob to lock the uprights together.

Bolt the assembly to your drill press table (each model will have different bolt-hole patterns). Align the drill press's chuck so it is centered on the table's base board and tighten it securely.

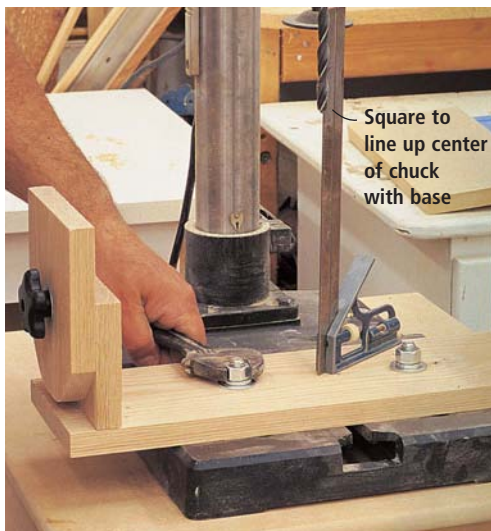
The tabletop is a piece of $\frac{3}{4}$ "-thick plywood. Cut two dados across the width of the board, 5" in from each edge. The T-track I



Adjustable uprights for your table also are made with hardwood and shaped to allow the table to pivot.



Secure the adjustable uprights to the fixed uprights with bolts and knobs for easy adjustments.



Bolt the fixed base to the drill press base, making sure the drill press chuck is centered on the fixed base.

use required $\frac{3}{8}$ "-deep dados, but because your hardware may be different, you should verify the track's thickness before cutting. Cut the track to length and secure it in the dados using $\frac{1}{2}$ "-long screws in the countersunk holes at the bottom of the tracks.

Align the plywood tabletop so it's equally spaced – side-to-side and back-to-front – on both upright edges. If the top has to be

replaced in the future, don't use glue to attach it. Rather, attach the tabletop to the adjustable uprights using only two 2"-long screws per upright.

The fence is made with $\frac{3}{4}$ "-thick plywood. The horizontal and vertical fence boards are 3" high and 24" long. Attach the vertical fence board to the horizontal fence board with glue and four 2"-long screws. This is a sim-

ple but strong fence that can be replaced easily if necessary.

Drill two $\frac{1}{4}$ "-diameter holes in the horizontal fence board over the center of each T-track slot. Use a $\frac{1}{4}$ x 20 bolt and knob assembly, with a 1"-long shaft, and screw it to flat oval nuts in the track to lock the fence.

Now you can organize your bits and accessories to your delight, and start drilling away. **PW**



Attach the plywood table, with the tracks already installed, to the adjustable uprights with screws. Secure the fence to the T-tracks using knobs with a threaded shaft and flat oval nuts (right).



NOTES ON CONSTRUCTION

If you build the drill press workstation as detailed here, you'll need about $1\frac{1}{4}$ sheets of MDF, a 2' x 2' piece of plywood and a 40"-long piece of 1 x 6 hardwood.

There are many configurations for the cabinet and the final dimensions will depend on the size of your drill press. However, the sizes shown in this project should be suitable for the majority of floor-model and benchtop drill presses.

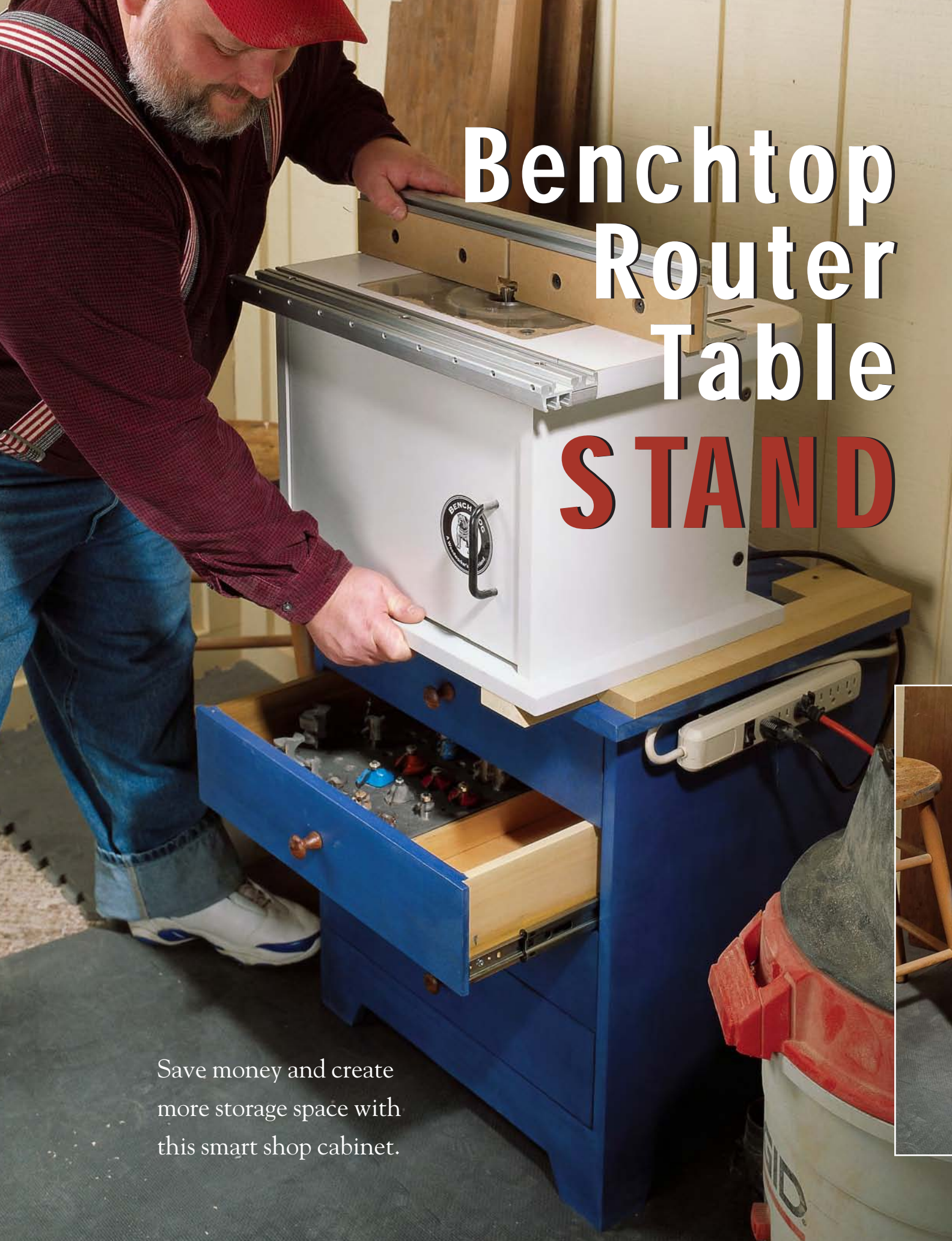
An additional knob and bolt can be added to double lock each set of uprights. If you do a lot of heavy work on the drill press, you might want some added insurance that the table will remain level, so add another $\frac{1}{4}$ x 20 bolt and knob to each side. Remove the extra lock when adjustments to the table are needed. However, the one knob per side setup securely locks the table; it would take quite a bit of weight to move it.

You might want to drill a large round hole in the table to insert a sanding drum. The drum can be installed in the drill's chuck and lowered through the hole. The large table and a drum will make a great power-sanding accessory on your press.

There are dozens of drill press accessories available, such as planers, plug cutters, hollow-chisel mortising attachments and so on. The cabinet can be made with one drawer over a door with adjustable shelves or, as shown, three drawers on full-extension slides. The slides are the most expensive part of the project. To reduce costs, you can use full-extension slides on the drill bit drawer and less-expensive slides on the remaining drawers. – DP

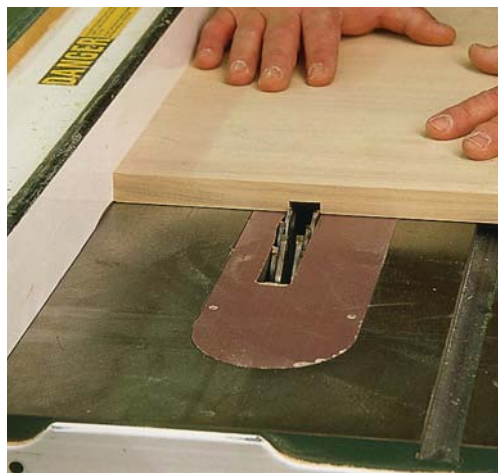
Benchtop Router Table **STAND**

Save money and create
more storage space with
this smart shop cabinet.



At first it might seem a bit odd to build a cabinet base that will convert a benchtop router table into a floor model. But it really makes great sense for a couple of reasons.

This setup takes up less space than a commercial floor-model router table, yet it has just as much storage for accessories than the big boys; in fact, it probably has more. On the whole, this setup costs less than buying a floor-model router table, and it lets you easily remove the benchtop unit if you need to take it with you on a job or to the garage.



A dado stack in my table saw makes quick work of the dado for the bottom in each side. The cut is made $4\frac{1}{4}$ " up from the bottom edge.



After resetting the dado height and adding a sacrificial fence to my rip fence, I was able to cut the rabbets for the back on each side.

As you'll see, I've come up with an ingenious way to slip the router table into place without clamping. I also added an inexpensive power strip to the side to make turning on the router (and a shop vacuum) a convenient, single-switch operation.

How it's Built

While this stand is built using solid poplar, you easily could build this project from $\frac{3}{4}$ " plywood.

The joinery is pretty simple, but I got a little fancy on the drawers. The case is held together with rabbets and dados. The bottom is held in place between the sides in $\frac{1}{4}$ " x $\frac{3}{4}$ " through dados. At the back edge of each side is a $\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet to hold the back.

For the drawers, I took advantage of a joint-cutting router bit I've been wanting to try for a while: the drawer-lock bit. This bit cuts an interlocking rabbet that adds extra strength against racking and separation to a drawer joint. Because there were going to be a lot of heavy router bits in the drawers, I figured the extra strength was a good idea.

Case Joinery

I used solid poplar for my stand, which means I started by jointing and planing the wood into straight and true $\frac{3}{4}$ "-thick boards. Then I edge-glued some together to make up the panels for the

sides, bottom and top. If you've opted for plywood, you've saved yourself a couple of steps, but you're still going to have to cut all the pieces to size according to the cutting list.

With everything cut to size, it's time to make some rabbets and dados. I prefer making these cuts on my table saw, but you can certainly opt for a router.

First, you should cut the through dado that holds the bottom in place between the side pieces. After installing a dado stack in my saw (and shimming it to a perfect $\frac{3}{4}$ " thickness) I set the height of the dado to $\frac{1}{4}$ " and set my rip fence to $4\frac{1}{4}$ " up from the bottom edge of the side. Mark the bottom and inside surface of each cabinet side so you don't get confused, then cut each dado with the side's bottom edge against the fence and the inside surface of the side down on the saw table.

With that joint complete, it's time to cut the rabbets on the sides that will hold the back. Increase the height of the dado blades to $\frac{1}{2}$ " and add a sacrificial



Photos by Al Parrish

by Troy Sexton

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

fence to your table saw's rip fence to allow only 1/4" of the stack to be exposed by the fence. Then cut the two inside back edges of each side to form the rabbets.

Glue and Nails

Except for the drawers, you've completed all the necessary carcass joinery. Sand the inside of the case and decide how you want to assemble it. I chose glue and a pneumatic nailer, but you could use screws, or hammer and nails.

Put one of the sides on your bench and glue the bottom piece into the dado. Add glue in the dado of the second side and then use one of the brace pieces between the two sides to temporarily prop the side piece up. Flush up all your joints and then nail the bottom in place.

Flip the assembled side and bottom over, and repeat the process for the second side. Then slide

BENCHTOP ROUTER TABLE STAND

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 1	Top	3/4	18 1/2	24	Poplar	
❑ 2	Sides	3/4	17 1/2	25 1/4	Poplar	1/4" x 1/4" rabbet at back
❑ 1	Bottom	3/4	17 1/4	21	Poplar	
❑ 3	Braces	3/4	4 1/4	20 1/2	Poplar	
❑ 1	Back	1/4	21 1/2	25 1/4	Plywood	
❑ 4	Drawer fronts	3/4	5	20 1/2	Poplar	Drawer-lock joints
❑ 4	Drawer backs	1/2	4 1/2	20 1/2	Poplar	Drawer-lock joints
❑ 8	Drawer sides	1/2	5	15 3/4	Poplar	Drawer-lock joints
❑ 4	Drawer bottoms	1/4	19	15 1/2	Plywood	
❑ 2	Fixed mounting strips	3/4	2 3/4	17	Poplar	
❑ 2	Short mounting strips	3/4	2 3/4	4	Poplar	
❑ 2	Removable router table mounting strips	3/4	2 3/4	13	Poplar	

the brace to the upper back corner of the case, and glue and nail it in place (vertically) between the sides. Keep this brace flush with the rabbets in the sides.

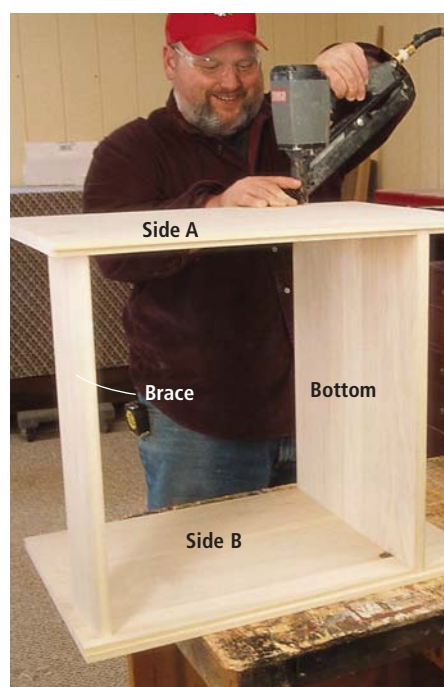
The next step is to shape and attach the two lower braces. One brace goes in the front and the other one goes in the back.

By notching the lower braces and both sides of the stand, I formed sturdy "legs" for my cabinet. This makes it more likely that your stand will sit flat on an uneven floor. Mark the cutouts using the illustrations at right, then use a jigsaw to cut away the waste. Nail the braces in place.

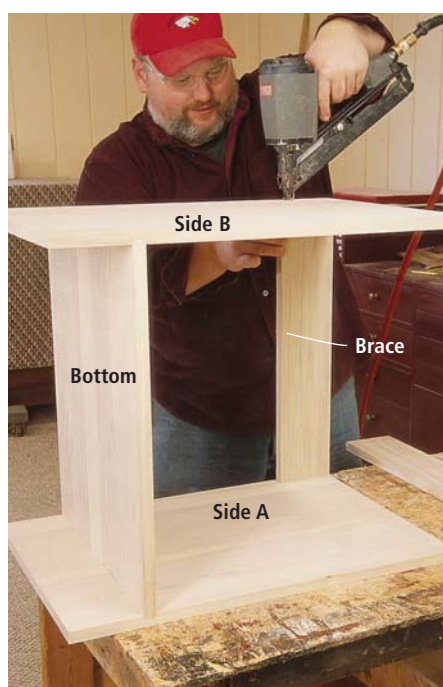
Topping it Off

The next part of the cabinet is the top. Evenly space the top's overhang on the cabinet and start nailing it in place at the back of the cabinet.

Before nailing the top at the front, be sure to measure the drawer opening at the front of the cab-



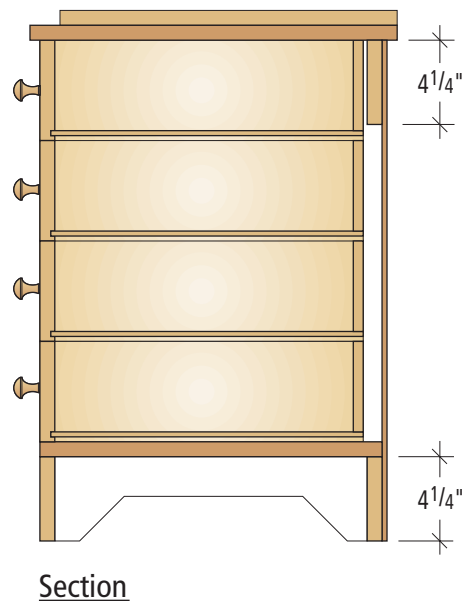
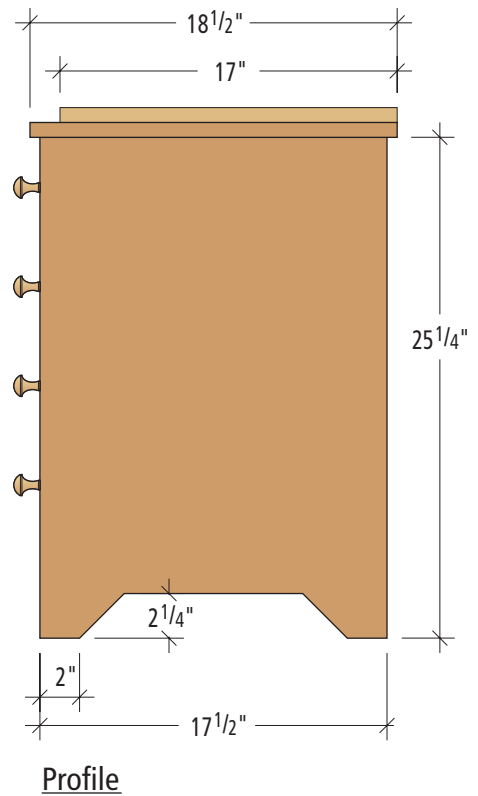
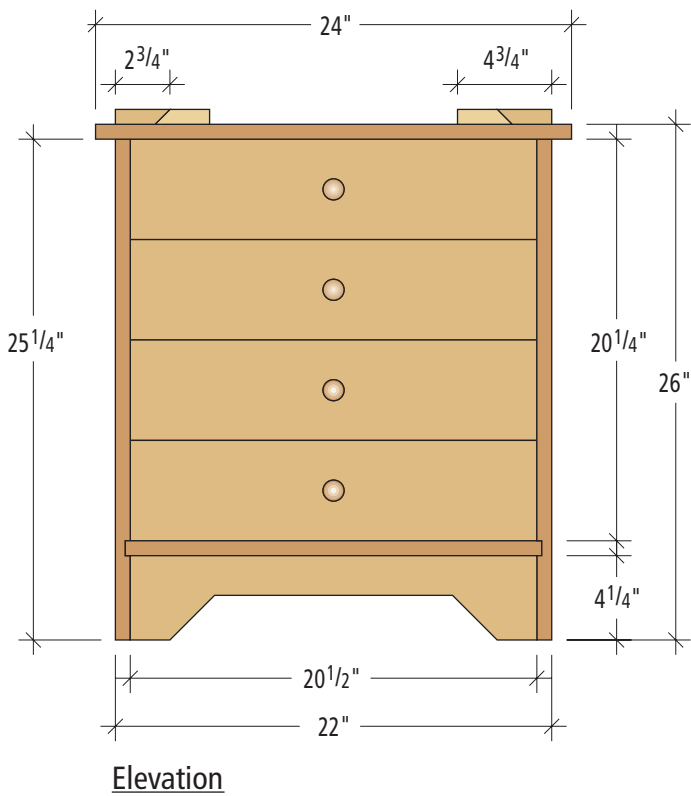
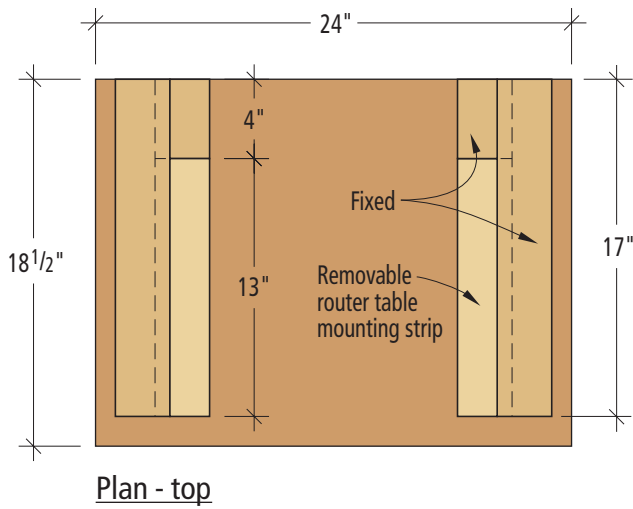
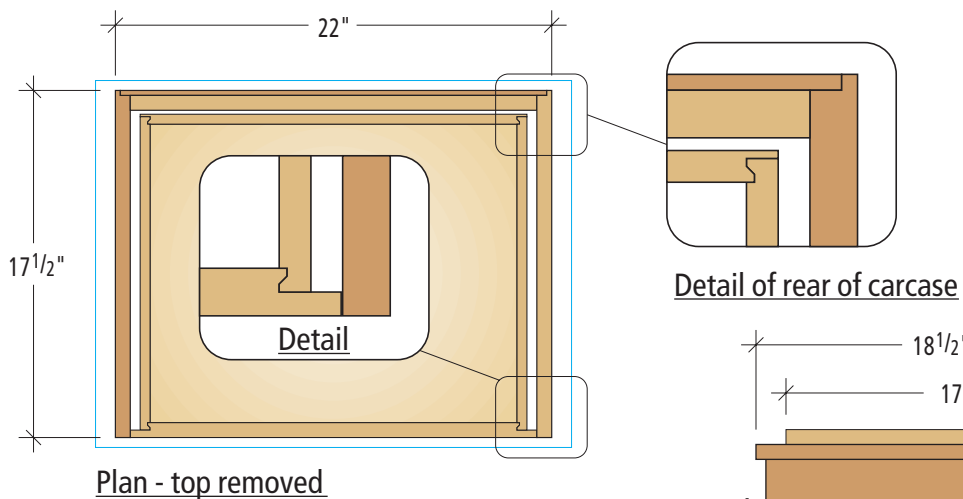
To assemble the bottom and sides, use one side to hold the bottom upright in the dado, put glue in the other side and install it. One of the braces makes a temporary support for the side piece as I nail it to the bottom.



After flipping the assembly and attaching the other side the same way, I take the brace I've been using as a support and shoot it in place at the upper back corner of the cabinet using my nailer.



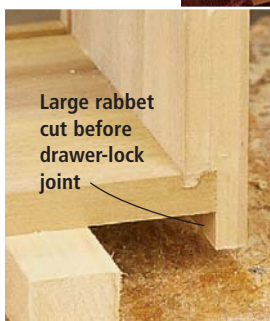
Nail the other two braces in place below the bottom. The braces help square up the cabinet as you attach them – assuming they're cut square.





The carcass is essentially complete. All that's missing is the back, which I leave off until after I paint it and install the drawers.

With the bottom grooves cut and the back trimmed for length, shoot the drawers together. The drawer-lock joint (inset) pulls the parts tighter, so there's less need to clamp during assembly.



Large rabbet cut before drawer-lock joint

inet to make sure it's the same at the top and at the bottom. Otherwise your drawers will be difficult to install because the case will not be square.

The last part to make is the back. Cut your back to fit in the rabbets, but don't nail it in place yet. It's a lot easier to put the drawer slides in with the back off.

A Bit of a Cavern

This cabinet has a remarkable amount of storage space; in fact, it gave me some room to grow my already extensive collection of router bits and accessories.

For shop furniture, I prefer drawers to shelves and doors because it's easier to organize small things in a drawer.

Making the drawers for this piece is pretty simple: I used a drawer-lock bit in my router table. To keep my setups to a minimum, I ran both the front and back at the same setting, then trimmed the back to length before assembling the drawer. For the drawer fronts and backs, I needed to inset the joinery $\frac{1}{2}$ " on each end to accommodate the mechanical drawer slides I was using. This meant taking off a pretty serious amount of wood on each end, so I quickly notched each end on the table saw first (the dado stack was still set up).

Then, by working with the inside surface of the drawer backs and fronts down against the router table, I was able to make the compatible joinery parts on different thicknesses of wood.

With the front and backs of the drawers complete, I ran the drawer sides vertically to form the mating pieces.

Drawer Assembly

The last step before assembling the drawers was to cut a $\frac{1}{4}$ " x $\frac{1}{4}$ " groove along the inside face of the front and side pieces to cap-

SUPPLIES

Woodworker's Supply

800-645-9292 or
woodworker.com

4 pair • 16" drawer slides
#860-835, \$13.79/pair

4 • Walnut Shaker knobs
#938-503, \$1.89

1 qt. • Federal Blue milk paint
#895-130, \$21.99

Prices as of publication deadline.

ture the plywood bottom piece. I did this with a $\frac{1}{4}$ "-diameter straight bit in my router table, but a couple of passes with a standard blade on the table saw also would work, if you prefer. I started the grooves $\frac{1}{4}$ " up from the bottom edge of each piece.

The drawer backs are narrower than the other drawer pieces, allowing the bottom to slide into the groove after assembly.

Dry-fit the drawers to make sure everything fits tight. While the drawers are together, mark the extra length on the drawer backs with a pencil. Then take the drawer apart and cut the backs to finished length.

The drawers now are ready to assemble. Add some glue to the corner joints. One of the other nice advantages of the drawer-lock joint is that the drawers can be clamped together with only a couple of clamps across the drawer width. The joint itself will hold everything tightly in place.

After assembly, slide the bottom in place to square up the drawer before nailing the bottom in place to the back.

Not Just Paint

While poplar is a good, sturdy and inexpensive wood for building this type of shop cabinet, it's not exactly attractive. I build a lot of Shaker-style furniture, so I've become fond of milk-paint

finishes. They brush on easily and look like a finish on the piece, rather than a coat of paint. My sister painted the outside surfaces (including the still-unattached back) and the drawer fronts.

I installed the drawer hardware by following the instructions supplied with the full-extension, 100-pound-capacity drawer slides I bought. When installing, the drawer fronts are held flush to the front edges of the cabinet.

Mounting a Table

Except for adding the Shaker knobs on the drawers, the cabinet essentially is complete. But to make it a router table stand, I still needed to add cleats to the top to secure the router table.

The cleats are a variation on a couple of very good ideas: the sliding dovetail and a French cleat. By mounting two strips of poplar cut lengthwise at a 45° bevel opposite one another on the top, you create the female part of a sliding dovetail. The mating strips then are mounted to the bottom of whatever portable router table already is in your shop.

To make a stop to keep the table from sliding front-to-back, I cut the second set of strips 4" shorter, then attached the 4" blocks to the rear of the cabinet, tight against the bevel of the longer, attached strips. Now the router table slides into place and stops where I want it.

OK, I have a confession to make. While I like the usefulness of being able to make my portable router table stationary and vice versa, it wasn't my only reason for making this stand. I'm guilty of owning more than one router table and leaving a set of routers ready-to-use for some joinery at all times. My router table stand allows me to switch out tables effortlessly. I know it's extravagant, but I like routers! **PW**



Once the cabinet is assembled, use the dimensions provided in the illustrations to mark and cut the "feet" on the front and back braces, and on the sides. A jigsaw makes quick work of these cuts.



If everything worked out right, you'll have 1/2" clearance on either side of the drawer for the drawer slides. With the back off, it's a lot easier to attach the slides to the cabinet sides. Then it's some final fitting, paint and adding a back.

THE DRAWER-LOCK BIT

If you're shopping for a clever router bit for making drawers, add the drawer-lock bit to your list.

I used it to make the drawers for the router table stand, and I'm going to be using it a lot more. The cut created by the bit is a variation on a tongue-and-dado joint that is used a lot in commercial drawer-making. But the bit is quicker and looks nicer, too.

The photo below left shows the router table setup with the bit ready to cut. You should note that the drawer front I'm about to cut has a notch cut in it already. Because I'm using drawer slides, I needed to allow 1/2" clearance on either side of the drawer. This means the drawer front extends beyond the drawer to hide the slide hardware. So the drawer-lock cut is deeper on the front



than it would be on a drawer without slides. Rather than try to hog off all that wood with the drawer lock bit in one pass (which would not be good for the router), I notched the drawer fronts and backs on my table saw first.

The photo below right shows the cut being made in the front. I run all the drawer fronts and backs with this setup. (Though the backs are thinner, I don't have to reset the bit height.) You also should note that I've added a build-up to the router table fence. This helps protect my hands during the cut, and it's also the setup needed for the next cuts on the drawer sides. By simply running the sides vertically against the fence, the mating half to the drawer lock joint is complete! It's a pretty slick system.

— TS



Writing letters longhand is one of life's simple pleasures, as is building this traditional lap desk.

Portable Writing Desk

The portable writing desk was an integral part of 18th and 19th century life, when writing was the only form of long-distance communication. As people spread across the globe in the 19th century, correspondence by mail became much more popular, and so did the writing desk.

The portable desks needed to be sturdy and lightweight, hold stationery and writing utensils, and have a place for people to write easily. The desk seen here will do all of the above, plus hold paper clips, rubber bands and more in the simple side drawer.

While you might not abandon your laptop computer for this more traditional item, it is an excellent place to write holiday cards, thank-you notes and personal correspondence. Though we all like the immediacy of e-mail, a hand-written letter always is a welcome surprise.

by David Thiel

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com.

Rabbets are the Key

Construction of this project is simple, but the joints are still sturdy. All the pieces are made from $\frac{3}{8}$ "-thick cherry, and the primary joinery is an interlocking $\frac{3}{16}$ " x $\frac{3}{16}$ " rabbit joint that can be cut on all the pieces at one time with

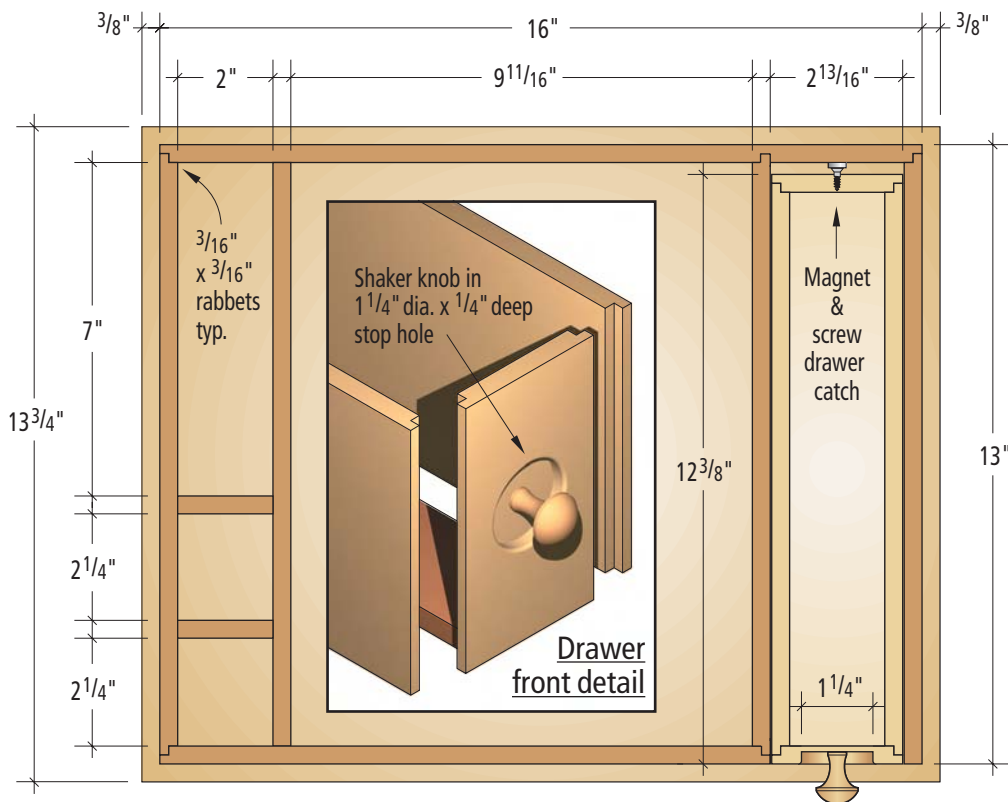
a standard table saw blade. A band saw (or jigsaw) handles most of the project's angles, and a hand plane finishes things up.

This is a good first project for the novice woodworker, or a pleasant weekend project for the accomplished craftsman.

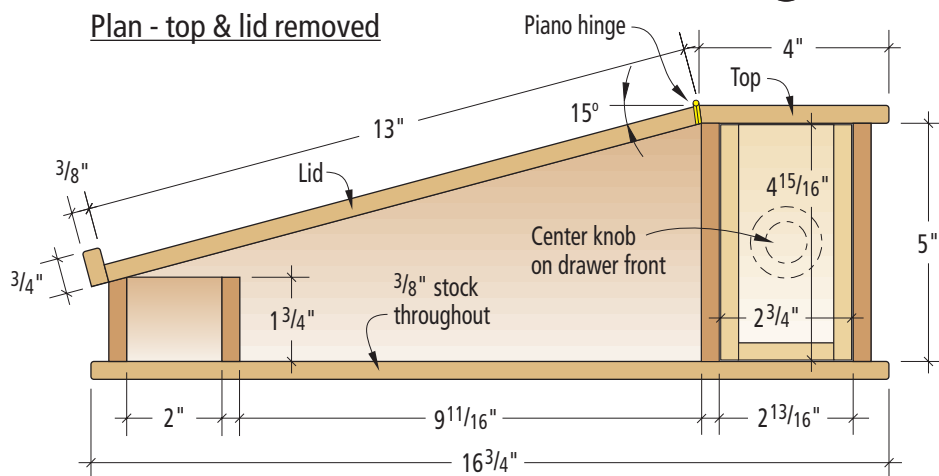


Photos by Al Parrish

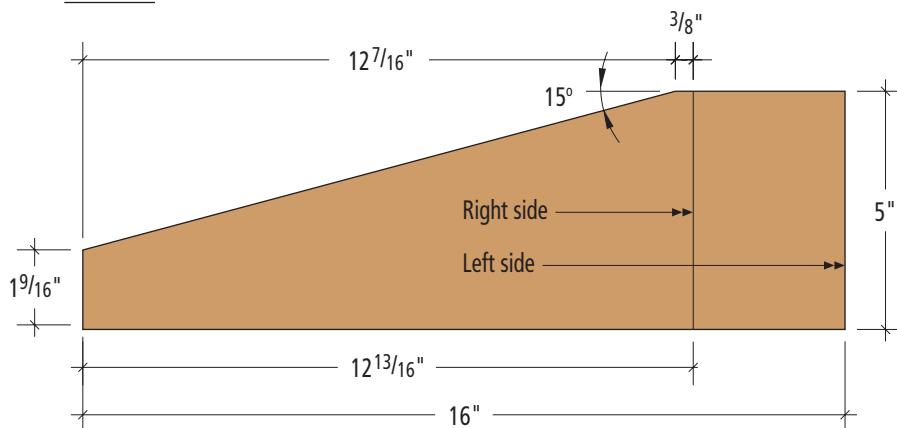




Plan - top & lid removed



Section



Sides

From Thick to Thin

If you own a band saw, the material for this project can be gleaned from a fairly small amount of wood. About 8 to 10 board feet will do. A nice piece of 6/4 (1½"-thick in the rough) cherry can be resawn easily to yield the necessary ¾" thickness and ensure a nice bookmatched lid.

"Resawing" is taking a thicker piece of wood and splitting it to make two thinner pieces. The band saw is the machine of choice for this process.

"Bookmatching" is when a resawn piece of wood is spread open like a book, exposing the two nearly matching inner surfaces. Choose your wood carefully, looking for consistent color throughout the piece. Cherry can have sappy areas that are lighter in color.

When you get the wood to your shop, flatten one face and square one edge on your jointer to give you a flat, square surface to run along your band saw's fence during resawing. You may want to cut the lumber to shorter lengths (a few inches longer than necessary for each piece) to make flattening easier.

It's likely that your rough lumber will allow you more than ¾" thickness after resawing. Half-inch stock or more is preferable

SUPPLIES

Rockler

800-279-4441 or rockler.com

1 • 7/8" cherry Shaker knob,
#78493, \$2.59/pair

1 • rare earth magnet,
#32907, \$3.99/pack of 10

Lee Valley

800-871-8158 or leevalley.com

1 • brass piano hinge,
#00D50.09, \$4.40

Prices as of publication deadline.



Mark each of the pieces as either inside or outside, as well as the ends that will need rabbet cuts, to avoid making mistakes once you're at the machine.

because no matter how careful you are, cutting a perfect $\frac{3}{8}$ "-thick piece of wood is unlikely.

There's one other thing to be aware of with thin wood. After resawing, you should allow the pieces to sit for a day or so to acclimate to the humidity levels in your shop before planing them to finished thickness. There's a chance the thinner boards will cup or twist, and you should let that happen before you run them down to $\frac{3}{8}$ " thick on the planer.

Once the wood is planed to the proper thickness, join the edges and glue up the panels for the bottom and the lid. Your bottom piece may require three pieces, so match the grain for the least visible joint. All the other pieces shouldn't require glue-up.

While the glue is drying, cut the two sides, front, back and drawer sides to size. Don't worry about the angled cuts on the sides at this point; we'll get to that later.

Decide which faces are the most attractive on all the parts mentioned above and mark the opposite faces as the inside. All but one of the ends of these parts (the right end of the back piece) will get rabbet cuts, so mark them to avoid confusion. The center partition also will receive rabbets on both ends, so make the appropriate marks on that piece.

Simple Rabbets

Next, head to your table saw with your marked pieces. All the rabbets for this project are the same size, $\frac{3}{16}$ " x $\frac{3}{16}$ ". You can use a router table to make these, or it's a fairly simple task on your table saw. I used a standard combination blade to make them. This works fine, but the angled teeth of the blade can leave a ridged surface on the rabbet cheek, causing a poor fit. But that's a pretty easy problem to avoid.

First set the blade height for $\frac{3}{16}$ ", measuring to the point of one of the angled teeth, not one

of the flat teeth. You want to measure to the maximum depth of the cut. Then set the rip fence $\frac{3}{16}$ " from the left edge of the blade. It will likely take two passes to cut the entire $\frac{3}{16}$ " rabbet.

Guide a test piece through the blade using your miter gauge. Make sure it's set up at an exact 90° angle to the blade. Push the piece snug against the rip fence (inside face down on the saw table) and make your first cut.

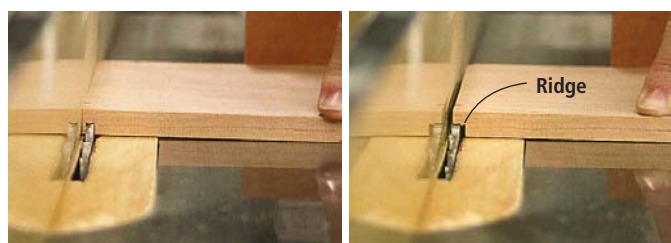
Before you bring the miter gauge back, slide the piece to the left and out of the way of the blade. Bring the miter gauge back and then push the piece to the right, toward the fence, stopping with

the piece slightly away from the fence and make another pass. This should remove the rest of the waste material from the rabbet, as seen in the two photos below.

If you look at the rabbet now, you'll see the ridges I mentioned. You could take a shoulder plane and smooth that surface, but it's just as easy to make a couple more passes over the blade, varying the location to nibble away the ridges.

Once you have it the way you like it, you can cut the rabbets on the marked ends of the desk pieces and the four drawer parts.

Before you change the saw's settings, there is one more cut to make. On the inside surface of



Cut rabbets in multiple passes on the saw. The first pass, with the piece pushed against the fence, defines the shoulder of the rabbet (left). The second pass, with the piece moved away from the fence, clears the rest of the waste. A combination blade will leave ridges in the rabbet; a few more passes over the blade will remove those.

PORTABLE WRITING DESK

NO.	ITEM	DIMENSIONS (INCHES)			COMMENTS
		T	W	L	
☐ 1	Top	$\frac{3}{8}$	4	$13\frac{3}{4}$	
☐ 1	Lid	$\frac{3}{8}$	13	$13\frac{3}{4}$	
☐ 1	Bottom	$\frac{3}{8}$	$16\frac{3}{4}$	$13\frac{3}{4}$	
☐ 1	Left side	$\frac{3}{8}$	5	16	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 1	Right side	$\frac{3}{8}$	5	$12\frac{13}{16}$	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 1	Back	$\frac{3}{8}$	5	$12\frac{13}{16}$	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet OE
☐ 1	Front	$\frac{3}{8}$	$1\frac{3}{4}$	$12\frac{5}{8}$	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 1	Back divider	$\frac{3}{8}$	5	$12\frac{5}{8}$	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 1	Front divider	$\frac{3}{8}$	$1\frac{3}{4}$	$12\frac{1}{4}$	
☐ 2	Interior dividers	$\frac{3}{8}$	$1\frac{3}{4}$	2	
☐ 1	Lid lip	$\frac{3}{8}$	$\frac{3}{4}$	$13\frac{3}{4}$	
☐ 2	Drawer sides	$\frac{3}{8}$	5	12	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 2	Drawer front and back	$\frac{3}{8}$	5	2	$\frac{3}{16}$ " x $\frac{3}{16}$ " rabbet BE
☐ 1	Drawer bottom	$\frac{3}{8}$	2	$11\frac{5}{8}$	
☐ 1	Drawer knob	$\frac{3}{4}$ dia. x $\frac{5}{8}$ length			

BE = both ends, OE = one end

the left side, you need to make a dado to fit the $\frac{3}{16}$ "-thick tongue on the center partition. Carefully mark the location of the dado using the right side piece and the illustrations on page 72. Then use the miter gauge and cut between your marks.

The Correct Angle

You're now ready to cut the angle on the two sides. Use the illustrations to locate the beginning and ending points of the angles, and connect the points to define the angle. Use your band saw or jigsaw and cut both pieces, but cut wide of the line to leave room to clean up the saw marks.



After carefully laying out the angle locations on both sides, use the band saw and cut about $\frac{1}{16}$ "-wide of the line to allow for accurate trimming.



To clean up the band saw cuts and ensure they're identical, clamp the two sides together and use a bench plane to clean them up simultaneously.

I've found the easiest way to make the angles perfectly (and equal on both pieces) is to clamp the two pieces together and use a plane to smooth the two edges. Take your time and keep the plane perpendicular to the pieces.

With the sides angled, clamp the front piece and the center partition between the sides without glue, as shown below. The top edge of the front will stick up above the sides. Make sure the bottom edges are flush, then mark the angle of the sides on the front piece on both sides.

Unclamp the box and connect the angled marks on both ends of the front piece on the

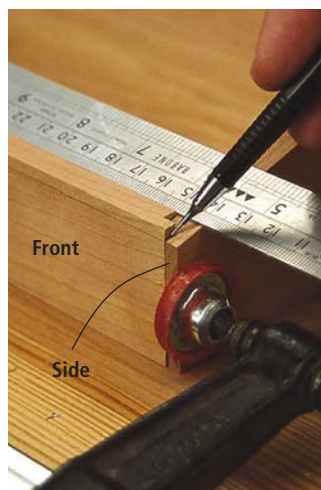
front and back faces. This is your next task with a plane. Shave away the material, checking the angle as you go, until you have matched the bevel to the sides.

Before you can put the box together, sand the pieces inside and out with #100-, #150- and #220-grit sandpaper.

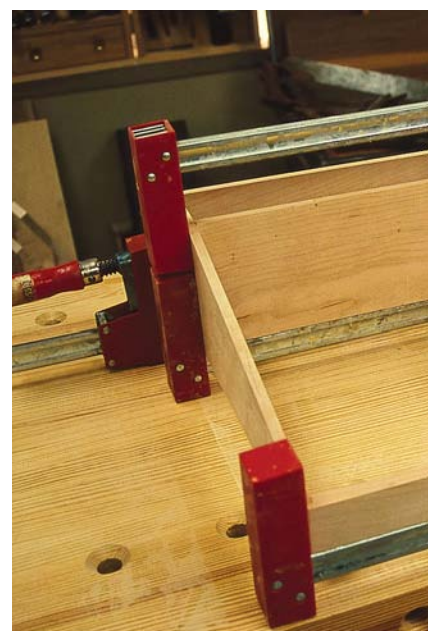
Ready to Glue

You're now ready to assemble the box. This can be a little tricky. The main box is simple enough, with the front, center divider and two sides making a simple frame. Test the joints to make sure they are tight, then go ahead and glue up those four pieces. Make sure the bottom edges of each piece are all flush. Also, check to make sure the frame is close to square after you apply clamp pressure.

While the glue in the other corners is drying or after the clamps are off, glue the back in place to the left side. Because this is attached at only one end, take care to clamp it squarely to the side.



With the front piece clamped between the sides (without glue) transfer the angle from the side to the front piece. Do the same on both ends, then use a straightedge or rule to connect the lines on the front and back. This defines the waste that needs to be removed. A block plane makes quick work of this angle.



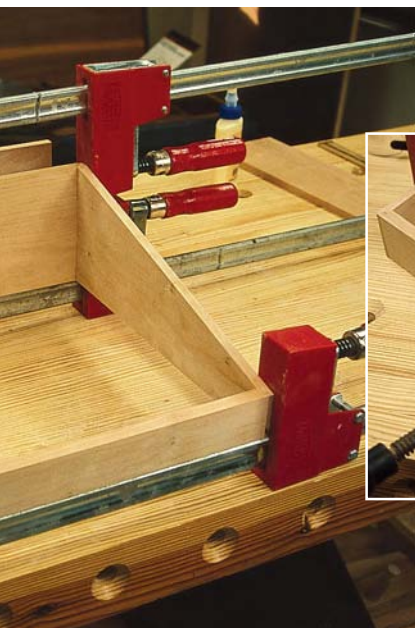
After the glue is dry, carefully turn the desk over and glue the top (not the lid) in place. Allow the top to overhang the sides and back by $\frac{3}{8}$ ". The front edge of the top will extend slightly past the divider. Make sure that distance is the same on both sides.

The inside dividers are next. The three pieces simply are glued in place with butt joints. Cut the pieces to fit, marking their locations, then glue them in place. The spacing shown in the illustrations leaves plenty of room for pens and smaller items.

The Lid and the Bottom

The lid is pretty simple, but there are two things to do before adding the hinge. The first is to add the lip to the front of the lid. Before gluing the lip on, use a small ($\frac{1}{8}$ "-radius) roundover bit in your router to shape the top edges of the lid sides, the back edge and sides of the top piece, and all four edges of the bottom. Then sand the lip and lid, and glue it in place, flushing the bottom edges of both.

Second, with the lip in place, the back edge of the lid needs to be beveled to match the square edge of the top. Lay the lid on the angled surfaces of the desk and carry the angle over to the lid. Make marks on both sides and



After a dry run, you're ready to add glue. Secure the front and divider between the sides, then glue the back to the left side (left). Next, glue the top in place on the back and divider, leaving $\frac{3}{8}$ " overhang at the back and two sides. After that's dry, glue the interior dividers in place.

use your block plane to cut the angle as you did with the front.

The bottom is held in place with screws and no glue. Because of the bottom's grain direction, the piece will expand and contract front-to-back with changes in humidity. If the bottom is glued in place, this could tear apart the desk, because the frame above won't move in the same direction.

To avoid this, drill elongated holes for the screws using your drill press. Three overlapping holes should be sufficient. Then countersink the holes and attach the bottom, predrilling the holes to avoid splitting the sides.

The lid is held in place with a simple brass continuous hinge. Predrill the holes in the top and lid to avoid splitting.

Adding the Drawer

With the desk complete, the last step is making and fitting the drawer. The four sides should have already been cut and rabbeted, so it's a simple assembly.

Before gluing, check the drawer fit by putting the sides between the front and back, and test the drawer in the desk. The drawer should slide with a little room to spare. If it's too wide you can reduce the width on the front and back until you have a good fit.

I added a simple Shaker knob to the drawer, but I didn't want it to stick out too far from the side of the box. So I cut a $1\frac{1}{4}$ "-diameter recess $\frac{1}{4}$ " deep in the drawer front. A Forstner bit in my drill press made this a simple task.

The knob actually came with a tenon, but because this drawer will hold lightweight objects I trimmed the tenon off and simply glued the knob in the recess.

You're now ready to glue the drawer together with the bottom captured between the four sides.

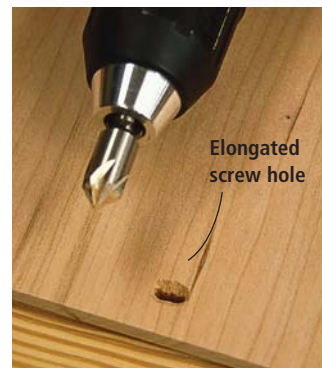
You may have noticed that the depth of the drawer is shorter than the space available. I wanted to make sure the drawer front ended flush with the desk sides when closed, and I also wanted the drawer to stay closed while the desk was being carried. A magnet and a screw solved both problems.

I installed a #6 steel flathead screw to the center of the drawer back, then attached a rare earth magnet (lots of strength in a very small package) to the screw.

I put a dab of cyanoacrylate glue on the magnet and pushed the drawer in place in the desk. After the glue has set, you can pull the drawer out (leaving the



Bevel the lid to match the angle formed by the sides and the front edge of the top. Lay the lid in place and transfer the angle to the lid from the top using a ruler. Then use your block plane to bevel the edge.



Because wood moves with changes in humidity, the bottom needs to expand from front to back without breaking the box. This is solved by screwing the bottom to the box through elongated screw holes.



Make the drawer using the same rabbet joints as the desk. The two sides fit between the front and back, while the bottom is glued in place between the four pieces.

magnet in place) and adjust the screw depth until the drawer is flush to the side.

A Simple Finish

Cherry is a great wood to work with because it can be left natural and its rich color will slowly intensify to a deeper red over time. If you're impatient, you can go ahead and add a stain to hurry the process, but I recommend letting time do its job.

In fact, sunlight hastens the process. If you set the completed box so it gets reasonably even sunlight for a couple of days, you'll see the color deepen pretty quickly.

A clear finish is still a good idea. I used a couple of coats of linseed oil, allowing each coat to dry fully, sanding lightly with #220-grit paper between coats. Wax would be another good option, or you simply could use a spray lacquer finish to protect the piece.

The last bit of work is to add a simple catch to hold the lid closed. I used a simple friction catch, but you may want to add a lock to keep things secure as well as in place.

You're now ready to take your correspondence on the road ... or maybe just as far as your back yard underneath a tree. **PW**

Folding Sawhorses

The entire weight of your project rests on these supports. Make sure they won't let you down.



Photo by Al Parrish

You might think this is an unusual product for a woodworking magazine to test, and so did some other members of our staff. But after some thought, the reality is that many woodworkers plunk down good money on folding sawhorses. Whether they're in shops or on job sites, these horses provide fold-away stable work areas. We wanted to make sure your money was well spent.

We shopped at Lowe's, Home Depot and online for the most readily available horses in both metal and molded plastic. We limited the price to \$60 a pair because, honestly, spending any more than that is silly.

Testing the horses was tricky. All are rated to hold 1,000 pounds or more, which is more than adequate for woodworking. Short of parking a truck on them to see if they collapsed, we decided the more important test was for their stability, not their ability to support weight.

To test for stability, we set up pairs of horses with a 6'-long piece of 1"-thick white oak clamped between. We then suspended a plumb bob from the center of the board and let the tip of the bob rest in a plate of fine sand to record any shaking or swaying. Next, we clamped a 2" x 2" piece of maple to the plank and got out our handsaw. The rationale was that handsawing – a very common force applied to horses – would be a good way to check stability. We're happy to report that all the horses we tested proved acceptably stable, moving the bob only 1" to 1½" at most.

The more telling evaluation comes from the horses' ease of use. Overall, we found that the metal horses fold to a smaller size. The plastic horses do store flat, but they're still an ungainly size. The Fulton TS101 horses close to a very tidy package that even offers a handle.

We found that the plastic horses were a bit more user-friendly to set up. A single motion spreads the legs and drops the shelf into place. While the shelf needs to be locked into retaining tabs for maximum stability, it can be used without being locked. Closing the plastic horses also is a snap, while the metal horses required some contortions similar to setting up a card table. And the Ebco and Fulton TS21 have some sharp edges that made them almost dangerous.

The Editor's Choice Award for the most stable horse goes to the Storehorse HD. You wouldn't expect a plastic horse to feel this rock-solid but it's a well-designed shop assistant. However, in the end, it came down to price. When you consider the price tag (\$20 vs. \$50) and the minor inconveniences between metal and plastic, the \$20 Ebco wins our Best Value Award. Just take a file or some sandpaper to the sharp edges and save some money.

by David Thiel

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com.

EBCO

Best Value

This is the real bargain of the lot. Costing about \$20 a pair (depending on where they're purchased), these folding steel horses are manufactured almost identically to the Fulton TS21 horses, but are about half the price. We found them at Lowe's, but they seem to be available online as well.

The steel is somewhat thin (.032" thick) and there are sharp edges on the legs and braces. But when the horse is locked open (dropping over pins to lock as shown), it's stable and strong. They collapse to a convenient storage size and the top is drilled to attach a 2x6 for a more friendly (and clampable) surface. These are the winners for best value, hands down.



SKIL

Designed very similar to the Storehorses listed below, the Skil horses are stable, but these are a bit different. The shelf on the Skil locks with 10 tabs, rather than the 16 on the Storehorse models. They have a less rigid shelf lock and the molded plastic is less rigid as well, allowing more flex in the individual parts. The top surface closely matches the top of the Storehorse HD, offering a nice stable surface. And Skil has added a pair of sawbuck accessories (shown) that accept either a 2x4 or 2x6 in a top-mounted position. Costing \$15 less than the Storehorse XL, it's a good option, but not as good a horse.



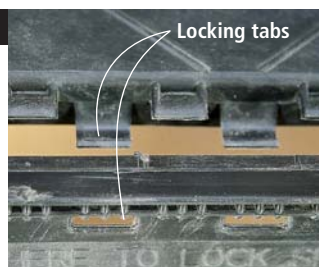
FULTON TS21

This set of horses would be in the winner's circle if not for the price. We're not sure how the pricing structure works, but these horses are nearly identical to the Ebcos we tested – right down to the interlocking cross braces (shown), the thickness of the steel and their tidy collapsed size. Unfortunately, they sell for almost \$40 at Amazon.com, and that's double the price for virtually the same product. With either the Ebcos or Fulton TS21 horses, we suggest taking a file or some sandpaper to the edges on the braces and legs to avoid a cut or abrasion.



STOREHORSE XL

This is the industry standard in portable, storable sawhorses. Made of molded plastic, the Storehorse XL folds flat for storage but provides a stable base by dropping (tabs slide in tracks in the legs) and locking the shelf in place. Differences from the Skil include a 16-tab locking mechanism (shown) for the shelf, providing very good strength. An open top piece designed to hold a 2x4 also is included. This makes the top a little flimsy and difficult to clamp to without the 2x4. It's a good stable design and easy to use. Surpassed in the plastic category only by its sister horse, this is a workhorse, but not a thoroughbred.



FULTON TS101

These metal horses were a little harder to judge. Their collapsed storage size is excellent and there's a handle for carrying. When open and weighted they were very stable with heavier 14-gauge steel (.085" thick) than on either the Fulton TS21 or Ebcos horses. The legs lock in the left-to-right position behind steel tabs (shown), but there is no bracing front-to-back except for the load and gravity. They offer a good clamping surface and the tops are drilled to accept a two-by. These are the shortest, heaviest, highest-priced and highest-capacity horses in the test. If stored size and capacity are your concern, then these horses belong in your stable.



STOREHORSE HD

Similar in many ways to the Storehorse XL, (the locking shelves are interchangeable) the HD offers more frame rigidity (thanks to thicker molded plastic and a less-perforated design) and a higher weight capacity. We were very impressed with the stability of this horse when locked in the open position. The top surface gives you the option of either dropping in a two-by for attaching tools or cutting wood (as on the XL) or you can use the drop-in V-notched cap (shown) for a fast, stable support. This is a very nice folding sawhorse, and even with the \$50 price tag for a pair, it's a strong finisher and the blue-ribbon winner in our race. **PW**



Editor's Choice

FOLDING SAWHORSES

Brand/model	Price per pair*	Weight (lbs.)	Wt. capacity (lbs.)	Stored size				Open size				Material	Website		
				D"	x	W"	x	H"	D"	x	W"			x	H"
Ebco SS-29	\$20	14	1,000	7¼	x	31	x	6¼	24	x	34¼	x	28½	.032" steel	ebcoproducts.com
Fulton TS21	\$37	14	1,000	7¼	x	31	x	6¼	24	x	34¼	x	28½	.032" steel	www.fultoncorp.com
Fulton TS101	\$60	22	2,000	4	x	36½	x	2¼	17½	x	36½	x	25	.085" steel	www.fultoncorp.com
Skil	\$30	10	1,000	2	x	27	x	31	18	x	27	x	29¾	Plastic	skil.com
Storehorse XL	\$45	14	1,000	2	x	30	x	31¼	17½	x	30	x	30¼	Plastic	lehighgroup.com
Storehorse HD	\$50	18	1,500	2	x	30	x	32¼	18	x	30	x	31	Plastic	lehighgroup.com

* Prices as of publication deadline.

Outdoor Lantern

Add some mood lighting to your next outdoor affair with this great Arts & Crafts luminary.

Call me dull, but I've never been a Tiki torch kind of guy. And the last time we lit an outdoor party we used oil lamps – which, because of the flammable nature of oil, almost ended in disaster. So my task before our next party was to build a lantern that's low-key and electric (to ensure that only ribs were barbecued and not the neighbor's dog).

This lamp can be used in a variety of ways. It looks great on a patio table, or you could glue 6"-long dowels into the feet and stake it in your garden. Either way, it's going to stand up to the elements.

The lantern's body is made from quartersawn white-oak scraps. The "rice paper" behind the slats is actually acrylic (\$4 for an 18"

x 24" sheet) that I sanded on both sides with a random-orbit sander and installed in the lantern using waterproof silicone.

The light fixture itself (\$3 from my nearby home center) is vinyl clad and is intended for outdoor use. It's also installed in the base of the lamp using silicone.

Construction

There's no complicated joinery in this project, but it does require more precision and care than most outdoor furniture. Essentially, the four panels are glued at the edges to the four posts. This is a long-grain-to-long-grain joint, so no real joinery is required. However, to keep all the parts aligned during glue-up, I used a single No. 10

by Christopher Schwarz

Comments or questions? Contact Christopher at 513-531-2690 ext. 1407
or chris.schwarz@fwpubs.com.

Photo by Al Parrish



biscuit in each joint. This saved me some real headaches when clamping. (For more information on biscuit joinery, check out Bill Hylton's "Power-tool Joinery" column on page 90.)

The lamp base, which holds the light fixture, rests on two cleats nailed to the inside of the panels. The removable top is held in position by four cleats nailed to the underside of the top.

Begin construction by cutting out all your parts. Cutting the five $\frac{3}{8}$ "-wide slots in the panels – the first task – is the trickiest part of the whole project. Once you do that, you can breathe easier.

There are several ways to cut these slots. A plunge router with an edge guide is an obvious way to go about it. I chose to use a dado stack in my table saw. Place a dado stack measuring $\frac{3}{8}$ " wide into your table saw and get out your miter gauge or table saw sled, which will hold the work during the cut. You'll make a plunge cut into the panel for each slot.

First pencil a line on both long edges of the panel that shows where the slot should start and end. Position your panel slightly back of the blade's center, then raise the blade until it emerges from the panel and has nibbled to the far line. Move the piece forward until the dado stack nibbles to the near line. Lower the dado stack back under the saw's table, move the workpiece over $\frac{3}{4}$ " and repeat the same process.

If you're feeling like these slots are more work than they're worth, consider other patterns. You can drill a series of holes with a drill press, or you can use a scroll saw to create a design that suits your brand of outdoor parties.

After all of your panels are cut, sand them to their finished grit or take a hand plane to them before turning your attention to milling the four posts.

Five-sided Posts

As I mentioned earlier, I used a biscuit in each joint to line everything up during assembly. Now it's time to cut those biscuit slots. Mark the location of each slot and cut a recess for a No. 10 biscuit in each post and in each long edge of the panels.

You could leave the posts square and your lantern will look fine. I tapered one corner to give the lantern a lighter look. The taper clips $\frac{3}{8}$ " off the top outside corner of each post and then tapers to nothing at the base.

Some woodworkers might build a jig to make this cut. The simplest way is to mark the taper in pencil on the post, then plane

down to that line using a block plane or bench plane. Each post should take less than five minutes to complete.

Sand your posts to their final grit and you're ready for assembly.

Assembly

Don't try to glue up all four posts at once. You'll want to be able to adjust the panels and posts as you clamp everything, and eight parts sliding around is enough to make any woodworker panic.

When deciding which posts should go where, take a look at the figure. Each post should have one face that is flat-sawn grain and one that is quartersawn grain.

Position the posts so the flat-sawn grain faces are together and the quartersawn grain faces are together. This is one of those things that might bug you about a project years later.

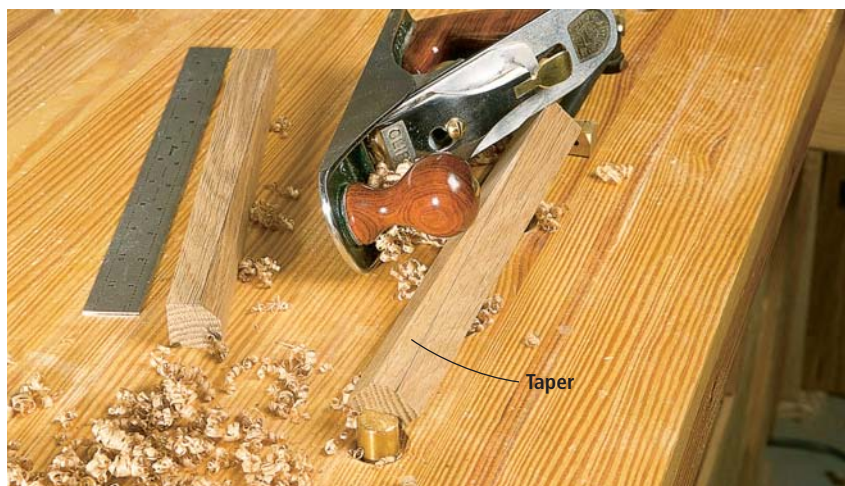
Begin by gluing up two assemblies that have two posts and one panel. While the glue is drying, nail the cleats for the lamp base to the other two panels in the location shown in the illustration at right. Then glue the two assemblies to the two remaining panels.

Final Details

Next, turn your attention to the top. Begin by cutting the $\frac{3}{8}$ " x $\frac{3}{8}$ " chamfer on the underside of all four edges. To let the heat from



Make sure you hold or clamp the stock firmly against your miter gauge's fence as you raise the dado stack. If you let the workpiece shift, it's very likely that it will self-destruct in your hands.



Clamp the post with one corner facing up. Check the grain direction and start planing. Begin with short strokes at the top of the post and, as your taper lengthens, make your strokes longer.

OUTDOOR LANTERN

	NO.	LET.	ITEM	DIMENSIONS (INCHES)		
				T	W	L
<input type="checkbox"/>	4	A	Posts	1	1	11
<input type="checkbox"/>	4	B	Panels	3/4	6	11
<input type="checkbox"/>	1	C	Top	3/4	9	9
<input type="checkbox"/>	4	D	Feet	3/8	1 1/2	1 1/2
<input type="checkbox"/>	4	E	Top caps	3/8	1 1/4	1 1/4
<input type="checkbox"/>	4	F	Spacers	1/4	1	1
<input type="checkbox"/>	4	G	Cleats to hold top	1/4	1/4	5
<input type="checkbox"/>	2	H	Cleats to hold lamp base	1/2	1/2	5
<input type="checkbox"/>	1	J	Lamp base	3/4	5 7/8	5 7/8

the light bulb escape, drill four 3/8"-diameter holes in the top, following the diagram.

Glue and nail the spacers to the top. Then add the top caps on top of the spacers. Screw and glue the feet centered on the posts.

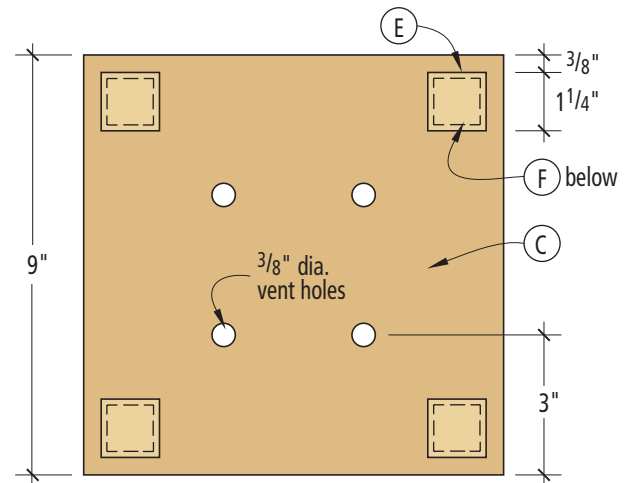
The light fixture I purchased for this lantern was designed to sit in a 1 1/2"-diameter hole. Drill the hole for your fixture in the center of the lamp base and attach the fixture to the base using silicone. Then attach the lamp base to the cleats using (again) a little dab of silicone.

The "rice paper" is my favorite part of the project. It's made from inexpensive 3/32"-thick acrylic I bought at my local hardware store in the glass section. Cut the acrylic to size using your table saw and

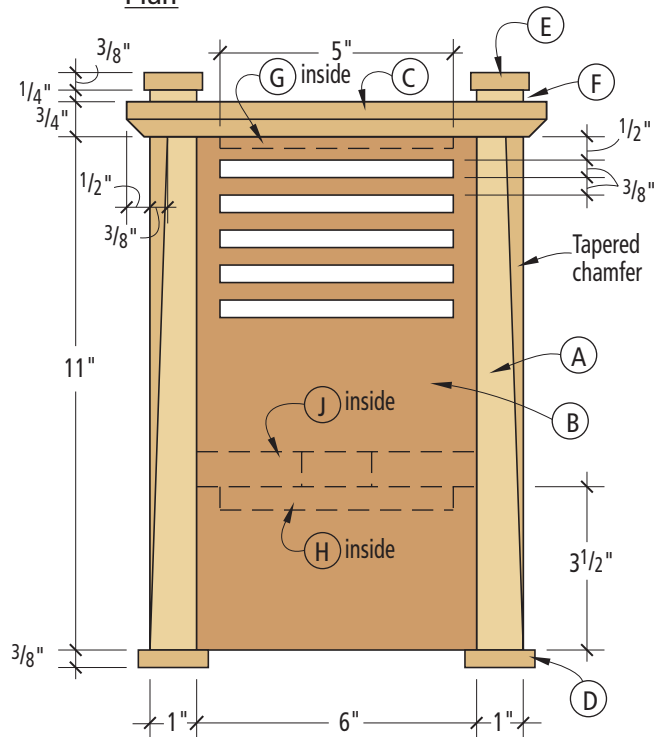
sand both faces with a random-orbit sander to get a frosted effect. Attach acrylic to the inside face of each panel using silicone. A spring clamp will hold it in place while the silicone cures.

Four cleats hold the top in position on the base. Turn the entire lamp upside down on your bench with the base centered on the underside of the top. Mark the location of the base. Measure in from those lines the combined thickness of the panels and the acrylic. Then nail four cleats at those locations.

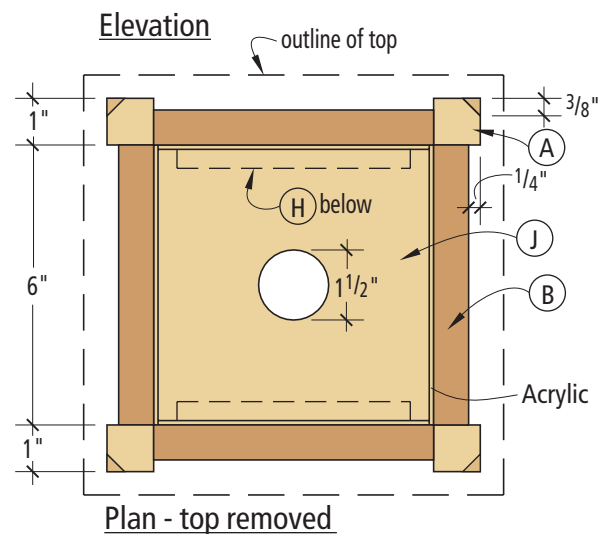
As for the finish, I left mine natural for now. I might someday put a few coats of an outdoor finish on it, such as tung oil. But first I want to see if it survives our next outdoor party. **PW**



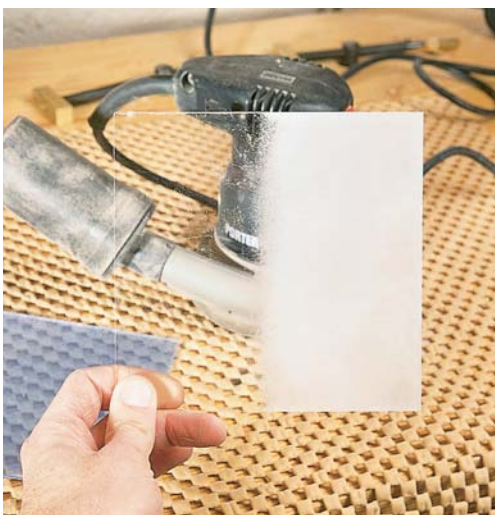
Plan



Elevation



Plan - top removed



Load your sander with #100-grit sandpaper and sand both sides of the acrylic. It takes only a couple of minutes to turn the clear plastic into frosted plastic.

Dado Storage Box



Photo by Al Parrish

This handy box protects your dado set and even helps you set up your saw for accurate cuts.

When I purchased my dado stack set, it came in a flimsy, clear plastic package that did nothing to protect the components from damage. So I decided to build a sturdy box to keep

the blades, chippers and shims organized and safe from harm. It's a better solution than the traditional nail-in-the-wall approach, and it gives you the perfect opportunity to put your dado set to work.

by Rick Campbell

Rick has been making sawdust for more than 25 years and has published more than 50 woodworking articles. When not bothering the neighbors with noise from his shop, Rick is a financial analysis manager at the University of Western Ontario in London, Ontario.

My design features slots to hold the chippers and an area to stack the two circular blades. The blades are separated by wooden spacers covered in laminate to prevent contact that can damage the teeth.

The lid slides into place to protect the contents of the box and provides a very convenient place to record sample dados. Each time I use a new arrangement of chippers and shims, I make a sample cut on the lid and record the combination of blades I used to make the groove.

I've prenumbered my collection of chippers and shims with a permanent marker to make this information easy to record. Now, when a project calls for a dado, I find a sample that fits, then set up the blade according to the predetermined recipe. This is a real timesaver because it avoids the usual trial-and-error setup process associated with dados and grooves.

I built my box to fit a standard 8" dado blade with five chippers. If your set is different, adjust the plans accordingly.

I used Baltic birch plywood covered with plastic laminate for most of this project. The laminate looks great and provides good protection against the rigors of life in the shop.

Baltic birch is a little more expensive and harder to find than standard plywood, but there are no voids between the layers, which makes it an excellent choice. I trimmed the top and bottom edges of the box with solid oak to resist wear and to provide an attractive contrast to the laminate.

Build the Box

Begin by cutting out plywood panels for the sides, lid and bottom to the dimensions shown in the cutting list. Then cut $\frac{3}{8}$ "-deep x $\frac{1}{4}$ "-wide rabbets on the ends of the long sides to make the connection at the corners, as

shown below. Rabbets are stronger than butt joints because they increase the bonding surface for glue and the joint's shoulder provides structural support.

With this done, apply glue to the joints and assemble the sides after making sure everything works by doing a dry-fit. Verify the box is square before you apply the glue.

Next it's time to adhere plastic laminate to the outside of the box and the top surface of the lid. Usually when I work with laminate, I glue oversized pieces to

the wood substrate, then trim the edges flush with a router and a bearing-guided straight bit.

However, the pieces for this project are relatively small, so I cut the pieces to the exact size required, saving me the job of trimming the edges flush. If you're new to laminate, cut your pieces oversize and trim them flush.

Head to the table saw and cut the laminate to size. Once that is done, you can adhere the laminate to the plywood using contact cement.

A Little Trim

Rip enough solid-oak strips to complete the trim on the top and bottom of the box. I milled a $\frac{1}{4}$ "-wide x $\frac{1}{2}$ "-deep rabbet along the edge of the lower trim strips to receive the plywood bottom. I also cut a $\frac{1}{4}$ "-wide x $\frac{1}{4}$ "-deep rabbet on the top strips for the lid.

I cut the rabbets using the dado stack and a sacrificial board clamped to the fence. The board allows the blade to come in contact with the temporary fence without damaging the teeth. Use



I cut the rabbets with my dado stack and a block of wood clamped to the fence to serve as a positive stop to gauge the rabbet width. It's safer than against the fence.



A band clamp helps hold things tight as the glue cures. Just make sure everything is square before you leave it to dry.

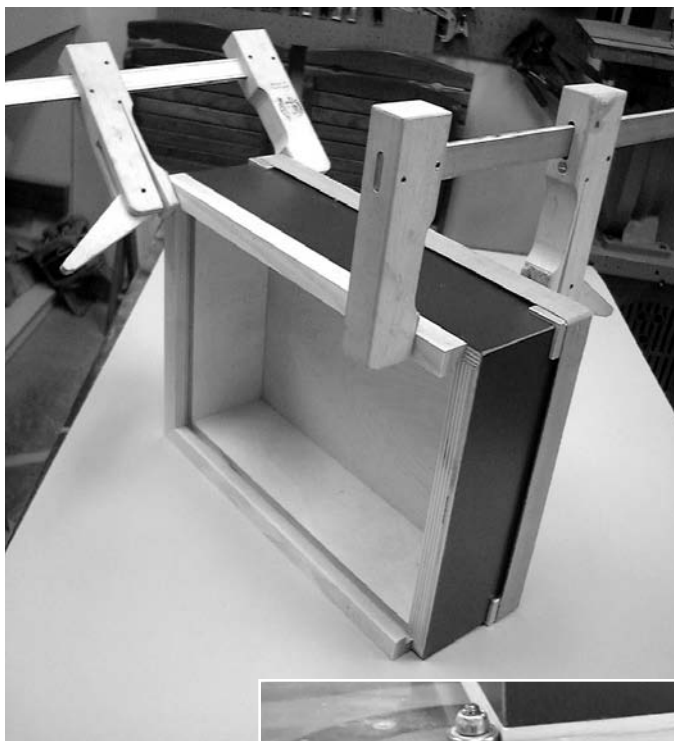


To cut the laminate, I used my table saw with a long board clamped to the fence. This board prevents the thin material from slipping underneath.



Use contact cement to adhere the laminate to the plywood. I prefer the water-soluble variety because it's easy to brush on, and it cleans up with soap and water.

Photos by the author



Why not nail the trim on? Because the nails will interfere when you round over the edges with your router, which you can do with a $\frac{3}{4}$ "-radius bearing-guided router bit (right).



a featherboard to safely keep the thin material pressed firmly against the fence while you work.

Mark the strips, then cut them to length with 45° miters on the ends. The long strips on top that guide the lid are left square on the open end and are $\frac{1}{2}$ " shorter than the total length of the box. With the bottom panel in place, attach the edging with glue and clamps. Once the glue has cured, round over the outside edges with a $\frac{3}{4}$ "-radius bearing-guided router bit, shown in the photos at left.

Dual-purpose Lid

Next, it's time to cut the $\frac{1}{4}$ "-wide x $\frac{1}{2}$ "-deep rabbets on three sides of the lid to form tongues that will fit the slots on top of the box. Adjust the fit until the lid slides freely in the grooves. A little candle wax rubbed on the tongues will help prevent binding. At this point, one end of the lid is still flat to receive the oak handle.

To make the handle, cut a blank from solid material, then bend a straightedge to lay out the curved profile, as shown above right. Cut the arc using your band saw, then sand the edge smooth. Use biscuits when gluing the handle to the lid. After the glue dries, round over the top edge with the same $\frac{3}{4}$ "-radius bit used earlier.

Organize Those Shims

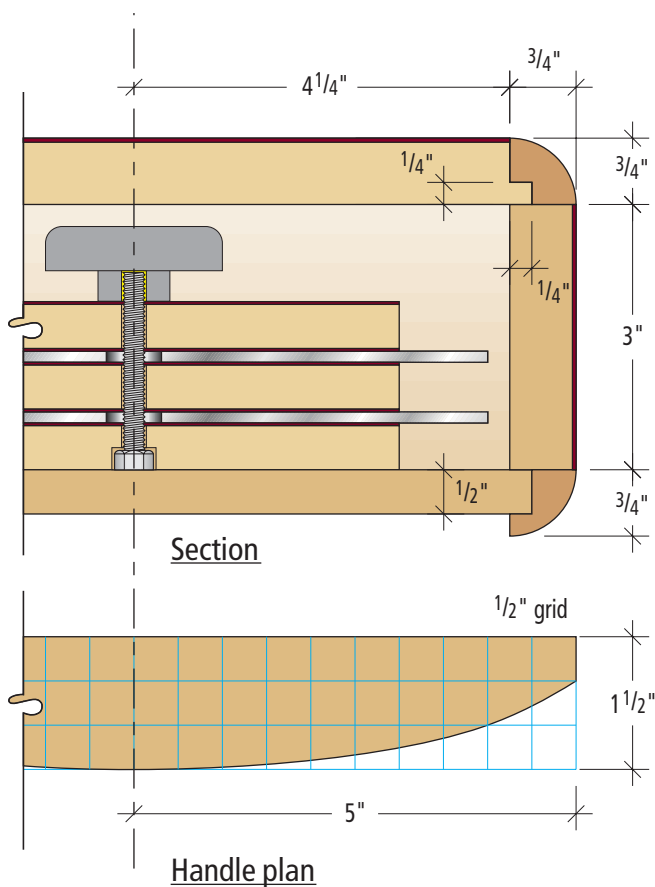
Once the box is built, you can turn your attention to the fixtures inside that will secure the blade components.

Start with the holder for the chippers and shims by laminating two layers of $\frac{3}{4}$ " plywood together to form a $1\frac{1}{2}$ "-thick block. Apply a piece of plastic laminate to the top face using contact cement as before, then cut a series of evenly spaced 1"-deep slots, as shown at right.

You also need to create an opening on one edge to form a pocket for the blade shims. I did this by nibbling the material away with repeated passes over the saw blade. Then glue the block in place on the box's bottom panel.

The illustrations at left show how the circular blades are stacked on a post with spacers in between to provide the separation necessary to protect the teeth. A $\frac{1}{4}$ " x $2\frac{1}{4}$ " bolt serves as the post, and a knob is threaded onto the end of it to secure the tooling. The bolt's head is recessed into the spacer that is attached permanently to the bottom of the box.

Begin by cutting 4" square blanks for the spacers from $\frac{1}{2}$ " plywood. Apply plastic laminate to both sides of the two removable spacer blanks and to the top



DADO STORAGE BOX

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
2	Long sides	$\frac{3}{4}$	3	13	Baltic birch
2	Short sides	$\frac{3}{4}$	3	$9\frac{1}{4}$	Baltic birch
1	Bottom	$\frac{1}{2}$	9	12	Baltic birch
1	Lid	$\frac{3}{4}$	9	12	Baltic birch
1	Chipper block blank	$1\frac{1}{2}$ *	$3\frac{3}{4}$	$8\frac{1}{2}$	Baltic birch
3	Blade spacer blanks	$\frac{1}{2}$	4	4	Baltic birch
1	Trim	$\frac{3}{4}$	$\frac{3}{4}$	90	Oak
1	Handle	$\frac{3}{4}$	$1\frac{1}{2}$	10	Oak

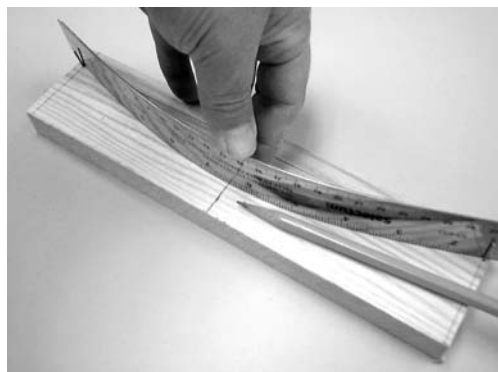
*Two $\frac{3}{4}$ " pieces

face of the spacer that will be affixed to the bottom panel.

Using a compass, lay out a 4"-diameter circle on each blank, then cut the spacers with a band saw or scrollsaw. Sand to remove the saw marks from the edges before drilling holes to receive the bolts. You can start by using a 1/2"-diameter Forstner bit to create the 1/4"-deep recess in the bottom spacer for the bolt head, then switch to a 1/4"-diameter bit to make the holes for the shaft.

Install the bolt in the bottom spacer and fill the recess with two-part epoxy to prevent the shaft from turning when pressure is applied. Use carpenter's glue and a clamp to secure the spacer to the bottom panel.

When the glue dries, your storage box is ready for use. Line up the chippers in the slots, store the shims in the side pocket and stack the blades with the spacers in position. Now, each time you use your dado stack set you will be comforted by the fact that your investment is well protected. **PW**



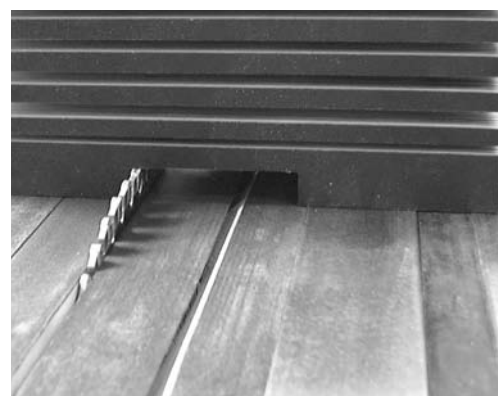
Use a flexed straightedge to lay out the curved profile for the lid's handle.



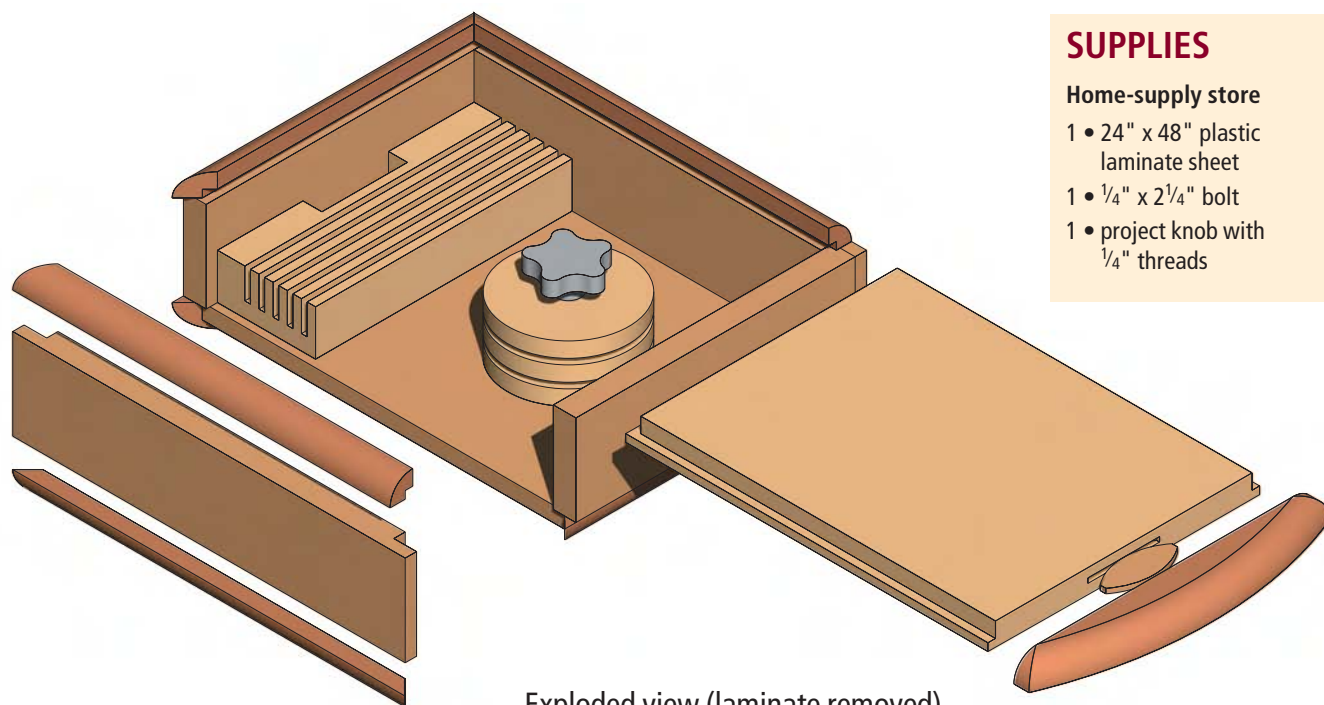
Before installing the handle, cut slots for a single biscuit in the center for added strength.



The chipper block simply is two pieces of 3/4" plywood face-glued together, with a series of evenly spaced 1"-deep slots for the chippers.



Nibble away a pocket for your collection of blade shims using your table saw.



Exploded view (laminates removed)

SUPPLIES

Home-supply store

- 1 • 24" x 48" plastic laminate sheet
- 1 • 1/4" x 2 1/4" bolt
- 1 • project knob with 1/4" threads

Sealers and Sealing Wood

Many woodworkers are confused about sealers and sealing. Here are the facts.

During the last few decades, misleading advertising has led many woodworkers to confuse wood conditioners and “conditioning” wood with sealers and sealing wood.

Wood conditioners, as I explained in the last issue (“Battling Blotching,” April 2004), actually are washcoats made by thinning varnish or water-based finish. A washcoat is any finish that’s thinned enough so one coat doesn’t totally seal the wood. Stain can still penetrate a little and add some coloring, but it can’t penetrate enough to cause blotching in blotch-prone woods – softwoods such as pine and tight-grained hardwoods such as cherry, birch and poplar.

So if wood conditioners are thinned finishes that only partially seal wood, what then are sealers and sealing?

“Sealer” is just another word for “first coat.” Any finish can be a sealer – oil, varnish, lacquer, shellac, water-based finish or, of course, sanding sealer. “Sealing” is the act of applying a thick-enough first coat so that liquids, including wood stains, don’t penetrate to the wood.

This concept contradicts the often-used phrase, “I applied two sealer coats.” Perhaps two coats were applied, but the second, even if it was sanding sealer, should actually be called a “topcoat” because the first coat had already sealed the wood. Stains and other liquids could be wiped right off the surface. It would be more accurate to say, “I applied two coats of sanding sealer.”

Think about this a little, and you’ll agree that the language I use makes the word “sealer” and the concept of “sealing” make sense, while the way the words are more commonly misused creates confusion.



Photo by Al Parrish

Sanding sealers contain a lubricant that makes them powder when sanded, rather than gum up the paper. Use a sanding sealer as the “sealer” coat when you want to make sanding easier and faster.

Sealer vs. Primer

Part of the confusion is caused by thinking of sealing as serving the same purpose as priming does for paint – that is, establishing a better bond to the wood. This couldn’t be further from the truth. In fact, as I’ll show later on, sanding sealer actually reduces the bond of a finish to wood.

To understand the purpose of a primer, remember that paint is loaded to the maximum with pigment to provide the best “hid-

ing” possible. A good paint is one that covers and conceals in one coat. The effect of loading the paint with pigment is that not enough binder (varnish in oil-based paint or water-based finish in latex paint) remains to glue the pigment particles to each other and to the wood. This is because wood is rough and porous and requires more binder to achieve a good bond than does a smooth surface such as an already-coated one.

So a primer is simply paint with less pigment and more binder. You can tell this is true by the poor hiding qualities that primers exhibit – they don’t conceal what’s underneath as well as paint does. Additional ingredients may be added to primers, of

by Bob Flexner

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

course, including mildewcides and preservatives, but these additives are there to provide a special function. They aren't what make the product a primer.

Now contrast paint and primers with a topcoat finish, which is 100 percent, or nearly 100 percent, binder. It bonds perfectly well to wood. There's no need for a separate product to improve the bond.

So what do products labeled or marketed as sealers do? Two things: They make sanding easier and they block, or "seal off," problems in the wood.

Sanding Sealer

Sanding the first coat of any finish is good practice because it's always a little rough, and sanding it smooth makes all additional coats go on smoothly and produce a better end result. Varnish and lacquer are difficult to sand, however, so sanding sealers, which are varnish or lacquer with soap-like lubricants added to make them powder when sanded, are made for these finishes. Sometimes, these are labeled "sealer," and this adds to the confusion. The proper labeling is "sanding sealer," and the emphasis should be put on the word "sanding."

Note that products such as polyurethane, water-based finish, shellac and pre-catalyzed lacquer rarely have sanding sealers available. In fact, manufacturers often instruct you not to apply these finishes over a sanding sealer. These products don't require a sanding sealer, because they're easy enough to sand without one. But more importantly, the lubricants in sanding sealers cause these finishes to not bond well.

This is critical because varnish and lacquer don't bond as well to sanding sealers as they do to wood either. You're actually weakening the bond of your finish to the wood when you put a sanding sealer in between.

Therefore, follow the example of finishers in factories and cabinet shops and use a sanding sealer only when you're working on a large project, such as a complete set of kitchen cabinets, where sanding would become a real chore if you had to fight your sandpaper from constantly gumming up. Use the finish itself as the sealer if the project is relatively small.

If you'd like to improve the sanding qualities of the first coat, thin it up to 50 percent

with the appropriate thinner. This will make it harden faster because the film will be thinner, and it will be easier to sand sooner. (Herein lies another myth about sealing, that the purpose of thinning the first coat is to get a better bond to the wood.)

Shellac

Shellac is often touted as a sealer. In fact, it's now thought of more as a sealer than as a finish. But there's no reason to use shellac under another finish unless there's something in the wood that will cause a problem.

One problem is the existence of oil, resin (as in pine knots) or wax in the wood. These substances will cause bonding and drying problems with most finishes, but not with shellac. It will not only bond well in most circumstances, it will establish a barrier so the finish you use on top won't be bothered.

Another problem is odors caused by animal urine or smoke in the wood that other finishes won't "seal off." Shellac is quite effective at blocking these odors.

With the exception of lacquer, the finish you apply on top of a shellac sealer will always bond a little better if you use dewaxed shellac – that is, shellac that's had its natural wax removed. Dewaxed shellac is available either as flakes you dissolve yourself in



Photo by Al Parrish

The resin in knots sometimes prevents finishes from curing hard. You can use shellac to "seal off" this resin so the finish applied cures normally.

denatured alcohol, or as already dissolved shellac. An example of this is SealCoat, which is widely available in paint stores and home-supply centers.

Conclusion

Sealing is the simplest of concepts: it's the act of creating a film barrier on the surface of the wood so stains and water don't penetrate at all. The first full coat of any finish does this, and there's no reason to use a special product unless you have a problem you need to solve – making sanding easier, or sealing off oil, resin, wax or an odor. **PW**



Craters called "fish eyes" sometimes occur in newly applied finishes, especially on stripped wood. They are usually the result of residue silicone oil in the wood and can be sealed off with a barrier coat of shellac.



Photos by the author

Thickly applied sanding sealer crumbles and turns white when struck with a blunt object, even under the finish. So never apply more than two coats of sanding sealer.

Biscuits: Fast, Cheap & Good

A few small wafers can help strengthen any project you're working on.

Biscuit joinery is so fast and easy it almost seems like cheating. And I gotta tell you, I'm no cheater. Consequently, I pretty much ignored the system, sticking with more traditional joinery, even when I was working with plywood and other sheet goods.

Then about three years ago, while working on a book about chests with drawers, I crossed paths with Mark Edmundson who exposed me to a novel (to me, anyway) method of post-and-panel construction. The posts and rails of a chest he designed and built were joined with loose tenons, while the maple-veneered medium-density fiberboard panels were joined to the posts and rails with biscuits.

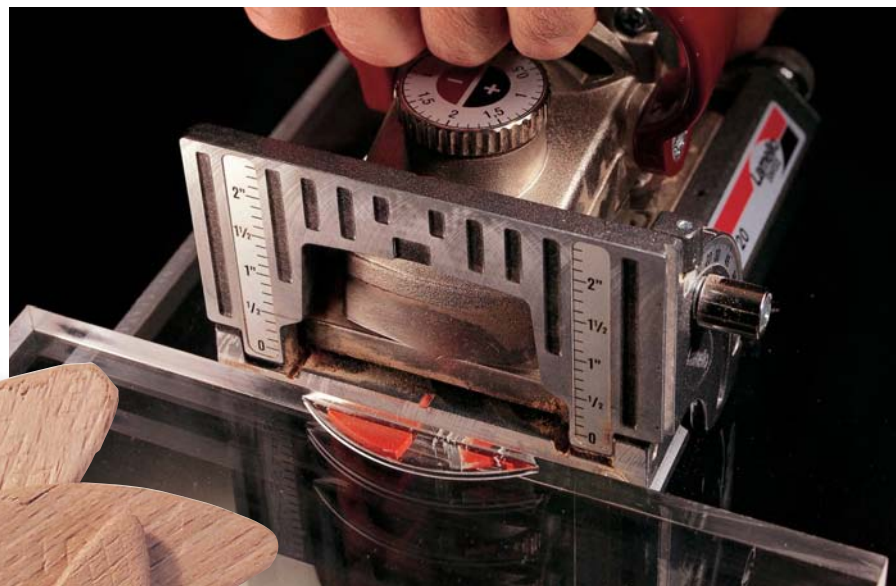
Don't misjudge Edmundson. He's a graduate of James Krenov's demanding course at the College of the Redwoods. He's capable of hand-cut joints. But when a client has a limited budget, the best way to reduce costs is to design something that goes together quickly. Hence, he sometimes uses sheet goods and biscuit joinery in his work. Speed and economy are the whole point of biscuit joinery.

Biscuitry Basics

For the uninitiated, a biscuit joint is a butt joint splined with a small beech wafer – the biscuit. Simple in appearance, biscuits are fairly sophisticated. Shaped like tiny, flattened footballs, they're stamped out, a process that (in most cases) compresses them. Add moisture and they swell up.

The linchpin of the process is a dedicated portable power tool known as a biscuit joiner. The tool enables you to plunge a cutter into a workpiece to make a slot that will, unsurprisingly, accommodate half a biscuit.

To make a simple biscuit joint, you cut a slot into each mating surface, insert a bis-



Biscuit joiners cut a slot the perfect size for a biscuit. To illustrate how one works, we cut some Lexan, a tough polycarbonate plastic. Though this isn't a common application for the tool, it handled the job with ease.

cuit into one slot, then slide the mating part into position. As you close the joint, the protruding biscuit half penetrates the second slot.

Here's where the reason that biscuits are compressed becomes clear. When you use ordinary yellow glue, the moisture in the glue prompts the biscuit to swell. The biscuit then locks in the matching slots and strengthens the joint. When you use polyurethane glue or an epoxy, you should dampen a biscuit with water as you insert it in its slot so it can expand and lock.

The result is a joint that's pretty easy to produce, invisible and surprisingly strong.

Biscuits can be used to reinforce – to

spline, in effect – almost any butted joint: edge-to-edge, edge-to-face, end-to-edge, end-to-face, case miters or frame miters. The qualification is that the contact surface between the mating parts must be thick enough and wide enough to accommodate one of the three common biscuits – No. 0 (the smallest), No. 10 or No. 20 (the largest). In the more common biscuit joints, you will use more than one, arraying them in a line across a wide piece or, for thicker stock, stacking them.

Biscuits are most appropriate when used in casework produced using sheet goods – plywood, melamine, veneered MDF, etc. Often, these sheet goods are selected for a project to circumvent lumber preparation and panel glue-ups; in other words, you're trying to shorten the production time. So a joinery application that also shortens production time – without sacrificing strength or accuracy – is appropriate.

by Bill Hylton

Bill Hylton is the author of several books about furniture construction and router operations. When he isn't writing about woodworking, he's doing it in his home shop in Kempton, Pennsylvania.

Photo by Al Parrish

Cutting the Slots

Many of the benefits of biscuit joinery derive from the tool itself. The biscuit joiner has only one purpose – cutting slots for biscuits – so it's always set up for the operation.

Once in a while you may need to adjust the machine for a different biscuit size, but this involves nothing more than a twist of a small knob to change the depth of the cutter's plunge into the work.

The tool has two reference surfaces: the base and the fence. Every joiner is designed to locate the center of the slot $\frac{3}{8}$ " from the base, centering the slot on the $\frac{3}{4}$ " edge of the stock. The front of the joiner will have a registration mark indicating the vertical centerline of the slot.

Fence designs vary, with some being easier and more precise to adjust. You should be able to adjust the angle of the fence and its elevation above the blade. Bear in mind that not all fences are aligned perfectly with the cutter, and not all stay locked.

Rule No. 1 is to always use the same reference surface for slotting both parts of any joint. On the tool, your first choice should be the base, simply because the machine's design virtually guarantees it to be accurate. It's easy to hold the tool steady when it's resting squarely on its base, but much more difficult when it's hanging from the fence.

(Keep in mind that the nose of the tool must be square to the surface being slotted. If the slot isn't cut square to the surface, the joint won't line up.)

If the location of the slot needs to be shifted, use a shim under either the tool or the work. You'll find, as I have, that you can orient the work and the tool so you can use the base as a reference to produce slots for any form of biscuit joint.

On the workpieces, the reference surfaces should be those that must line up in the final assembly. For example, say you need the top surface of a case top to be flush with the top edge of the case side and you want to use the biscuit joiner's base as the reference. Just slot the top with its top surface facing down and slot the side with the joiner's base flush against the side's top edge. One good way to accomplish the latter is to butt the side's end against a "fence" held in a bench vise. Stand the joiner on its nose with the base against the fence and make the cut.



For a case, large or small, align the sides and clamp a straightedge to them – I'm using a shelf here – to position the biscuit joiner. A few quick plunge cuts and the joint is ready for assembly.

Photos by the author



With the shelf butted against the bench vise's dog (or some other stop), you can cut biscuit slots with both hands on the tool. No layout here, because the edge of the tool's base is aligned with the edge of the workpiece.

To accomplish that with case miters, just clamp the mating elements face-to-face so the bevels form a "V," then set the joiner into the "V." The tool will rest on one bevel while slotting the mate.

Laying it All Out

Layout is simple – place the parts together the way you want them to be in the assembled joint, mark the center of each slot on the mating pieces and align the joiner's registration mark to cut the slot.

Typically, that's all the layout necessary. Occasionally, you'll have to extend the mark across an edge or onto a face so it's visible when the joiner is in position to cut the slot. You don't need to address the slot's vertical position because that's determined by the tool's fence or base.

In a wide joint – where you'll join a bottom to a side in a 2'-deep cabinet, for example – you'll need to use several biscuits. The generally recognized rule of thumb is to space biscuits 6"-8" apart on center. Offset

the biscuits on the ends about 3" from the edge of the workpiece.

Stacking your slots is common when the thickness of the working stock exceeds 1". If your material is all the same thickness, you can cut a slot, then roll the piece over and cut the second. When a piece is thicker or thinner than its mates, the best approach is to use a shim under the joiner's base to elevate it when cutting the second slot.



When stock thickness is more than 1", you should stack at least two biscuits evenly.

Assembly

When putting the biscuit joint together, it's essential to get enough glue in the mating slots and on the biscuit to promote expansion. But be discrete – you don't want glue welling out of the slots.

You can buy applicators designed especially for biscuit slots. I usually run the glue-bottle's tip along the edge of the slot, then use an artist's brush to spread it through the slot. I run a bead from slot to slot, and I use the brush to spread it, too. When the glue is applied to both parts, I stuff a biscuit in each slot, seat it firmly and move on.

Be wary of gluing biscuits in one at a time, and of trying to apply glue to all the joints in an assembly before closing any of them. The biscuits can swell before you want them to and make assembly difficult.

A benefit of biscuit joinery is that your case will clamp up square if your parts are squarely cut. The scramble to wrench the case into proper alignment before the glue sets up is reduced to a low-key measuring of diagonals to confirm what you already know.

Working Routine

A small wall cabinet I made recently is a good example of how I used biscuit joinery. I set two shelves, a top and a bottom between the sides using biscuit joints. I then assembled a face frame of very narrow members, again using biscuit joints. I glued the frame to the



Make sure glue gets into the biscuit slot, because it's the moisture that causes the biscuit to swell and produce a strong joint. I use an old artist's brush to work glue through the slots.

case, and used five biscuits to help locate it.

The photos above and below show the essential steps. Because of the narrowness of the sides (they are less than 10"), I used only two biscuits per joint, and I placed them by aligning the joiner base's edge with the edge of the side or the shelf. The only layout needed was to mark where the shelves crossed the sides.

The shelves were laid flat on the benchtop for slotting. A straightedge clamped across the two sides served as a fence when I slotted the sides with the joiner on its nose, its base against the fence.

In making the face frame, I used half a biscuit to join the top rail to the stiles. To do this, I used the rail's top edge as my center-

line in slotting the ends, and in marking the stiles for slotting. The assembled frame had biscuits jutting out the top; these I sawed off (and with the cabinet hung on the wall, you don't see that).

Finally, the locations of the biscuits between the frame and the case were marked with the frame carefully aligned – without using any glue, of course – on the case and clamped. I stood the case and the face frame on end to slot them for the biscuit at the top, then set them both on their side to slot them for the side biscuits.

The completed cabinet isn't fine furniture, but it went together quickly, it looks good and it's solid. Using the biscuits isn't cheating – it's just working smart. **PW**



Face frame members often are too narrow for a full biscuit. The biscuit that joins this stile to the top rail will have to be trimmed after assembly. Because the frame's top edge will be concealed in the completed cabinet, the open joint won't be a problem.



The primary value of biscuit joints between face frames and casework is alignment. Only a few biscuits are needed to ensure that.

The Painted Panther

American folk art meets the world's most collectible hand saw.

It's easy to understand why folk artists love to paint on saws—a saw blade is a large and flat area that is easy to paint, yet the overall shape is instantly recognizable as something “old.” Using an old saw instead of a canvas creates an implicit link with the past.

As a rule, tool collectors (especially collectors of old saws) are not too fond of saw painters. The painting all but ruins the collectible value and usability of the tool, and in most cases the quality of the art is pretty abysmal. However, this isn't always the case.

At a recent meeting of my local tool collector's organization, a member brought a painted saw to share that he had recently purchased at a local flea market. It definitely was not a run-of-the-mill example, and it caused quite a stir among the group.

The first thing I noticed was the overall quality of the art. While it's certainly not a museum piece, it is a big step up from what you often see. There was good balance of the subject, excellent use of color (the sky has some particularly nice brushwork), and the somewhat skewed perspective that is symptomatic of American naïve art. Someone at the meeting pointed out that this work would undoubtedly earn you an “A” at the local community college.

After my quick art appraisal, I examined the saw itself. It looked to be in excellent shape, with the characteristic “nib” that marked it as 19th century production. The handle was in remarkable condition, without the chips, cracks or rodent damage one normally sees on a saw of this vintage.

But the real surprise was the shape of the handle. It didn't register with me immediately, but I suddenly found myself doing a double take ... there was a panther head carved on the handle! This was no ordinary

old saw—it was one of the true “holy grails” of saw collecting: the Woodrough and McParlin “Panther” saw!

On Jan. 13, 1880, James R. Woodrough of Cincinnati was issued U.S. Design Patent 11,603 titled simply “Design for Saw-Handles.” The specification is quite short, covering, “A design for handsaw-handles, consisting of the ordinary form of handle, its front end being provided with an ornamental head projecting from said front end over the blade of the saw”

This saw was featured in a 1991 *Smithsonian* magazine article, which stated that only six of these tools were known to exist. Since then more examples have turned up, but it is estimated that there are less than 30 of these left. What's even more interesting is that this is only the second example that I am aware of that has wheat carving on the handle, making it even more rare.

The combination of rarity and unusual design means these saws are in great demand from collectors, and will command a high price. Even rough examples can sell for \$500 or more, and nicer ones will bring \$4,000 to \$5,000, according to Pete Taran, who runs vintagesaws.com, a site devoted to old saws.

An expert in tool restoration could undoubtedly strip the paint and varnish, and restore the saw to collector condition. If this was done, this saw would likely be the nicest known example of this incredibly rare tool,

by Ralph Brendler

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Photos by Dirk Fletcher (dirkfletcher.com)

and could possibly challenge the record auction price for saws. This makes it obvious that the saw should be refinished—or does it? The owner of the saw put it best:

“To me, as a collector, the saw helps celebrate a remembered time when fine hand tools and craftsmanship were an important part of everyday lives. The saw painter celebrates the same bygone era through illustration using an item from the past. Both of us, the collector and the folk artist, are trying to carry forward to tomorrow something from our past. If I were to clean the saw, all I would have when I am done is, well, just another panther saw. Clearly the sum is greater than the parts, so I intend to leave the saw as is.”

After thinking about it for a while, I have to say that I agree with him. After all, what's more interesting—owning one of 30 known panther saws, or owning the only known painted panther saw? **PW**

MORE INFO ONLINE

Mid-West Tool Collectors Association:
mwtca.org

OldTools archive:
www.frontier.iarc.uaf.edu/~cswingle/archive/

OldTools FAQ: brendlers.net/oldtools

Vintage Saws: vintagesaws.com