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OCTOBER 2003
ISSUE #136

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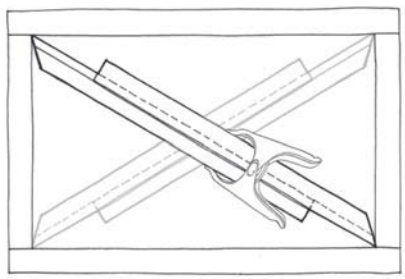
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ON THE COVER

Dados, dowels and glue make this stout German Work Box a great project for beginners and ideal roll-around storage for the small shop.

Cover photo by Al Parrish

DEPARTMENTS

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New Feature Examines Routers in Greater Depth

Turn to the center of this issue and you'll find a section that's new and different from anything you've ever seen in *Popular Woodworking*, or any other woodworking magazine for that matter.

"Woodworking Essentials" takes a basic subject and explores it in great detail during the course of several issues. We're starting with the router, a fundamental woodworking tool in most shops. "Woodworking Essentials" starts with the premise that while individual articles on a subject are fine, certain subjects are so important that they require a more textbook approach to be truly meaningful.

This special section isn't just for novice woodworkers, though. You'll find elements designed to fill in knowledge gaps of more advanced woodworkers, too. And everyone will benefit from the jig project included in each installment.

Before this all-encompassing series on routers ends, we're going to cover everything you need to know about bits, jigs, techniques, tables, pro tricks, joinery and advanced routing. And should you wish to organize the series in a three-ring binder, we've printed hole locations that fit a binder perfectly. When you have the complete series, you'll have one of the best books on routers ever.

Welcome Don McConnell

I'd also like to introduce you to Don McConnell, our newest contributing editor. Don, who writes our "From the Bench" column on hand tools, is an amazing source of knowledge about traditional woodworking techniques, tools and the history of the trade.

Don started as an apprentice in the cabinet shop at The Ohio Village and has worked as a professional builder for 26 years. Despite the power-tool bias of most shops, Don has made his living using hand tools for the vast majority of that time.

His column seeks to introduce present-day woodworkers to the world of hand work, which often can be as efficient and accurate as work done with power tools. Often he will show you how to properly use a tool that has frustrated woodworkers in the past. Or, as in this issue, Don shows you the wonders of a traditional tool you've probably never even thought about picking up, even though it's best suited for the job at hand.

What's Your Shop Worth?

On a side note, whether you know it or not, you probably own a small fortune in tools and equipment. But have you tallied up just how much everything is worth or would cost to replace? More importantly, does your spouse, family or insurance agent know?

In the event of a disaster, it's a good bet a standard homeowner's policy won't come close to paying for equipment losses. Coverage varies from company to company, even state to state, so it's best to check with your agent. And heaven forbid you meet an untimely demise without a family member knowing the realistic value of the tools, especially collectible ones.There's been more than one spouse fleeced by a greedy soul.

However, as a matter of self-preservation (or just to promote marital harmony), you might want to put that list of equipment and its value in a sealed envelope that's to be opened only after your passing. **PW**

Steve Shanesy
Editor & Publisher

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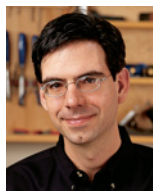

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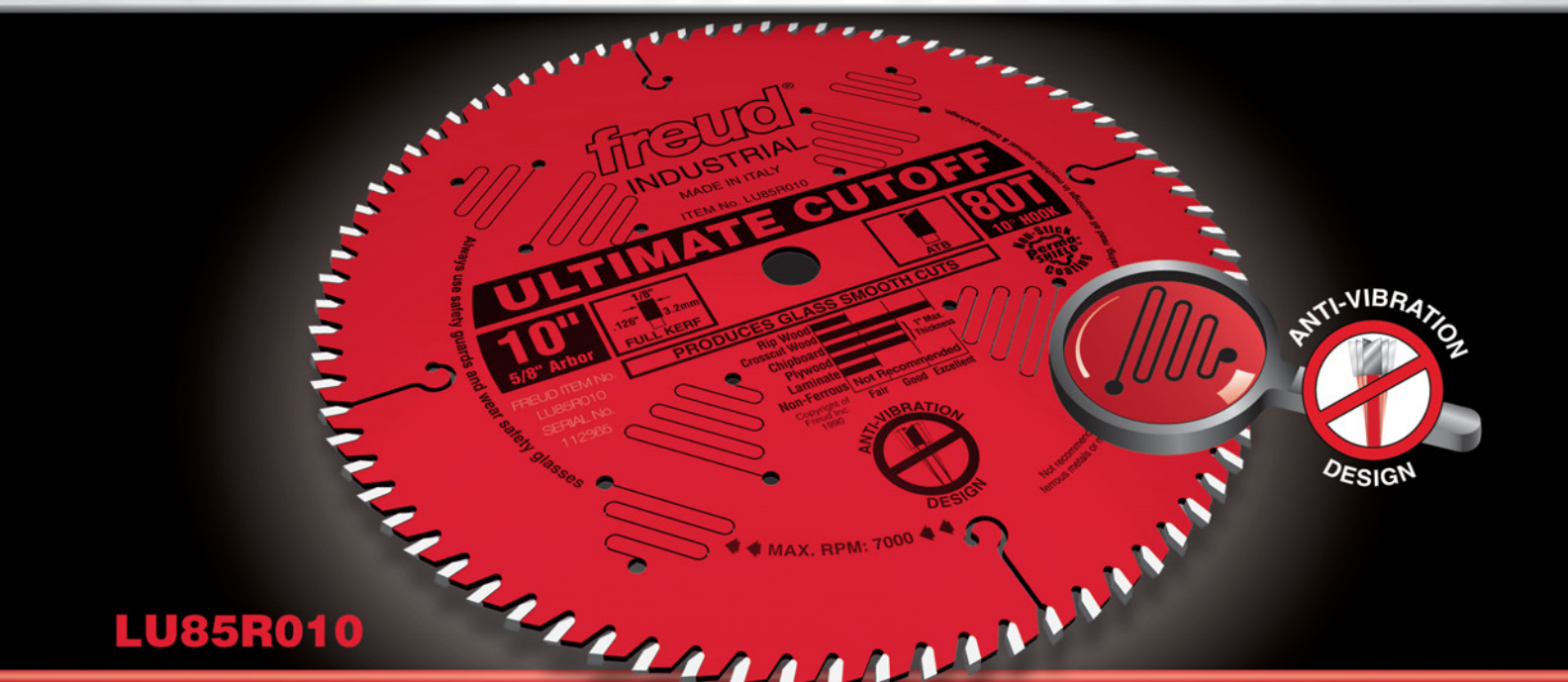
Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In certain photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy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

How Do You Make Flawless, Glass-Smooth Crosscuts?



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Dumb Mistakes Can Strike Us All, Right?

When Mounting Your Saw Blade, Make Sure You Know Front from Back

In regards to your article "The 16 Dumbest Woodworking Mistakes" (August 2003), here's another one to watch out for: mounting a saw blade backwards on your table, radial arm, miter or circular saw.

After using a masonry blade to cut some flat stone with my old 12" radial-arm saw, I remounted the saw blade and tried to crosscut a piece. The blade entered the cut, then stalled and started to smoke. Puzzled about why a sharp blade refused to cut, I removed it, looked over the perfectly sharp teeth and remounted it on the saw.

Same result. Then I looked again: The teeth were backwards! Now that's dumb.

Reversing the blade solved the problem, and that old blade is still cutting clean.

Barney Howard
Sisters, Oregon

It's Not Really Dumb if You Have Learned Your Lesson

I'm afraid I don't agree with the title of your article "The 16 Dumbest Woodworking Mistakes." In my opinion, there are only two types of "dumb" mistakes: Those you don't learn from, and those you knew you were making but went ahead with anyway because it took too long to do things the right way. Most accidents come from the second type. A better headline would have been "16 Common Mistakes You Can Avoid."

Michael R. Turner
Renton, Washington

Endurance Test Doesn't Give Fair Account of Tools' Values

I have been a faithful reader of your magazine because I greatly enjoy the articles by your senior editors and contributing editors. My skills are not up to the projects of Glen Huey and Troy Sexton, but I read their articles to get ideas.

However, when you venture into product endorsement by way of your Endurance Test, you raise my suspicions about your objectivity and lack of a comparative basis for your endorsement. The June 2003 issue with the testimonials to Titebond II and Bessey Tradesmen Clamps is a good example. They add nothing to the overall quality of your magazine and, in fact, detract from it. Who cares what you use in your shop when there is no comparison test? You probably got the product for free or, if you bought the product, the cost is a business expense.

Moreover, the statement in the clamp section that you get what you pay for is not a helpful rule of thumb. I do not have unlimited funds at my disposal – I need to know what product will get the job done at the lowest price. I do not ordinarily make wooden objects to sit outside, nor do I build a small volume of projects a year, so I would like to know what the bond strength and open time are for Titebond as well as its competitors.

The clamp section of the test report was more of the same. I believe that Besseys are overpriced. My belief, if erroneous, could have been corrected and my knowledge

continued on page 14

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

continued from page 12

increased if you had informed me that the Bessey Tradesmen 12" clamp with 4" throat, 1" x 5/16" bar and clamping strength of 800 pounds at $23.99 competes with an economy model 12" with 5" throat, 1 3/8" x 5/16" bar and a load limit of 1,200 pounds at $15.95. I ask (rhetorically) if you get what you pay for, what are you getting in the 12" Bessey 4" throat that justifies the 3/8" smaller bar size and the $8 higher price?

What you do well in evaluating tools is perhaps best shown by the 12-volt cordless drill comparison in your February 2003 issue. Here, I can understand the basis for your recommendations. Get rid of those Endurance Test reports – another report like the June issue and you will be turning off readers.

Lester McAuliffe
via the Internet

Editor's note: The reports in the Endurance Test were never designed to report on comparative data with other products in the same category. They are, in fact, designed to report on the one thing we cannot compare in a direct test comparison such as the drill test you mention. The drill test may give you the information you need about the performance of a new, out-of-the-box product, but it cannot give you any insight as to the likely longevity that tool may have in use in your shop (or mine).

When I think back about the tools we've reviewed in our Endurance Test column, they are all woodworking classics that have literally stood the ultimate test – the test of time.

These are products that any woodworker could buy with confidence. It may be that not every woodworker can afford some of them, but that is not necessarily our biggest concern in this instance. They are still good tools and, I'd go so far as to say, the best in their class.

I am not trying to change your mind about how tools should be tested. I'm just trying to show you why we think Endurance Test has a valid position in our article lineup.

– Steve Shanesy, editor & publisher

Beginner Could Have Used More Definitions in Lumber Glossary

As a beginning woodworker, I enjoy the tips, tricks and general information in your magazine very much. I would, however, like to comment on the "Lusting for Lumber" articles that appeared in August 2003.

I enjoyed the "Sticker Shock" story about the man getting a great deal when the clerk didn't know the difference between "dressed" and "undressed" lumber. Well, to tell you the truth, I don't know the difference either. It would have been nice if you told the difference, especially because there was a glossary accompanying the article.

Also, in that glossary, the definition for "dimensional lumber" states that a 1 x 4 will typically measure 3/4" x 3 1/4". Shouldn't the larger dimension be 3 3/4"?

Finally, and I know this is a real nit-pick, the definition for "air-dried lumber" states that it reduces the moisture content to about 12 percent to 15 percent. It would have been nice, just for information, if the definition of the "kiln-dried lumber" also would have listed the moisture content.

Lane Wallace
Knoxville, Tennessee

Editor's note: You've got some good questions. "Dressed" lumber has been planed down and is presumably ready to use, while "undressed" is in the rough right from the sawmill. We should have included that in the article's glossary.

As to the actual width of a 1 x 4, I was being generous when I said it was 3 1/4". Most 1 x 4s in my neck of the woods are more like 3 1/8" wide.

As to kiln-dried lumber, the final moisture content depends on the region of the country and where the lumber is stored. It can be anywhere from 7 percent to 12 percent on average. Thanks for pointing that out. **PW**

— Christopher Schwarz, executive editor

CORRECTION

Popular Woodworking corrects all significant errors. For a list of corrections to the magazine, or to report one, please visit our web site at popwood.com and click on "Magazine Extras."

• In the Saw Blade Box (June 2003), the 3/4"-wide x 1/2"-deep rabbet should be cut on two short edges and one long edge of the top and bottom of the box, not on two long edges and one short edge.

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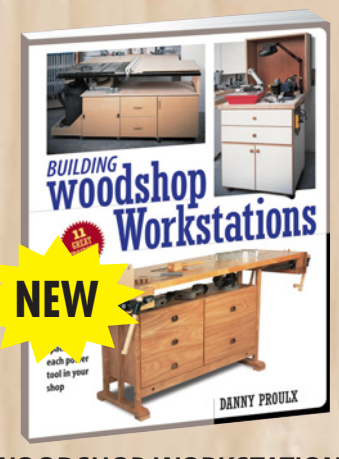

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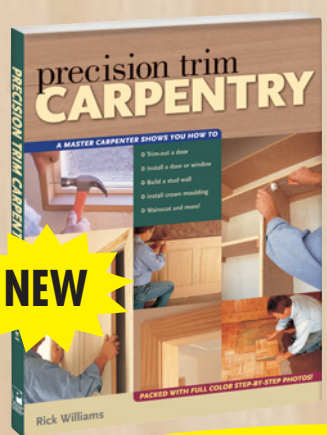

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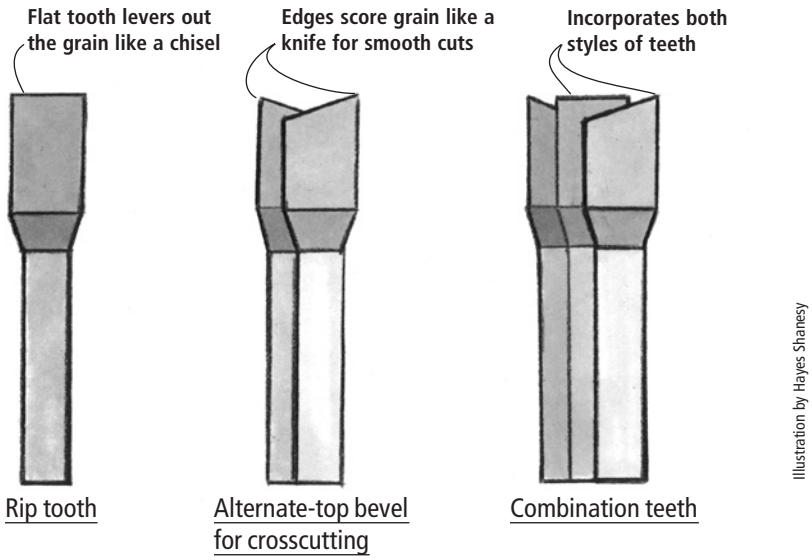

Illustration by Hayes Shanesy

A Lesson in Saw Blade Anatomy

Can you explain the difference between a crosscut and a ripping blade? Of course, I know the difference between crosscutting and ripping, but I can't seem to figure out how the saw blades are different.

Also, as far as teeth go, what is the advantage of fewer teeth? I don't have a lot of blades, so I have invested primarily in quality finish blades. I have the blades my saws came with and I use them on less important cuts to preserve my expensive blades. When those wear out, should I buy more blades with fewer teeth? I haven't seen a downside to the finish blades, and I don't get much tear-out.

Brian Dickerson
Mound, Minnesota

A crosscut blade has teeth oriented in an "alternate-top bevel" (ATB) pattern. ATBs have the teeth points beveled to the outside of the blade, alternating sides with every other tooth. This pattern is designed to slice wood fibers like a knife, separating them cleanly. A rip blade has teeth with flat tops (rakers) to plow through the wood like a chisel, pulling with the direction of the fibers and making a clean cut. A true rip blade is less common today because many woodworkers opt for a combination blade with both ATB and raker teeth, usually in sets of five with the raker tooth preceding the four ATB teeth.

The best number of teeth will depend on how the wood is being cut. A blade designed for crosscutting needs between 60 and 80 teeth. A ripping blade works with the grain and the cutting action requires less work, so fewer teeth (between 24 to 36) are needed. Also, the "continuous fibers" removed by a rip blade require large gullets to remove the waste.

In the best of all worlds, we recommend a good 40- or 50-tooth combination blade, a good 24-tooth rip blade and a good 80-tooth crosscut blade for the best variety and performance.

— David Thiel, senior editor

How is a Smoothing Plane More Efficient Than a Random-orbit Sander?

I read your article "Use a Smoothing Plane Instead of Sandpaper" (June 2003) and still believe sandpaper in a random-orbit sander is the least amount of time and effort. However, the concept of smoothing planes is great.

I have only one problem with your article. You said to use wax on your plane's sole. This will affect the finish when you try to stain the wood. It seems to me that it would seal the wood (like when glue runs out and is wiped off). If wax gets into the grain it will cause finish problems. Is this really the case?

Howi Torgersen
New Port Richey, Florida

With beginners, I completely agree that a random-orbit sander will produce the best results with the least amount of practice. But in the hands of an experienced user, a sharp smoothing plane cannot be beat.

Here's why: When I sand solid wood (and I do sand on occasion), I start with #100 grit, then move up to #150 and then #220. According to most manufacturers I've talked to about random-orbit sanders, you should move the tool slowly, about a foot every 10 seconds. And it takes three or four passes to get the scratch pattern completely even – maybe more at the lowest grit. So to sand a piece of wood 6" wide and 12" long, it should take about two minutes, not counting the time to change sandpaper.

With a smoothing plane, I can plane a board that size in about 15 swipes. When I'm done, the surface is better than #220 grit by far.

As for paraffin wax, woodworkers have been using it for generations on their planes without finishing problems. Paraffin is petroleum distillate, the solid form of mineral spirits, which does not interfere with finishing. I've never had a stain that wouldn't penetrate the wood because of the paraffin, or a topcoat that wouldn't stick. **PW**

— Christopher Schwarz, executive editor

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.

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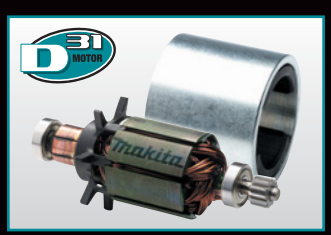

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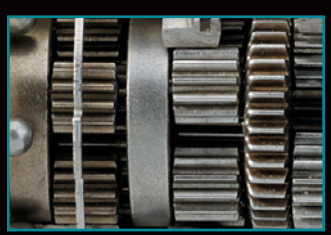

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Compiled by Paul Anthony

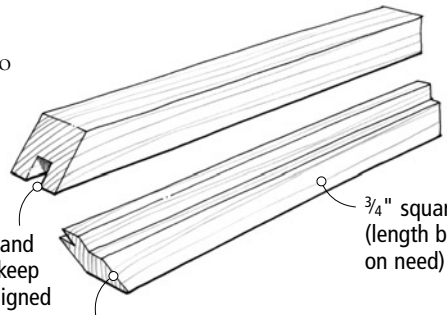
Shop-made Squaring Sticks

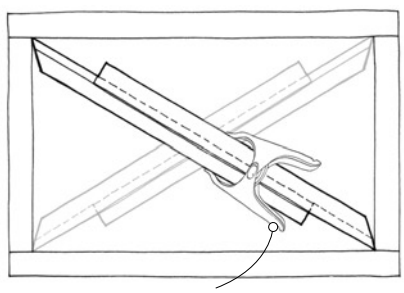
THE WINNER:

One of the best ways I have found to check the squareness of an assembly is to compare its diagonal measurements to make sure they match. The quickest and most accurate way to do this is to use squaring sticks.

You can easily make your own squaring sticks from straight-grained scrap as shown. Simply saw a mating tongue and groove into the edges of two ¾"-square sticks. This joint keeps the sticks aligned in use. The 40° miters at the ends allow easy insertion into case and frame corners. When comparing diagonals, use a small clamp to hold the sticks in lengthwise position. Then, using the same set of sticks, measure the other diagonal. If the assembly is square, the length should be the same. I make pairs in various lengths to suit differently sized projects.

Roger Winers
St. Paul, Minnesota





Illustrations by Matt Bantly

continued on page 22

CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish useful woodworking tips from our readers. Next issue's winner will win a **Grizzly** G1014Z, 6" x 48" belt/ 9" disc sander, which has quick release for fast belt changes and a convenient, single-knob tracking control system. The G1014Z offers a ¾-horsepower (10 amp) motor, shielded bearings, a cast-iron table and body, a 2" dust port and an A-frame stand.

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
4700 E. Galbraith Road
Cincinnati, OH 45236

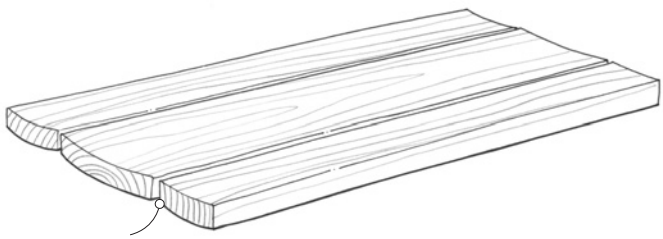
continued from page 21

Flattening a Cupped Board

Often the best way to deal with a severely cupped board is to rip it, dress the pieces straight, flat and square, then edge-join them together again. The usual approach is to rip the board down the center into two pieces. But if the board is flatsawn – as most are – this method yields an unattractive grain pattern in the reglued board.

A better approach is to rip the board through the straight-grained areas near the edges of the board. Although this involves a bit more work, the resulting joint lines in the straight-grained areas will not be nearly as noticeable.

John Franks
Santa Monica, California



Rip through straight grain areas

File Your Tool Rest for Smoother Turning

When turning smooth, flowing profiles on lathework, scratches or dings in the tool rest can interrupt the motion of the tool, creating flaws on the workpiece. Whenever I notice that my skews or gouges are starting to catch on the tool rest, I smooth its edge with a 10" mill file to remove any roughness. Then, to really make things go easily, I rub some paraffin on the edge of the tool rest and on the shanks of my turning tools. It's amazing how much a little lubrication can aid smoother cutting.

Kenneth Burton
New Tripoli, Pennsylvania

Putting Your Junk Mail to Work

I've finally found a great use for those pesky plastic cards shaped like credit cards that come in the mail. I just wrap a piece of self-stick sandpaper around one and use it as a sanding block. The thin edges allow for sanding right up to corners and protrusions, as the card will slip into grooves and other tight areas. You can make as many different grit cards as you like, cutting them into any suitable shape if necessary. They work like a charm.

Nathan Dixon
Fort Fairfield, Maine

Biscuits to Guide Your Work

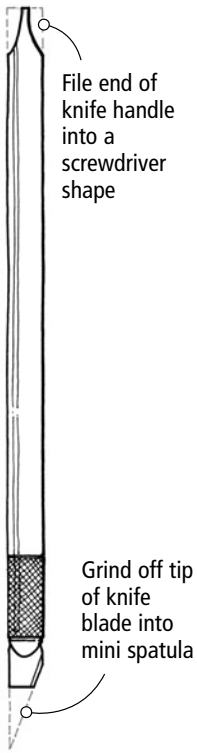
When laying out biscuit joints, sometimes the size and position of the slots can be crucial. When joining frames, for example, a slot that's too long can break through the edge of a rail. As a layout aid, I keep several "reference biscuits" in a container near my bench. On each biscuit, I mark its size (#0, #10 or #20) and the length of its slot using a permanent marker. I also "ring" its perimeter in red marker to prevent accidentally using it during a hurried glue-up.

Craig Bentzley
Chalfont, Pennsylvania

A Perfect Putty Knife

I work in a busy cabinet shop where we use brad nailers all day long and then have to putty the holes. I've learned that applying putty using a small applicator prevents smearing it all over the workpiece, so I made my own putty knife from a 5/16"-diameter aluminum craft knife. I ground a dull blade into a mini-spatula shape, which makes a nice flexible applicator. I also filed the end of the handle into a screwdriver-like shape to pry open the lids of the putty cans.

Dominic DeBlasio
Kintnersville, Pennsylvania



Stop the Screaming from Upstairs

The noise level in my basement shop often makes it difficult to hear my wife calling me from upstairs. Needless to say, this does not promote peace and tranquility in our house. I resolved the problem by purchasing a wireless doorbell for about $15 from a local home center. Plugged into one of my shop's electrical outlets, it's plenty loud for me to hear over the machines. Now, instead of having to yell down the stairs, my wife simply presses the button that she keeps in a kitchen drawer. Should the default bell tune happen to match that of your existing front doorbell, it can easily be changed to a unique "spouse alert" tune.

Joseph Shidle
Palatine, Illinois

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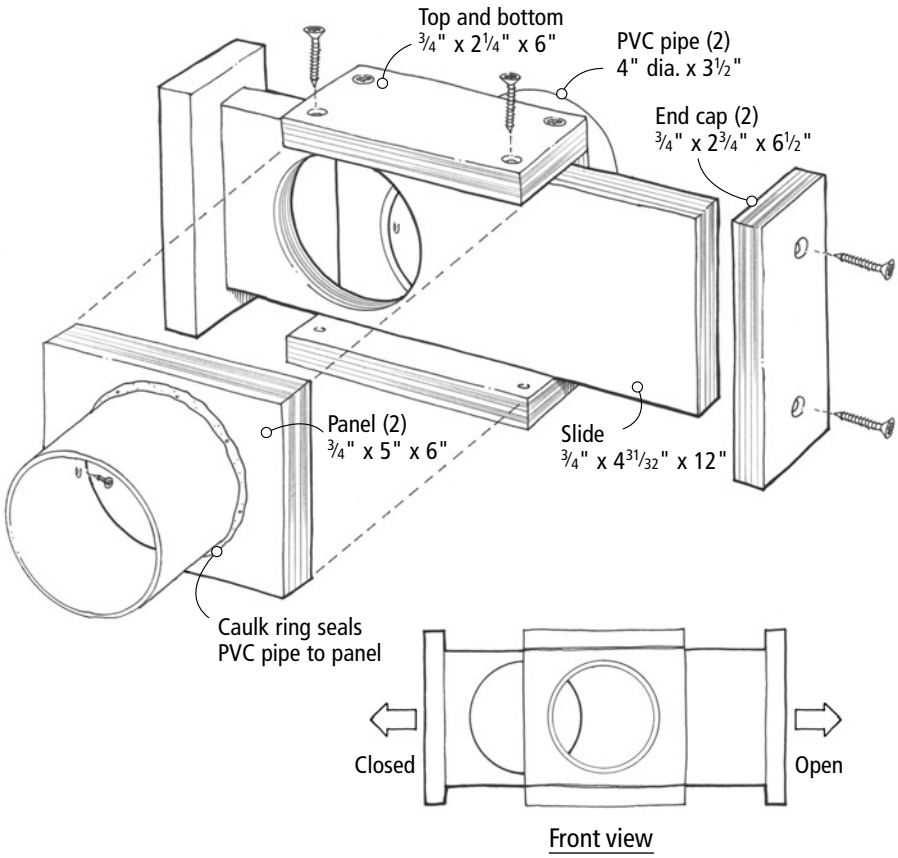
Build a Better Blast Gate

I have an 11,000 cubic-feet-per-minute dust collector and have tried various types of blast gates for my system. The plastic gates tend to get jammed with chips, and the gaps in metal gates tend to reduce system suction. This led me to build my own gates, which I've used for about a year with great success.

The gates are simple to make. Use the same type of wood for the panels and slide, orienting the grain in the same direction to ensure the pieces expand and contract across the grain at the same rate. (You could make the entire gate from plywood to eliminate any potential wood-movement problems.)

The end caps overhang the faces of the panels ¼" to allow easy grabbing. I attached each 4"-diameter section of PVC pipe to its panel from the inside with a couple of screws, then caulked around the perimeter. When you are assembling the top and bottom to the panels, first sandwich the slide between the panels, along with four pieces of paper. Removing the paper after assembly will create a small gap to allow easy sliding. I also waxed the slide to minimize friction.

Jerry Darby
Odessa, Texas



A Cradle for Crosscutting Cylinders

Crosscutting dowels, tubes or other cylindrical work can be dicey because round stock tends to spin out of control when the blade makes contact. For a safer approach, I mount the work in a shop-made cradle that consists of two beveled lengths of wood attached to a platform. To make the cradle, set your tablesaw blade at 45° and rip the beveled pieces from the edges of a wide, thick board. Then glue or screw the pieces to the plywood platform, aligning their ends with one squared end of the panel. You can now clamp or screw the jig to your miter-saw table or table-saw crosscut sled. To use the jig, hold the round stock firmly in the cradle and make the cut slowly and steadily to prevent spinning. For extra friction, you can glue sandpaper to the bearing faces of the beveled pieces.

Andy Rae
Asheville, North Carolina

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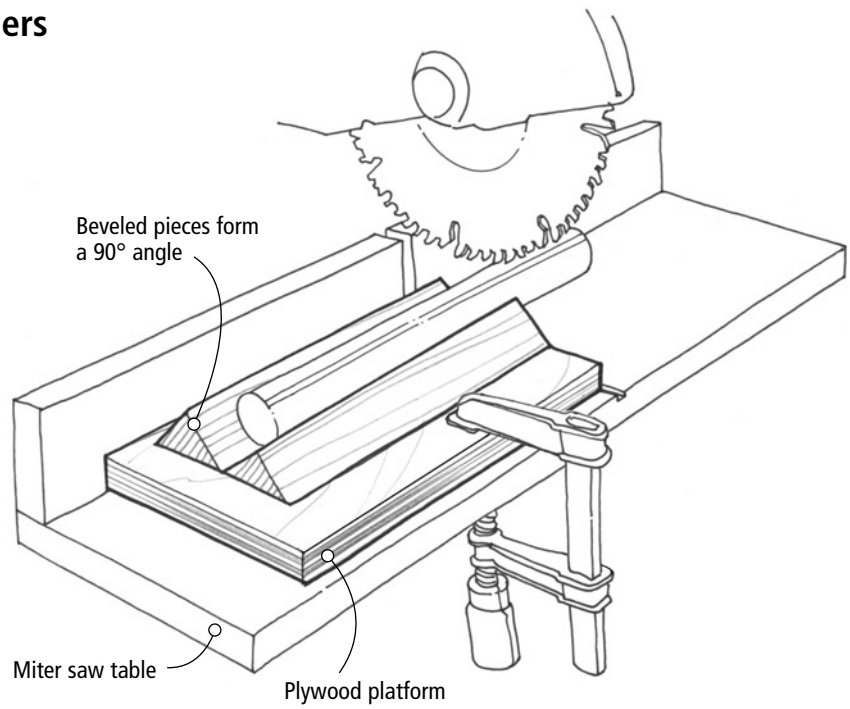

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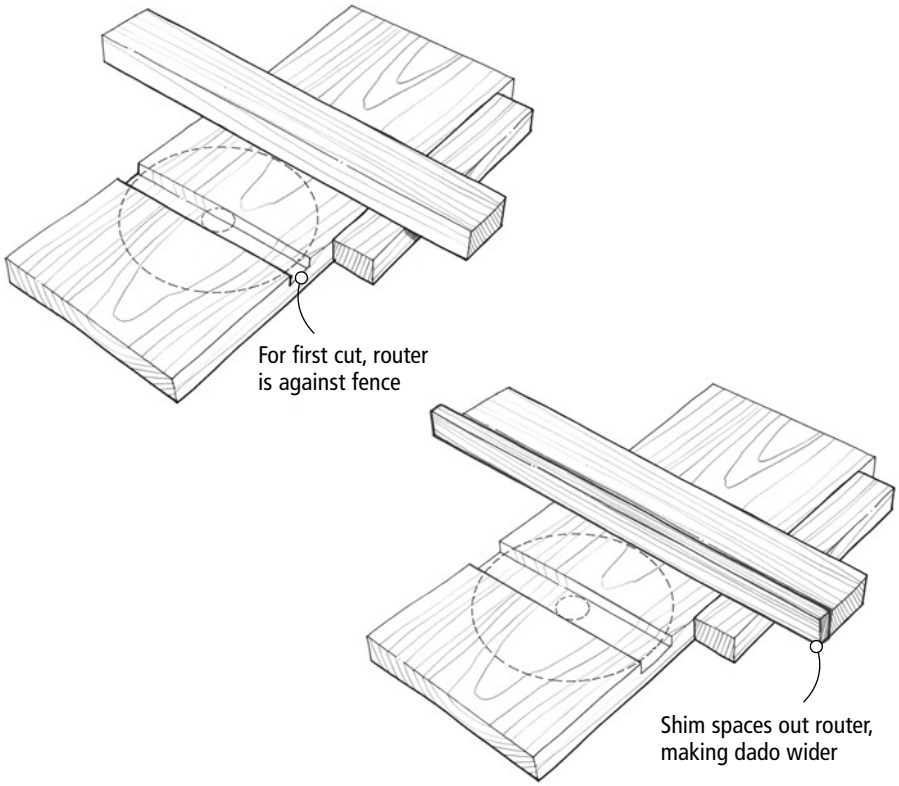
continued from page 24

Routing Dados with Shims

Routing dados and grooves across boards typically involves making two passes with a straight router bit while guiding the router against a straightedge. The problem is that resetting the guide for the second cut is time-consuming and leads to errors in the width of the cut. A quicker and more accurate approach is to make the second cut by placing a shim of the proper thickness against the body of a T-square clamped against the workpiece, as shown at right.

Percy Blandford
Stratford-upon-Avon, England



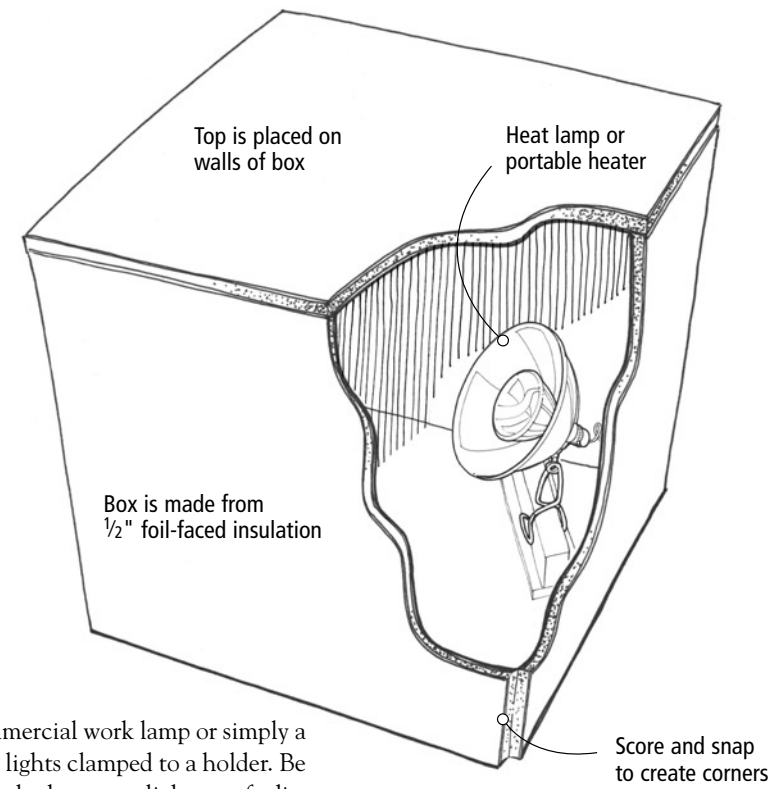
Cold Glue-ups Feel the Heat

In the winter, my shop can get too cold for glue to cure properly. Under those circumstances, I enclose my assembled project in a "warm box" made from ½"-thick, foil-faced rigid insulation. The interior of the box is heated using lamps or a portable electric heater. When not in use, I stash the flat panels away with my plywood sheets.

Available at most home supply stores, these 4' x 8' foil-faced sheets of lightweight foam insulation can be made into a box of almost any size simply by cutting the pieces with a utility knife and then taping them together. To create the walls for small- or medium-sized boxes, you can score one face of a sheet, then snap it toward you from the unscored side to create a folding hinge at a corner. Leave one corner of the box unattached to create an access door. For the roof of the box, just lay a piece of insulation on top of the walls.

Hang a cheap thermostat inside the box to monitor the temperature. A thermostatically controlled portable heater can be used to maintain the interior temperature at about 70°. For heat, you can use a high-wattage commercial work lamp or simply a few portable lights clamped to a holder. Be sure to place the heater or lights a safe distance from the workpiece and box walls. **PW**

Charles Chinaski
Hollywood, Florida



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Jet's JBM-5 Mortiser

With a few small tune-ups, this benchtop machine can handle just about any 'boring' task.

With a couple of exceptions, I've used almost every benchtop mortiser on the market. After cutting hundreds of joints in a wide variety of hardwoods, I concluded that with the benchtop machines, the fast-speed mortisers are less likely to stall in use.

(For a full report, check out "Mortiser Slug-fest" in the August 2001 issue of *Popular Woodworking*, available at popwood.com.)

When I began that test of mortisers, I had Jet's JBM-5 slow-speed benchtop machine in my shop at home. After concluding the test, I had the option of buying one of the fast-speed machines. But I didn't.

Here's why: The Jet has yet to fail me and it is hands-down my favorite slow-speed mortiser. The Jet has proven itself accurate, reliable and gutsy enough for demanding jobs, such as cutting 64 deep mortises in a Morris chair. And while it does stall on occasion, sharp tooling, a proper setup and some slick wax have reduced my downtime significantly.

Out of the box, the Jet is a good machine. But with a few tune-ups you can make the Jet (or any other mortiser) perform better.

Grind a notch in the hold-down's post, and your hold-down is less likely to go flying.

The first order of business with the Jet is to square the table and fence to the chisel. Of the three JBM-5s I've used, all needed this minor tweak. The table should be a perfect 90° to the chisel, and the fence should be parallel to the chisel. To square the table, shim beneath it using masking tape at the front, rear or sides until everything is perfect. Then check the relationship between the chisel and the fence. If it's not perfect, add a thin wooden facing to the fence and shim that. Only one of the three JBM-5s required this adjustment.

Next you should modify the Jet's hold-down. This is the weakest part of all benchtop mortisers. The hold-downs slip, so when you pull the chisel out of the work, the hold-down forks or the post that holds the forks flies off and your work is lifted off the table.

There are two modifications. The easy one is to secure the post in the fence. It's held in with a set screw, which is not good enough. Mark on the post where the set screw hits it and grind a V-shaped notch in the post at that location. That will ensure the post never leaves the fence unless you want it to.

The more involved modification replaces the entire post with a metric (usually 14mm) bolt that has threads on one end. Hacksaw the head off. Grind a notch in the unthreaded part of the bolt's shaft, as described above. Then use a nut to secure the hold-down forks at the top. This works brilliantly.

Finally, learn to sharpen your tooling. An auger bit file ($10 from Highland Hardware: 800-872-4466 or tools-for-woodworking.com) will keep the auger bit in shape. And a cone-shaped sharpening stone will surely keep the inside flutes of the chisel honed.

When setting up the tooling, be mindful of the gap between the auger and the chisel. It's like the mouth of a handplane. A large gap allows bigger chips (which can stall the motor). For the Jet JBM-5, I like a 1/16" gap.

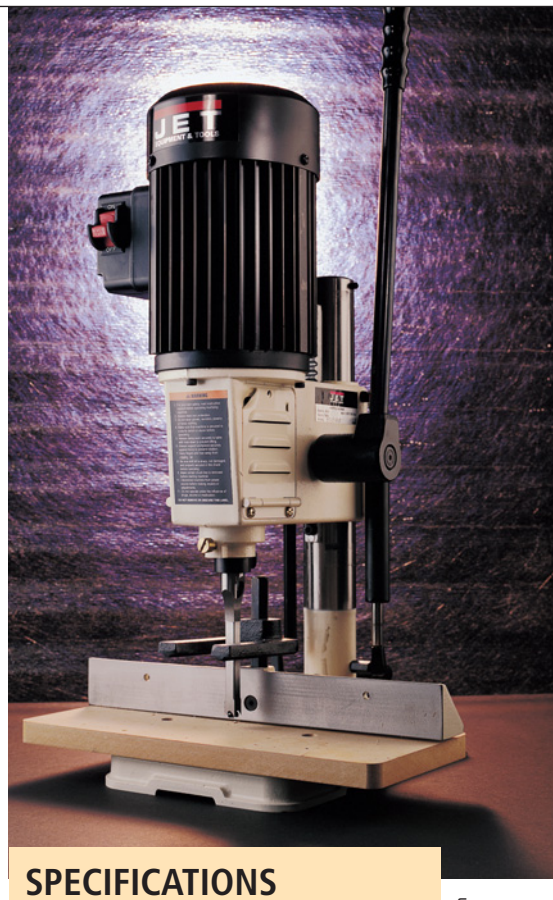

Photo by Al Parrish

SPECIFICATIONS

JET Tools JBM-5 Benchtop Mortiser

Street price: $200 to $250

Motor: 1/2 horsepower, 1,725 rpm

Max chisel width: 1/2"

Max space under holddown: 3 5/8"

Chisels included: 1/4", 3/8", 1/2"

Bushings included: 5/8", 3/4"

Nice features: You can change most of the settings without tools. The machine is durable, accurate and powerful enough.

Recommended modifications: Alter the hold-down post, shim the table to square.

For more information: Contact JET Tools at 800-274-6848 or jettools.com.

With these basic modifications, you'll find there's little that the JBM-5 cannot handle. Just about everything I build needs mortise-and-tenon work: chairs, face frames and raised-panel doors to name a few. And I can't envision ever replacing it, no matter what comes down the pike next. **PW**

— Christopher Schwarz

ABOUT OUR ENDURANCE TESTS

Every tool featured in this column has survived at least two years of heavy use by the *Popular Woodworking* staff.

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CIRCLE NO. 158 ON FREE INFORMATION CARD.

DeWalt's DW735 13" Planer – Pricey, but Complete with All the Bells and Whistles

Let me get this out of the way right at the start because I rarely say this: I can't find any feature missing (and have little to complain about) on this planer. DeWalt has done a nice job making a user-friendly, ergonomically intelligent high-quality planer.

Let's start with the features:

- Three double-sided disposable knives that are easily changed and can be adjusted laterally to avoid nicks;
- Two-speed feed rate (96 or 179 cuts per inch) for a better finish on the final pass;
- Four-post chain-driven cutterhead height-adjustment system that is under spring tension to give you snipe-free planing (yes, really!) without a head lock;
- Fan-assisted chip ejection system to keep chips out of the knives and rollers.

Then there's the other smart stuff:

- Single oversized table;
- Material removal scale;
- Well-designed depth stop (six settings);
- Single on-board tool for all adjustments and maintenance.

OK, my one complaint: The universal motor still is pretty loud (98 decibels). But beyond the noise level, the DW735 was a pleasure to test. Right out of the box I was able to produce snipe-free work taking 1/8" cuts in both maple and pine boards.

The cutterhead's height adjustment is smooth, requiring little effort. All of the scales were easy to read and understand. Changing blades (or adjusting to avoid a nick) is easy thanks to an on-board tool, providing easy and ample access to the cutterhead.

While this planer has a lot going for it, it's also the highest-priced one (substantially higher than many) in the category at $479. That said, we'd say the thought and engineering that went into this machine more than compensates for the price.

— *David Thiel*

SPECIFICATIONS

DeWalt DW735 13" Planer

Street price: $479
Motor: 15-amp universal, 10,000 rpm
Knives: 3, M2 laminated, 2-sided, disposable
Cuts-per-inch: Two speeds: 96 or 179
Speeds: 14 or 26 feet per minute
Table size: 13" x 19 3/4"
Weight: 92 lbs.
Performance: ●●●●●
Price range: $$$$$
DeWalt: 800-4dewalt (800-433-9257) or dewalt.com

Aftermarket Chipbreakers an Amazing Upgrade

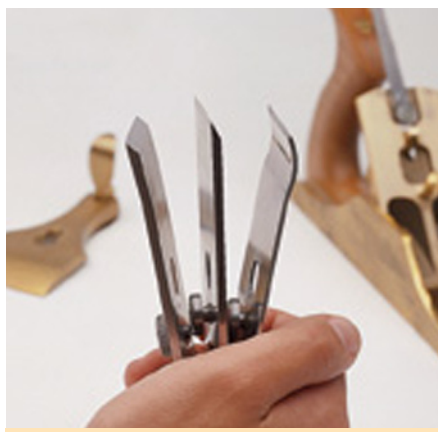


Photo by Al Parrish

No matter how much you fine-tune your Bailey-style plane, there is one part that will almost always give you fits. I'm talking about, of course, the plane's chipbreaker.

Screwed to your plane's iron, the chipbreaker is supposed to reduce tear-out and clear shavings from the plane's mouth. If it's not mated perfectly to the iron, however, it will cause more problems than it solves.

For years, Clifton in England has offered a heavy two-piece chipbreaker that has always performed well. Now two more manufacturers have come out with less expensive heavy-duty chipbreakers that solve all the problems of the wimpy stock ones.

In my humble opinion, these chipbreakers are as important an upgrade as an aftermarket plane iron.

Hock Tools and Lie-Nielsen Toolworks now sell thick, well-made chipbreakers that stiffen your cutting iron (to reduce chatter) and give you an airtight fit against your iron's cutting edge. Both brands of chipbreakers are available in the common sizes to fit vintage and new Stanley planes, as well as Lie-Nielsen planes.

The two versions are a bit different in the details, but they both work exceptionally well, so I cannot recommend one over the other. In the photo at right you can see a stock chipbreaker (right), the Lie-Nielsen (center) and the Hock.

After months of using both, I have found that these chipbreakers make the most difference in smoothing planes, where every bit of extra performance is important. So start by upgrading your #3, #4 and #4 1/2 planes.

At press time, the Hock version was available in three sizes (1 3/4", 2" and 2 3/8") for $20 each. The Lie-Nielsen chipbreakers are available in two sizes individually or as an optional upgrade when you buy a bench plane. The 2" sells for $20; the 2 3/8" is $25.

— *Christopher Schwarz*

continued on page 32

SPECIFICATIONS

Aftermarket Chipbreakers

Street price: $20-$25
Width: 1 3/4", 2", 2 3/8"
Thickness: Both are about .136"
Performance: ●●●●●
Price range: $
Hock Tools: 888-282-5233 or hocktools.com
Lie-Nielsen Toolworks: 800-327-2520 or lie-nielsen.com

continued from page 30

Vario-Pro Sander Follows Any Contour

The Vario-Pro contour sanding form helps reduce the frustration woodworkers encounter when sanding odd shapes.

The Vario-Pro sander uses 40 spring-loaded 1/32"-thick plastic forming plates (1¼" x 3⅜" total surface area) to form against the profile to sand. Once you achieve the right contour, twist an allen wrench to lock the forming plates in position. Then wrap hook-and-loop sandpaper over the sole, sticking it to two hook-and-loop pads on the side of the tool.

It's faster and more effective than custom sanding blocks. In fact, the Vario-Pro's only limitation comes from the thickness of your sandpaper, which can't easily form to the most intricate contours. If you sand a lot of moulding, this is a good investment. The Vario-Pro costs $30; packs of fitted paper (3½" x 4") in #100 to #220 grits cost $20 per 100 sheets. — *DT*

SPECIFICATIONS

Klingspor Vario-Pro
Street price: $30
Performance: ●●●◐○
Price range: $$$$$
Klingspor: 800-228-0000 or woodworkingshop.com

Avenger Economy Dado Sets

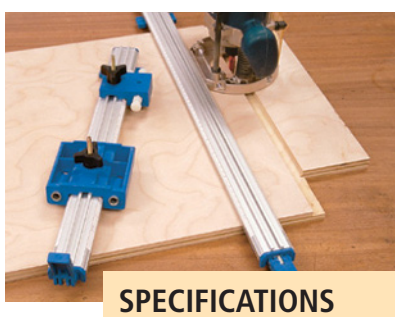
Avenger now sells a stack dado set that costs much less than half of what you would pay for a premium set ($125 to $250). But, as I'm sure you're wondering, how well does it cut?

What surprised me is the Avenger has more carbide teeth than many bargain sets with six-tooth, full-body chippers rather than the typical two-tooth wing chippers. Despite that, the cut wasn't perfect and had a slightly irregular bottom. The outside bevel teeth left fine score grooves below the bottom of the channel. In cross-cut dados, there was very little tear-out. So while we can't recommend these sets for fine-furniture through-dado work, as a work-a-day dado set the Avengers performed well at a good price. — *DT*

SPECIFICATIONS

Avenger Stack Dado Sets
Street price: 6" x 20T - $40
8" x 30T - $50
Chippers: 4-1/8", 1-1/16" & 1-3/32"
Shims: 2-.010", 2-.020", 2-0.05"
Performance: ●●●○○
Price range: $$
Avenger Products: 702-293-7510 or avengerproducts.com

All-In-One Straight-edge Guide



While a clamping tool guide isn't a new idea, E. Emerson Tool Co. has done a nice job of refining the tool and adding useful accessories.

The basic edge guide/clamp works quite well. It locks quickly and positively against your panel with three increasing pressure positions. Inch and centimeter scales built into the guide allow easy setup for stop blocks, or just for orienting your work. The guides also make great fences for drill presses and band saws, clamping right to your machine's table.

The accessories that attach to the guide's T-slot track simplify a lot of common operations. You can add a jig for drilling pocket holes, stop blocks that are micro-adjustable, sliding router guide plates, featherboards and circular saw guide plates. — *DT*

SPECIFICATIONS

All-In-One Guide
Street price: 24" - $29
36" - $31
50" - $38
Performance: ●●●●○
Price range: $$$
All-In-One: 562-945-6759 or allinoneclamp.com

PENN STATE CLAMPS ARE A GREAT BARGAIN

You can never have enough clamps, but you can go broke buying as many as you want. Penn State Industries has a new clamp in a popular style at what should be a popular price. The Clamp-n-Spread is a one-handed clamp that's similar to some now sold in Sears stores. The major difference is the Sears clamps have a second spring-loaded lever to open the jaws of the clamps bit-by-bit one-handed. The Penn State clamps offer a release button that simply allows the clamping jaw to slide open on the bar. Oh, and the Penn State clamps are half the price!

One-handed clamps aren't for panel glue-ups or case construction, but when you need to clamp a jig to your bench or temporarily hold some pieces in place, a one-handed clamp is a joy. Everyone should have about four of them on their bench. They'll also function as spreaders by relocating the fixed head.

The 12" Clamp-n-Spread clamps cost $9.95 each and the 24" versions are $13.95 apiece. They're a steal. Penn State also sells one-handed clamps that have a threaded jaw pad for more clamping power. Called the PSI Power Spreader, these are the same price as the Clamp-n-Spread. — DT
Performance: ●●●●○
Price range: $ $ $ $ $

Penn State Industries: 800-377-7297 or pennstateind.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 david.thiel@fwpubs.com, or visit our web site at popwood.com to sign up for our free e-mail newsletter.

— David Thiel, senior editor

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For precision and speed, nothing can touch our new TwinLaser™ Compound Miter Saw. Because the TwinLaser™ system shows the exact line of cut on either side of the blade kerf, at any angle, with or without the blade in motion. It's even bright enough for outdoor use. You might have even seen it on New Yankee Workshop with Norm Abram. Call 800-438-2486 (US), 800-463-3582 (Canada) or visit deltamachinery.com for a free catalog.

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CIRCLE NO. 115 ON FREE INFORMATION CARD.

The Magic Trammel Jig

Rout precise circles and ovals without having to follow a line.

The trick to learning to cut precise, professional-looking circular and oval shapes is to achieve a "fair curve." This is a curve with no bumps, divots or abrupt changes in direction – the curve must appear to be a single, flowing line.

While you can achieve a fair curve with a band saw and a belt sander, the best tool in your shop for making a fair curve is your router. With the aid of a trammel jig, you can rout circles and ovals more precisely than you can by laying them out and cutting them with any other tool in your shop.

Making the Trammel Jig

The trammel jig consists of three parts:

- a single fixed pivot for routing circles;
- a plywood plate with two movable pivots for routing ovals;
- a long beam with a mounting plate on one end to hold the router and swing it around the two pivots.

by Nick Engler

Nick Engler, author of more than 50 books on woodworking, has built a replica of the 1903 Wright Flyer, the first true airplane.

As shown, the beam is 32" long with pivot holes spaced every ½". This lets you rout circles up to 60" in diameter and ovals up to 48" long. For larger workpieces, all you have to do is make a longer beam.

At one end of the beam, attach a router mounting plate and drill holes to mount your router. Remember, the holes must be counterbored or countersunk so the head of the mounting screws do not protrude.

The circle pivot block is a square block with a pilot hole in the center of one face. The oval pivot block has two dovetail slots

Routing an oval with a double trammel setup. The resulting curve is perfectly fair.

Photos by Tim Grondin

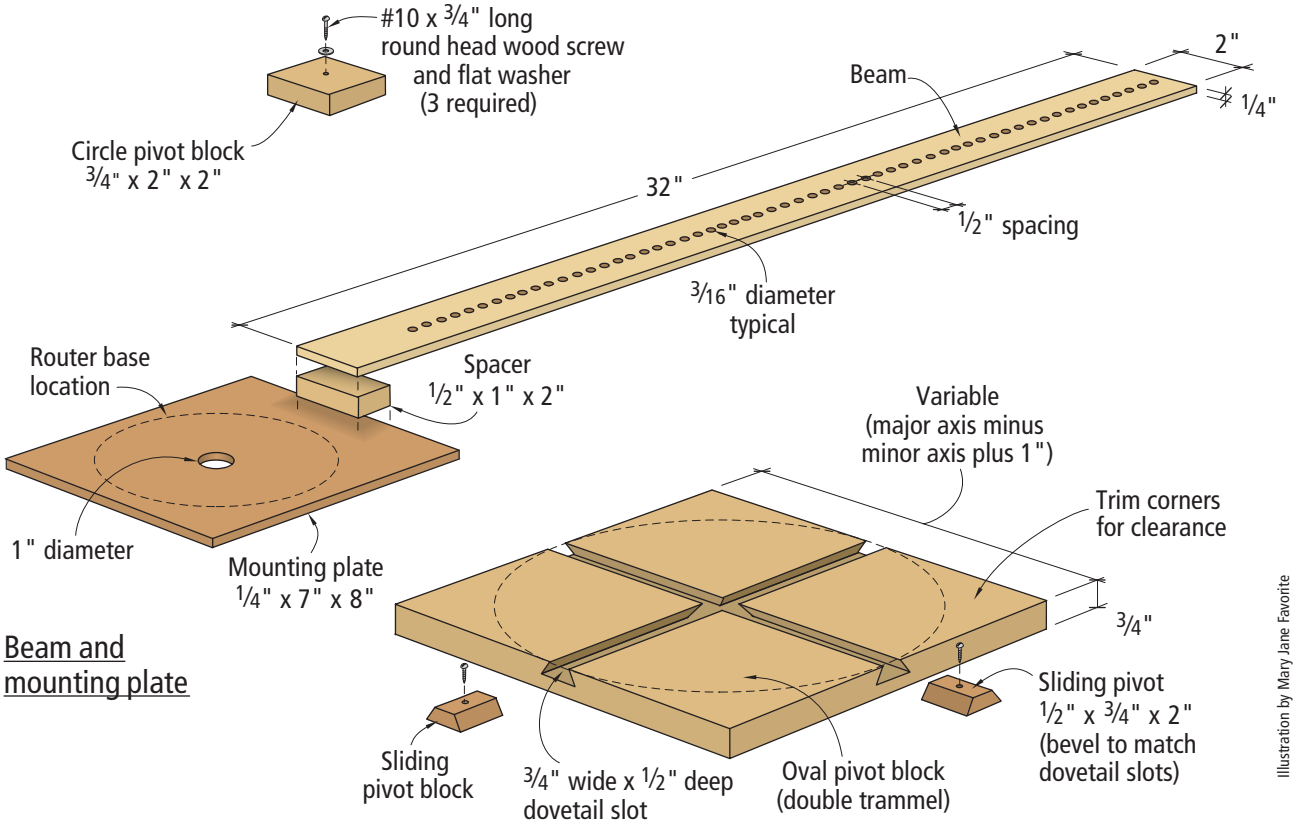


Illustration by Mary Jane Favorite

that cross at right angles in the middle of the block. To cut these slots accurately, first rout ordinary grooves with a straight bit to remove most of the stock. Then use a dovetail bit to create the angled shape. Cut the sliding pivot blocks to fit the dovetail slots, making them small enough to slide easily.

Depending on the size of the ovals you want to rout, you may have to adjust the size of the oval pivot block. I made mine 8" in diameter – this works well for a variety of small- and medium-sized ovals. To determine if this will work for you, subtract the minor axis of the oval (its width) from the major axis (its length). Add 1" to prevent the sliding pivots from slipping out of the slots, and that's the minimum diameter of the pivot.

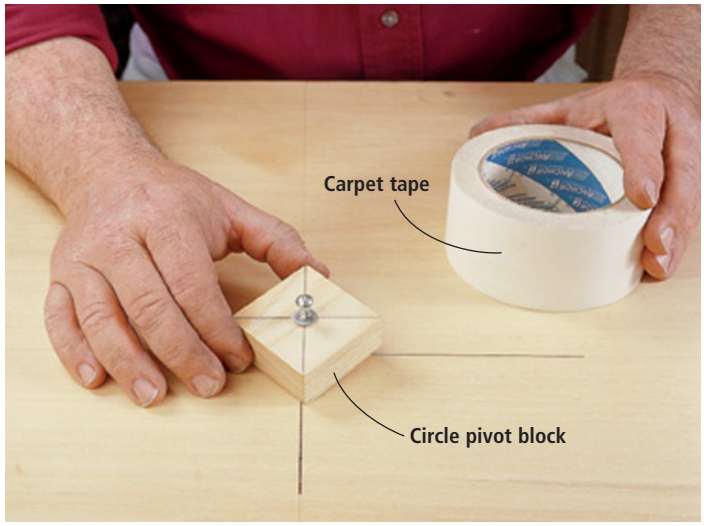
Cutting a Circle

To rout a circle, position the circle pivot block in the center of your workpiece (shown at right) and attach it with double-faced carpet tape (so you won't have to drive a screw or a nail into your work and mar the surface).

Mount a straight bit in your router and attach the router to the beam. Drive a round-head screw through the beam and into the center of the pivot block.

The distance from the screw to the edge of the bit should be equal to the radius of the circle you want to cut. You can adjust this radius either by varying the diameter of the bit or drilling new holes in the beam.

Swing the router and the beam around the pivot clockwise, cutting your circle. Make the circle using several passes, routing no



When you mark the center of the circle on your work, draw a large crosshair. Fasten the circle pivot block to the work with carpet tape, aligning the corners with the arms of the crosshairs. This will center the block precisely. Attach the beam to the block and rout your circle.

deeper than 1/8" with each pass until you have cut through the wood.

Cutting an Oval

To rout an oval, you must swing the router around two movable pivots in an arrangement called a "double trammel." The pivots slide back and forth in their dovetail slots; one controls the length of the oval while the other controls the width.

Start by marking the center of the oval on your workpiece. Draw two lines at right angles that intersect at this point, then mark the length of the oval along one line and its width along the other.

Attach the oval pivot block to the workpiece with carpet tape, centering the slots over the lines you have drawn. Attach the router to the beam and align the beam with the major axis (length) of the oval.

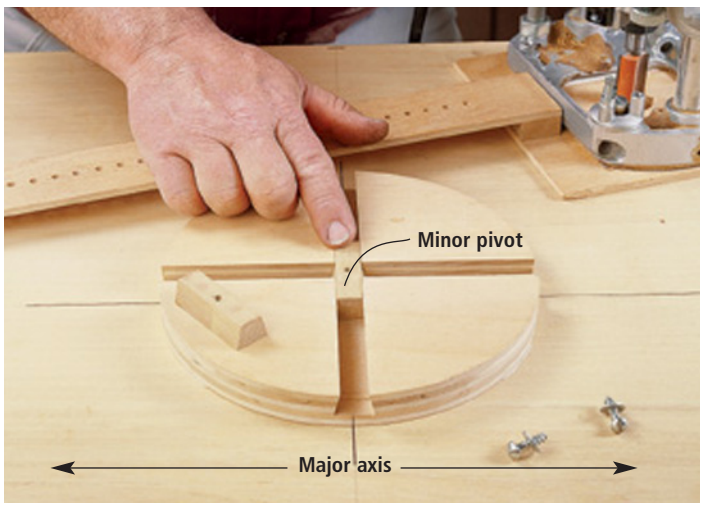
Center the minor pivot (which is the pivot that moves along the minor axis, or width) and fasten the beam to it with a roundhead wood screw.

Next, swing the beam 90°, aligning it with the minor axis. Position the router so the bit is even with the mark for the minor axis, center the major pivot and attach the beam with a screw. The beam should not be fastened too tightly to either pivot.

To check your setup, swing the router once around the pivot block with the power off. The bit should pass over the end of the major and minor axes.

Once this is done, turn on your router, adjust the depth of cut for a shallow bite and swing the router around the pivots. As you rout, pull gently outward. The slight tension will take any play out of the mechanical system, helping to create a smooth, precise oval. Rout in multiple passes, cutting just a little deeper with each pass. **PW**

To rout an oval, position the minor pivot over the center of the oval where the two slots cross.



Position the router so the inside cutting edge of the bit (the edge nearest the center) is even with one end of the major axis, then attach the beam to the pivot by driving a roundhead screw through one of the predrilled holes. If none of the holes are aligned over the pivot, you must use a different diameter router bit or drill a new hole.

Repeat, centering the major pivot and aligning the inside cutting edge of the router bit with the mark for the minor axis. Note that the minor pivot has slid to the opposite side of the pivot block from the router.

Splined Joints

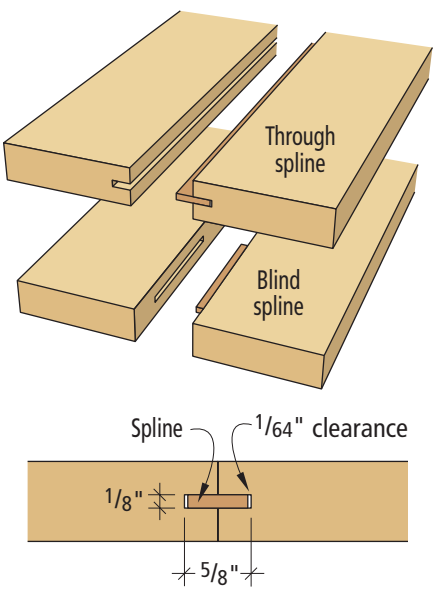
Learn how to make one of the best tools to align your edges and joints – the spline.

Photos by the author

A shop-made angle sled allows you to cut bevels and spline grooves on the table saw without tilting the blade. Clamp the work to the sled's sloping fence and guide the sled along the saw's rip fence to make the cut.

If you want to increase a joint's strength and simplify its assembly, I suggest adding a spline. It's an enhancement that is often advocated for edge joints, but it is most appropriate in a miter joint. The process is pretty simple: You cut the grooves in the mating surfaces of the joint and as you assemble the joint you insert a spline, which bridges the seam and links the two pieces.

The drawings below show the most common varieties. In the through spline, the grooves are cut from edge to edge and the ends are visible in the assembled joint. In the blind spline, the grooves end short of either edge, making the spline totally concealed in the assembled joint. A stopped spline is the compromise: visible at one end, concealed at the other.



Splined edge-to-edge joints

Spline Materials

Because the nature of the spline can have an impact on the method you use to cut the grooves, you should think about whether you want to use solid wood or plywood.

Plywood is strong, because of its criss-crossing plies, and it is stable, meaning you can use it without worries about grain orientation. The primary reservation I have about plywood is with its thickness. It's surprisingly difficult to cut a closely fitted groove for ¼" plywood, which we all know ain't ¼".

At the table saw, two passes with the same setup and with each side against the rip fence gives you a centered groove for an edge-to-edge joint. And you can use the two cuts to customize the groove width. But when your narrowest cut is ¼", as it is with a dado cutter, the plywood's thickness is a concern. Even cutting with a 7/32" router bit doesn't produce a good fit. A spline that's poorly fitted can result in misalignment and a joint that's weak.

Solid wood splines are extra work, but you can customize the thickness to suit standard, easily-cut groove widths – ⅛", 3/16" or even ¼". Moreover, if the spline is going to be visible, you can use either the working stock, so it nearly disappears, or a contrasting stock, so it's more of an accent.

Another thing to be wary of is the grain direction in the spline. The grain in the spline should run parallel to the grain in the mating parts, unless you're using it in a miter. Then the spline's grain should run perpendicular to the joint seam.

Cutting the Grooves

The primary tools for cutting the grooves are the table saw and the router, either hand-held or table-mounted. Boil down all the joint variations and you discover that you have two basic cuts: 1) into square edges and 2) into beveled edges. When you cut into square edges the setup steps are pretty routine for both the table saw and the router.

by Bill Hylton

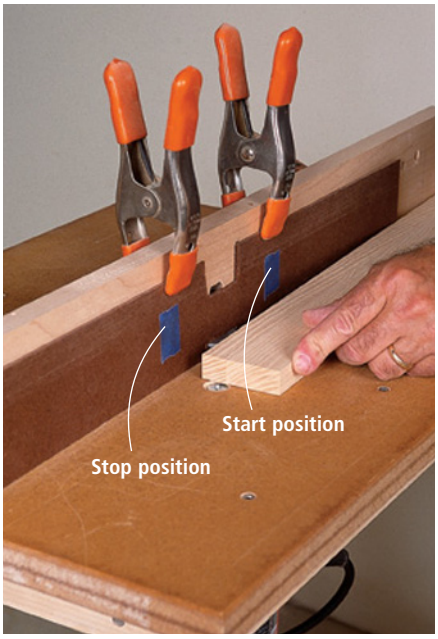
Bill Hylton is the author of several books on router woodworking and furniture making. He'll be giving seminars on power-tool joinery at select WoodWorks 2003 shows.

• **First, select a cutter.** At the table saw, ask yourself if a pass with the standard blade (typically producing a 1/8" kerf) will be adequate. Do you switch to the dado cutter, with a minimum kerf-width of 1/4"? Can you make successive passes with a careful setup to produce a kerf width between 1/8" and 1/4"? At the router table, select either a straight bit or slot cutter, then choose the appropriate dimension of cutter.

• **Set the cutter.** With your cutter selected and installed, you next have to adjust its height. Raise the saw blade or the straight bit to the depth you want for the spline groove. For the slot cutter, raise it to position the groove; the depth is controlled by the fence.

Appropriate depths vary with the orientation. In a square edge, you can cut 1/2" or more deep. Limit a cut into a face to about one-third of the board's thickness. Edge-miters and end-miters should be limited so that you don't weaken the stock. In 3/4" material, a 3/8"-deep slot is fine.

• **Set the fence.** The fence guides the work and establishes where the cut will be. (The exception is when you use a slot cutter, as I just mentioned.) Position the fence, then check the settings with a test cut.



Blind slots for splines can be cut on the router table with a slot cutter. Remove the bearing from the cutter assembly so a zero-clearance facing clamped to the fence doesn't rob you of too much cut capacity. Starting and stopping points are marked with blue tape.

• **Establish a reference face.** Mark each workpiece to ensure you are using the same face on each piece to index the cut. Otherwise, you'll have misaligned slots.

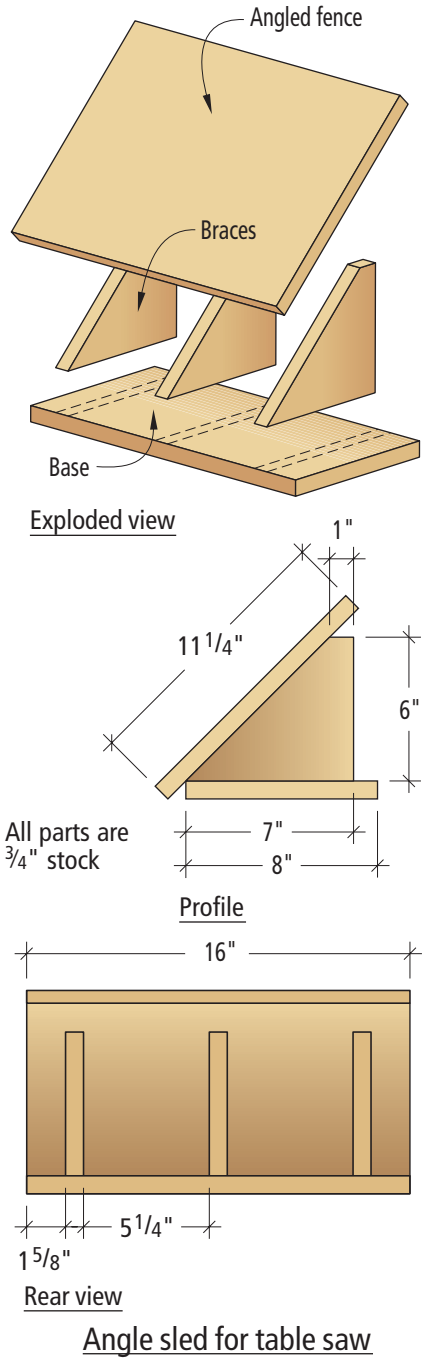
• **Make the cuts.** Through-cuts are straightforward, regardless of which tool you're using. The table saw cuts to full depth in a single pass, as does the slot cutter. With a straight bit, limit the bite to about 1/8" per pass and plan on making two or three passes to complete a groove.

Stopped cuts and blind cuts should not be done on the table saw. They can be done much more easily on the router table with either a straight bit or a slot cutter. Mark the starting and stopping points on the fence, align the end of the workpiece with the mark on the outfeed side and plunge it onto the cutter. Feed right to left until the trailing end lines up with the mark on the infeed side, then lift or pivot the work off the cutter.

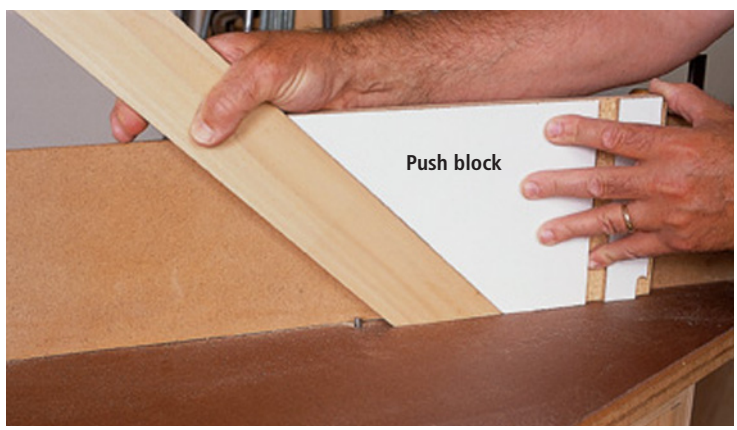
• **End slots.** Slotting the end of a workpiece can be very simple. A tall facing clamped to the router table's fence can support the work for a straight-bit cut. Use a push block to keep the workpiece square as you slide it along the fence. If you're using a slot cutter, the work rests flat on the tabletop. That's a big benefit. On the table saw, you can use a tenoning jig to guide the cut.

Regardless of your approach, it's a good idea to use a zero-clearance insert around the cutter. You don't want the work to catch on the cutter opening, whether that opening is in the fence or the tabletop.

A flat miter is square-edged, though because of the angle you probably don't think of it that way. The pitch of the piece probably will prevent you from using a tenoning



Angle sled for table saw

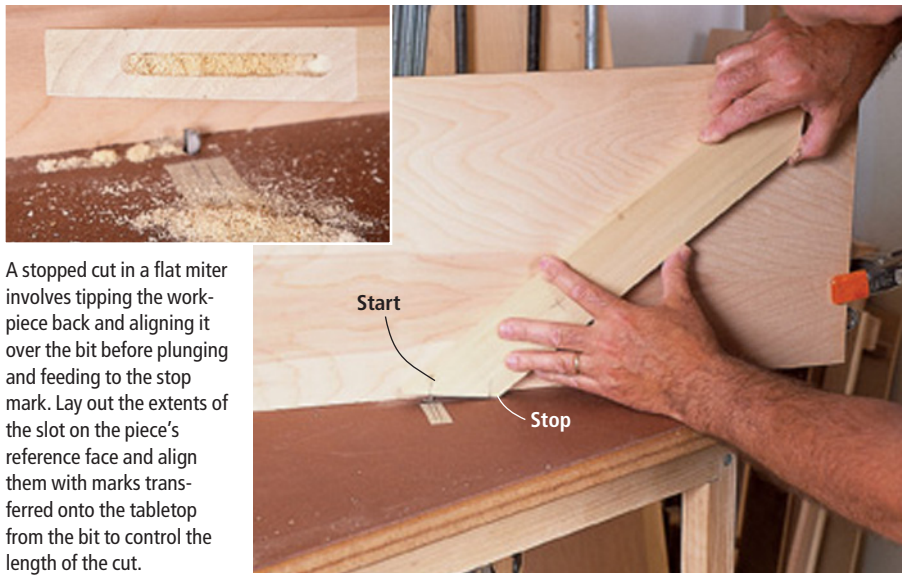


Use an angled push block to back up a through-cut in a flat miter. A tall fence facing helps steady the work, and a zero-clearance auxiliary tabletop (an 1/8" hardboard covering for the tabletop) prevents catching the work on the bit opening.

jig, but you can mount a tall facing to your rip fence and use a push block, making the cut the same way you would on a router table with a straight bit.

With a flat miter, your push block's leading edge needs to be angled exactly like the miter. Your piece will be leaning forward when you slot one end, leaning back when you slot the other. Use the same push block for both cuts and just roll it over between cuts.

• **Stopped-end & blind-end cuts.** Because an end slot is likely to be short even when it is through, making it stopped or blind presents real maneuvering challenges, regardless of the tool you use. This is a good place to use a biscuit or two.



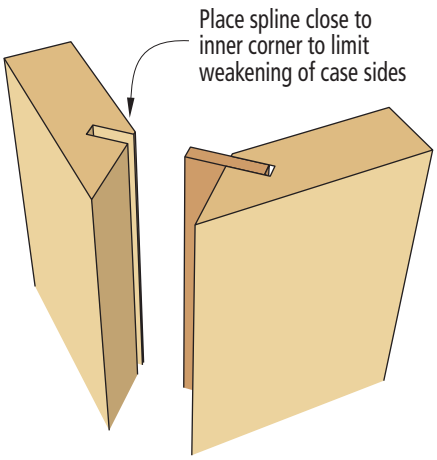
A stopped cut in a flat miter involves tipping the workpiece back and aligning it over the bit before plunging and feeding to the stop mark. Lay out the extents of the slot on the piece's reference face and align them with marks transferred onto the tabletop from the bit to control the length of the cut.

Grooving Bevels

The starting point for a successful splined miter joint – whether an edge miter or an end miter – is making accurate 45° bevels on the stock. After cutting all these, lay out the spline groove on one piece. To avoid weakening the tips of the bevels, you want to locate the spline slot very close to the joint's inside corner. This allows you to make a 3/8"-deep cut without weakening the stock.

Decide how wide your slot will be. The spline doesn't need to be very thick, and in most instances a single saw kerf is satisfactory. If you want the spline thicker, you'll have to either use your dado cutter or kerf each piece, then reset the fence to widen the kerf.

With an edge miter, place the fence so the blade tilts away. Feed the stock along it with the sharp edge of the bevel against the fence. With an end miter, use the miter gauge to guide the stock. (The rip fence can safely be used to position the work for this cut.)

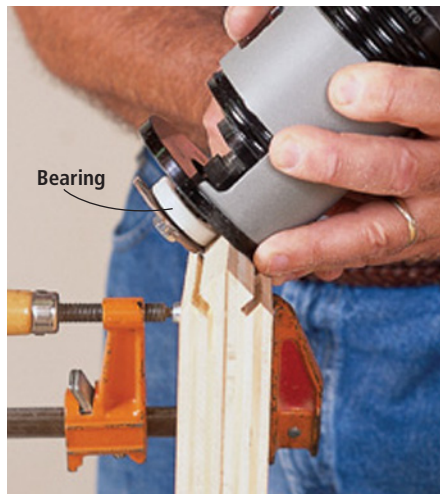


Diagonally splined end miter

Router Grooving

Splined joinery isn't the exclusive province of stationary tools. With a router and slot cutter, you can cut the grooves for most every splined joint. A few can be done with a straight bit and an edge guide.

With a slot cutter, the router sets on the face of the workpiece while the cutter works the edge. To alter the cut depth with a slotter, just switch bearings. Installed in a small router, a slot cutter can groove ends and flat miters. Even edge miters and end miters can be grooved with this setup. Clamp two workpieces face to face so the bevels angle to the outside. Rest the router on one bevel and the slotter cuts a groove in the adjacent one, as shown in the photo at right.



With the work sandwiched face-to-face, you can guide a trim router along one bevel while the slot cutter grooves the other bevel. Use an oversized bearing, positioned as shown, to limit the depth of the cut.

Assembly

Fitting the splines comes next. Plywood splines are easy – you just cut them to width and length. If the spline is stopped or blind, the ends usually must be rounded to fit.

A wood spline has to be measured for thickness, then ripped and crosscut to fit. Its ends sometimes must be shaped. For an end miter or flat miter, the spline's grain should be perpendicular to the joint's seam. Crosscut strips of a long blank and glue them side-by-side in the slot in one part, then assemble the joint. Assembly is usually uncomplicated. Just spread the glue, insert the spline, close the joint and apply clamps.

The real payoff comes in assembling a miter joint. Typically, miters are difficult to get into alignment and, as clamps are applied, to keep in alignment. That is seldom the case when the miter is splined. The spline prevents the faces of the bevels from slipping and sliding, and you can apply clamps without extra alignment blocks or glued-on, tacked-on, clamped-on cleats for the clamps to grip.

Ease-of-assembly is the whole point of the spline, and it really works. **PW**

Forrest Blades

Quality Blades for America's Craftsmen

Serious woodworkers demand perfection. That's why so many of them choose Forrest saw blades.

Forrest quality is legendary. Our proprietary manufacturing process, hand straightening, and unique grade of C-4 micrograin carbide give you smooth, quiet cuts without splintering, scratching, or tearouts. In fact, independent tests rate our blades as #1 for rip cuts and crosscuts.

Forrest saw blades are simply the best that money can buy. They're made in the USA by the same family-owned business that's been producing and sharpening them for over 55 years. And they're backed by a 30-day money back guarantee. It's no wonder that serious woodworkers give them such high praise!

"Your blades are without question the best by miles, and I have tried them all."
Bob Jensen–Fridley, MN

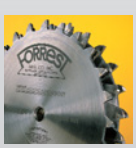
"These are the finest blades I have ever owned and you should be proud of your quality product."
Patrick T. Hankard–South Windsor, CT

"[Forrest blades] cut true, with no vibration. I was a carpenter by trade for over 60 years and continue to be an active woodworker. So, I can say with confidence that Forrest blades are the best."
Carl Stude–Burbank, CA

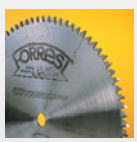
The message is clear. If you're looking for quality, performance, and value, it pays to choose Forrest blades every time.

Our Most Popular Blades:

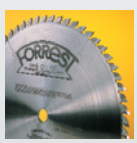
Woodworker II – This award-winning, all purpose blade is the finest of its type. It turns big jobs into easy-to-handle ones.



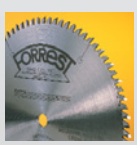
Dado-King – The world's finest multi-tooth dado set. It works effectively in all directions—with the grain or across it.



Chop Master – Produces perfect miters every time—with no bottom splinters. You get smooth edges on all types of wood.



Woodworker I – Great for table and radial saws. It trims and crosscuts all woods up to 2" and is ideal for plywood.



Duraline Hi A/T – Our best blade for birch and oak ply veneers. It also delivers a clean cut on melamine and vinyl over particle board.

Forrest blades come in a wide variety of sizes and are available for practically every application. Call or send for our complete list of products.

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We back our blades with a 30-day money back guarantee. So, choose the method most convenient for you and order today:

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- **Call us toll free at 1-800-733-7111.** (In NJ, 973-473-5236) Ask about special discounts, free shipping on orders over $275, and discounts for blade sharpening.
- **Contact our internet store:** www.stores.yahoo.com/forrestman

FORREST

The First Choice of Serious Woodworkers Since 1946

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CIRCLE NO. 119 ON FREE INFORMATION CARD.

Shaker Trestle Table

A classic design with extra stability and an antique finish.

I've built a number of trestle tables in the Shaker style over the years, usually following the style of an original table from one Shaker collection or another. But when I decided to do a trestle table for *Popular Woodworking* readers, I took a second look at some of the designs and decided I could add a feature and come up with a stronger table without sacrificing the simple Shaker lines.

The one shown here is a standard two-pedestal table with a single stretcher tying the bases together. One of the concerns I've always had with this design was the stability of the joint at the stretcher. Anyone who has been to a family dinner at my house knows that a sturdy table is important when everyone starts hungrily reaching for platters of food. To solve the stability concern I doubled-up the hardware from another sturdy piece of furniture – the bed. By using a pair of bed bolts at each joint, this table becomes amazingly stout.

Save Money on Wood

If you've seen my other furniture (hueyfurniture.com), you know I'm addicted to figured maple. Though they've tried to get me into treatment, I haven't yet accepted that I have a problem.

But when it came to choosing the wood for this table, even I had to admit that with such a simple piece, adding busy figure to the base would be gilding the lily. So I saved the good stuff for the top and chose to use painted poplar to build the base.

by Glen Huey

Glen Huey builds custom furniture in his shop in Middletown, Ohio, for Malcolm L. Huey & Son. He is a contributing editor for Popular Woodworking *and is the author of "Fine Furniture for a Lifetime." You can see more of his work at hueyfurniture.com.*

Photos by Al Parrish

Nibbling away the mortise locations on the leg halves can be accomplished with a flat-tooth rip blade or a dado stack.

Step photos by the author

Half a Foot, not Six Inches

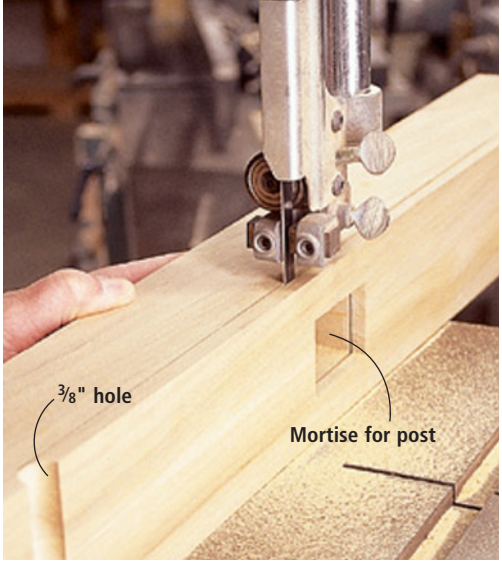
Construction on the base begins with the feet blanks. The feet actually are two "half-feet" that you face-glue together. This allows you to conserve lumber (no sense trying to find 3" x 3" wood for a painted base) and you can make the mortise for the leg post before gluing the halves together. Mill out the two halves for each foot, then clamp the pairs together and lay out the two notches that will form the 1½" x 2¼" mortise for the post tenon.

There are many ways to remove the waste material from the notches, but I'm a table-saw guy, so that's where I headed. Use your miter gauge and make repeated passes across the blade to nibble away the waste area on all four pieces, as shown above.

With the notches cut, it's time to make the halves a whole. When gluing the two halves together, the last thing you want are the pieces to "creep," or slide on the glue, which will cause misalignment. My solution is to mount a 1" section of a #6 finish nail into one half by drilling a small hole and gluing in the nail piece with the point out. As you glue the two halves, align the two sections and press them together. The nails "bite" into the wood and prevent creeping. Go ahead and clamp the pieces securely and set them aside to dry.

While the feet could be left flat at the floor, it's not as attractive as shaping them to leave "pads" at either end. It also helps the table to sit flat on uneven floors. To form the pads, clamp the two assembled feet together with the bottoms facing the same direction. Mark the pads on the feet according to the illustrations, then drill a ⅜" hole at the transition point at either end. The hole itself will create the small radius for the transition. After making the two holes per foot, head to the band saw to cut away the portion between the radius cuts to finish the pad shapes.

Some simple shaping using a couple of saws will give the feet an even more graceful look. First cut a 7° bevel on the ends of the feet using the table saw. Next, make a mark ¾" down from the top edge at the ends of each foot. Make another mark 10½" in to-



After gluing the halves together, I first drilled two 3/8" holes to define the foot pad and then connected the dots. The rest was simple band saw work.

With the post cut to shape, the first step in forming the tenon is to define the shoulder on all four sides. The miter gauge (hidden behind the work) on my saw works well, while the rip fence allows you to set the shoulder location.

I use a high-sided shop-made tenoning jig to cut the cheeks on the tenon. You could also nibble away the waste á la the foot mortise if you don't have, or want to build, a tenoning jig.

The top of the post is notched 4" deep, so the table saw won't cut it (pun intended). The band saw will and I use staggered cuts to remove much of the wood, then chisel out the excess. Notice the notch isn't centered on the post, but offset by 1/4" to one side.

ward the mortise at the top of the leg. Connect the two marks and you have the slope for the top of each foot. Head to the band saw and cut the slopes. To finish the feet, sand the surfaces and round all the edges with a 3/16" radius bit in your router.

Going Vertical

The next step is the 2 7/8" x 2 7/8" posts. As with the feet, there's a good chance you'll need to glue up thinner pieces to form the posts.

Once assembled and milled to the size given in the cutting list, it's time to form the tenons to match the mortises in the feet. Start cutting the tenons by first defining the shoulder on the table saw with the posts flat on the saw's table. Then reset the table saw and run the posts upright to form the cheeks. Cut two cheeks, then adjust the fence and cut the other two. Make the tenons slightly oversize and then trim them to achieve a snug fit.

At the tops of the posts, cut out a notch the width of the post to hold the cross braces. Lay out this notch using the photos above to locate them. Note that the notches aren't centered in the posts – rather, they're offset by 1/4" to one side. An easy method to remove the 4" of waste is to hog the majority out with a band saw, then chisel away the remaining waste. To finish off the posts, use a chamfer bit in your router to make decorative cuts on each edge, stopping 7/8" from the joinery at each end.

Visible Means of Support

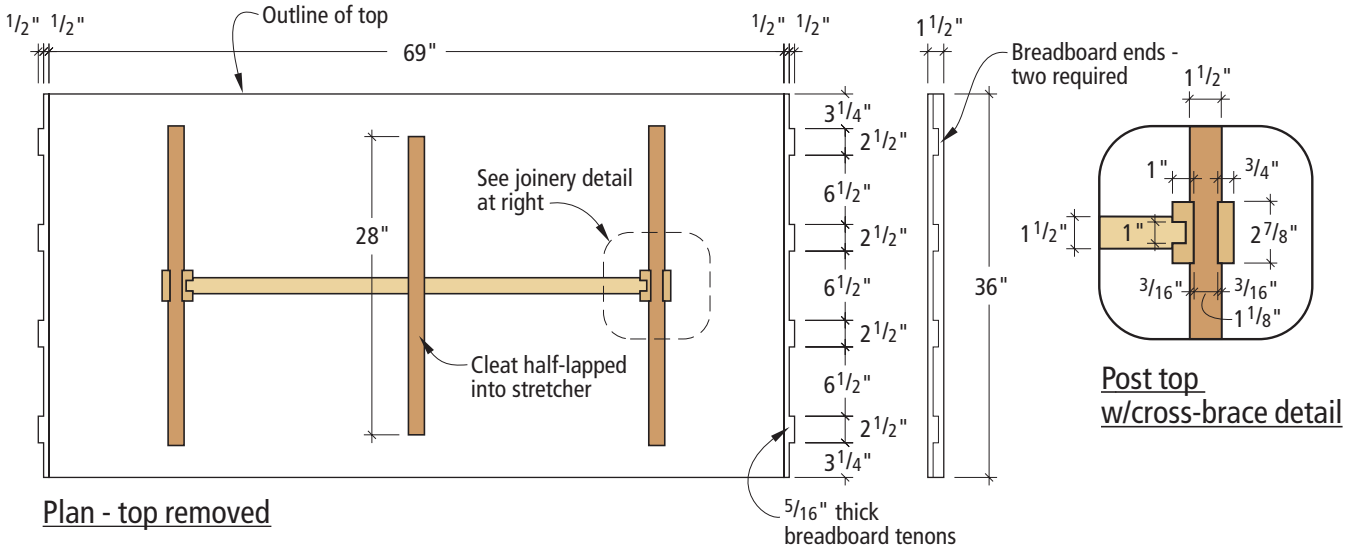
The part of the leg that actually supports the top is the cross brace. Mill the stock for the cross braces, then use the table saw to nibble away the shallow notches (as you did on the feet halves) on the two opposing sides of each brace. These notches will fit into the 4"-deep notches at the tops of the leg posts, so test the fit to make sure it's snug, but not too tight.

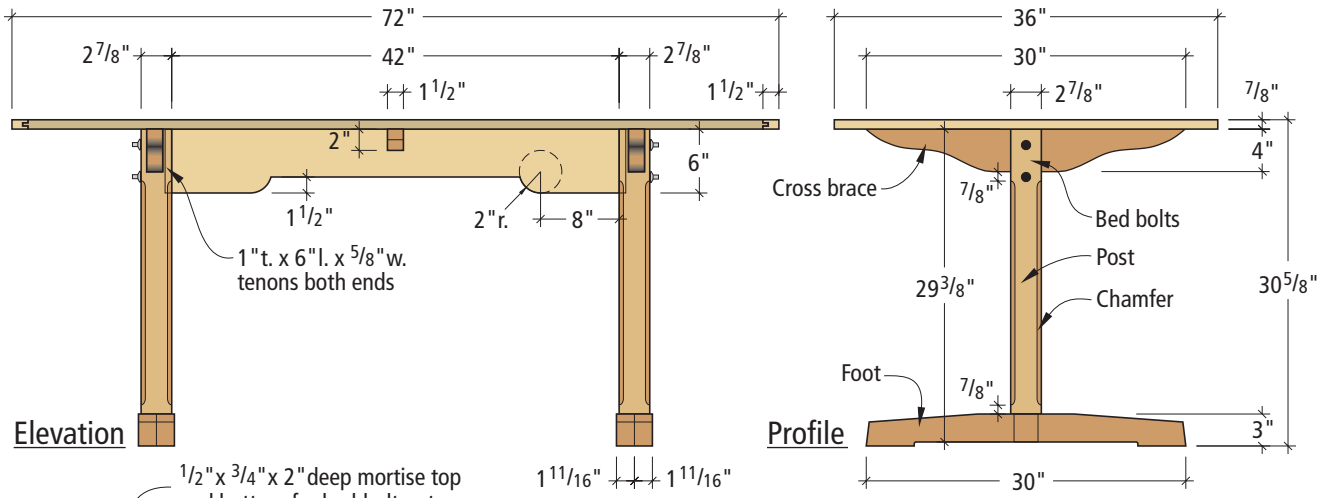
While the cross braces are mostly hidden under the tabletop, they can be seen at times and therefore there's no sense leaving them square and chunky. Use the pattern (at right) to trace

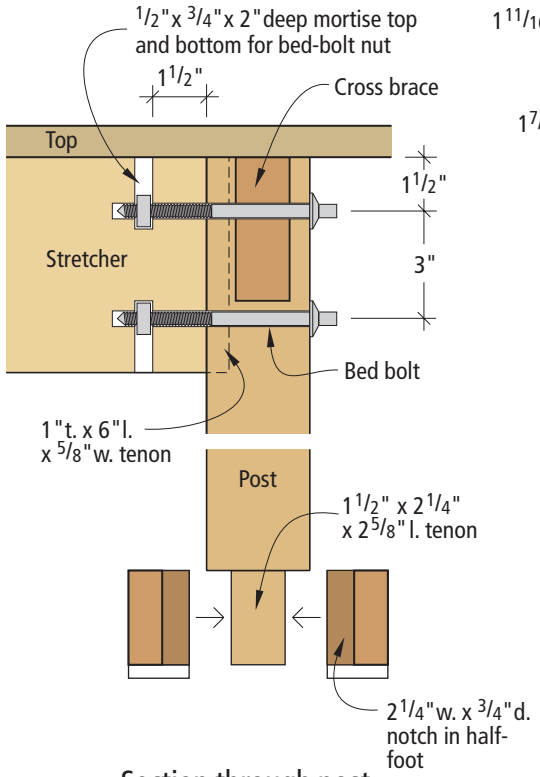
SHAKER TRESTLE TABLE

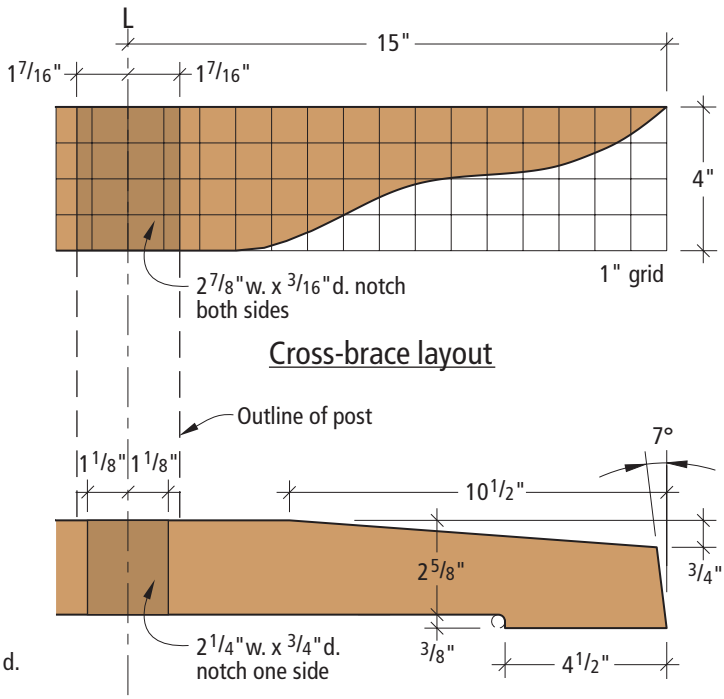
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	4	Feet halves	1 11/16	3	30	Poplar
❑	2	Cross braces	1 1/2	4	30	Poplar
❑	2	Posts	2 7/8	2 7/8	29 3/8	Poplar
❑	1	Center brace	1 1/2	2	28	Poplar
❑	1	Stretcher	1 1/2	6	43 1/4	Poplar
❑	1	Top	7/8	36	71	Cherry
❑	2	Breadboard ends	7/8	1 1/2	38*	Cherry
❑	10	Top fasteners	3/4	7/8	2 1/4	Cherry

*Finished size is 36" long.


1/2" 1/2"
Outline of top
69"
1/2" 1/2"
1 1/2"
Breadboard ends - two required
1 1/2"
3 1/4"
2 1/2"
6 1/2"
2 1/2"
6 1/2"
2 1/2"
6 1/2"
2 1/2"
3 1/4"
28"
See joinery detail at right
Cleat half-lapped into stretcher
36"
1"
3/4"
1 1/2"
1"
2 7/8"
3/16"
3/16"
1 1/8"
Post top w/cross-brace detail
Plan - top removed
5/16" thick breadboard tenons


72"
2 7/8"
42"
2 7/8"
1 1/2"
1 1/2"
2"
6"
1 1/2"
2" r.
8"
1"t. x 6"l. x 5/8"w. tenons both ends
Elevation
1 11/16"
1 11/16"
36"
30"
2 7/8"
7/8"
4"
Cross brace
7/8"
Bed bolts
Post
29 3/8"
Chamfer
30 5/8"
Foot
7/8"
3"
Profile
30"


1/2"x 3/4"x 2"deep mortise top and bottom for bed-bolt nut
1 1/2"
Cross brace
Top
1 1/2"
Stretcher
3"
Bed bolt
1"t. x 6"l. x 5/8"w. tenon
Post
1 1/2" x 2 1/4" x 2 5/8" l. tenon
2 1/4"w. x 3/4"d. notch in half-foot
Section through post


L
15"
1 7/16"
1 7/16"
4"
2 7/8"w. x 3/16"d. notch both sides
1" grid
Cross-brace layout
Outline of post
7°
1 1/8"
1 1/8"
10 1/2"
2 5/8"
3/4"
2 1/4"w. x 3/4"d. notch one side
3/8"
4 1/2"
Half-foot layout

or mark the curved shape on the pieces themselves. Then use the band saw to cut out the shape on the braces, cutting wide of the line and then smoothing the curve with sandpaper.

Now glue the foot and cross brace to each post. To add a bit more strength after the glue has dried, drill two 7/16" holes (on opposite sides of the leg) in each joint and pin the joint with dowels. Make sure to stagger the pins on each side so they don't run into each other. Using a knife or sandpaper, taper one end of each peg a bit to make it easier to insert in its hole. After tapping the dowels in place, cut the extra length nearly flush to the leg surface and sand it smooth.

Bridging the Gap

With the ends assembled it's time to attach the stretcher to tie everything together. This is the joint where you need all the strength you can muster. As I mentioned earlier, I used bed bolts here, but I started with the traditional method of cutting mortises in the legs and tenons on both ends of the stretcher. Start by cutting the 1" x 6"-long x 5/8"-deep mortises on the thicker side of each assembly. I used a Forstner bit to make most of the mortise (see below) then chiseled out the waste to square everything up, but you could use a router with a straight bit. To create the short tenons on the stretcher, I used a rabbeting bit in a router to cut rabbets on opposite faces of the stretcher.

If you haven't used bed bolts before, they're essentially heavy-duty bolts that screw into a square nut buried in a mortise in the other piece. After cutting the rabbets on the stretcher, make two 1/2" x 3/4" x 2"-deep mortises at each end of the stretcher, one in the top edge and one in the bottom edge, to hold the bed-bolt nuts.

To add more stability to the table, a third center brace is half-lapped into the center top of the stretcher. Mill the stock for this part and use one of the finished cross braces as a pattern to shape the center brace. Next, use the illustration to lay out the decorative cut on the bottom edge of the stretcher. Then use the table

Sculpting a shape on the cross braces isn't necessary to keep the table sturdy, but it does keep it from looking clunky. After transferring the pattern onto the brace, I cut wide of the line on the band saw, then used a spindle sander to smooth the shape.

With the cross braces glued to the posts, they are pegged in position. Clamp them tight and check for square between the post and brace. Note that the pegs are at opposite corners of the joint. This allows room for the mortise (in the next step).

Here's the mortise for the stretcher. I removed most of the waste with a Forstner bit, then chiseled the mortise square.

Getting the holes for the bed bolts straight is important. And the best tool for that task is the drill press. The two 7/16" holes are located in 1 1/2" from the top and bottom edges of the mortise.

saw and miter gauge to cut the half-lap joint for the center brace. This piece is attached with glue and a 2" wood screw, but don't attach it until you're done installing the bed bolts.

Use a drill press to make the holes in the trestle legs for the bed bolts. The holes are 7/16" in diameter and are in the center of the stretcher mortises, 1½" from both the top edge and bottom edge of the mortise. To finish making the hole for the bed bolt, slip a stretcher tenon into the end section, clamping the two pieces firmly. Use a long 7/16" drill bit to finish the hole through the end of the stretcher and into the mortise area created for the bed-bolt nut. The straight hole at the drill press acts as a guide to drill the remainder of the hole straight. Clean out any waste from the hole, place the nuts into the mortises, slide the bolt into the hole, and attach it to the nut. Tighten the connection with a wrench.

Holding the Top in Place

I use wooden clips to hold the top in place on the base. The clips have a rabbet cut on one end that slips into slots cut into the cross braces on the base. I use a biscuit cutter set to make a cut for a #20 biscuit and start the slot ½" down from the top of the brace. Because the tenon on the clip is almost ¼" thick, make two cuts with the biscuit joiner, lowering the cutter to finish the cut at ¼" wide. Place two slots on each inside of the cross braces and one on either side of the center brace.

Rather than trying to cut rabbets on the ends of the little wooden clips, start with a 5"-6" wide piece of wood that is 4⅝" long and ¾" thick. Cut a ½" x ½" rabbet along the end grain leaving a ¼" tongue. Then rip the piece into ⅞"-wide strips and crosscut the ends to 2¼"-long pieces.

Pre-drill clearance holes in the wooden clips you've just made to accept a #8 x 1¼" wood screw.

With a Cherry on Top

Again, trying to avoid admitting I have a curly maple addiction, I chose cherry for the top. Cut and glue the slab to the finished size given in the cutting list.

Appropriately, the Shakers used breadboard ends (traditionally called a "clamp") on their tops to hide the end grain and to help keep the top flat. The breadboard requires a tongue on each end of the top for the breadboard to fit over. I created the 5/16"-thick x

SUPPLIES

Ball and Ball
800-257-3711 or
ballandball.com
4 • 6" bed bolts
#U60-076, $5.15 each

Horton Brasses
800-754-9127 or
horton-brasses.com
4 • 6" bed bolts
#H-73, $3.50 each

Olde Century Colors
800-222-3092 or
oldecenturycolors.com
1 • pint of lamp black acrylic latex paint
#2022 (waterbase) or
#1022 (oil-based), $9.40

Rockler
800-279-4441 or rockler.com
1 • pint of Sam Maloof Oil/Wax Finish
#58669, $10.99

10 • #8 x 1¼" slotted screws

Prices correct as of publication deadline.

After clamping the stretcher between the legs and drilling the bed bolt holes into the stretcher I simply dropped the nut into the previously cut mortises and bolted the base together.

Double-wide #20 biscuit slots in the braces work well to hold the wooden top fasteners (shown in the inset photo).

1"-long tongue on the top using a straightedge to guide my router and a ¾" pattern bit.

Use a marking gauge at each edge to locate the tongue depth and align the straightedge to the mark. Set your bit to cut just behind the mark on the bottom side and just covering the mark on the top side to ensure the breadboards will fit snugly against the tabletop on the top side.

After the tongue is made, draw another line on it ½" from the end, running the entire width of the top. At four equally spaced locations on the tongue, mark locations for the 2½"-wide tenons. Trim the tongue around the tenons, leaving them extending the full 1". This is where the breadboards and top will be pinned.

Cut the two breadboard ends and plow the ½"-deep groove the length of the ends for the tongue. Then lay out the areas that match up with the extended tongues and cut the ½"-deep mortises in the bottom of the grooves.

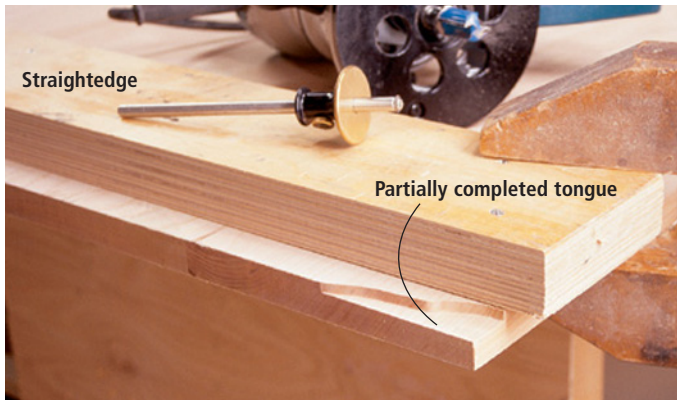
Fit the breadboard ends to the top and clamp. At each extended tongue, drill a ¼" hole for the pin. Use a scrap piece on the underside to prevent "blowout." Remove the ends and elongate the holes to accommodate wood movement. Apply glue to only the middle 4" of the tongue, reinstall the ends, then drive the pins into the holes and apply glue to only the top edge of the hole. Trim the pins and the extra length of the breadboards flush.

Finishing Touches

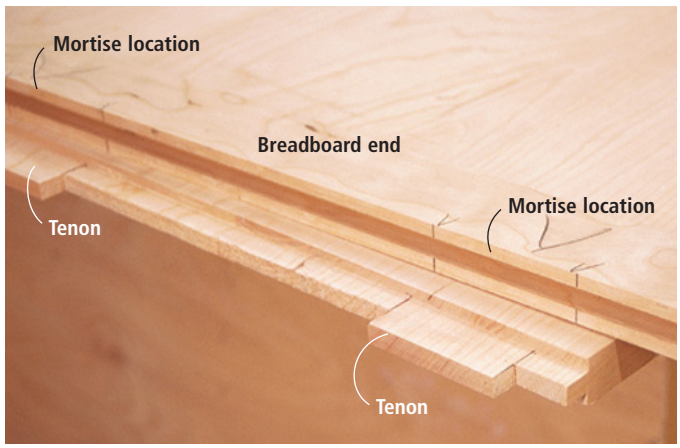
Sand the top with #150 grit sandpaper and rout the edges, top and bottom, with a 3⁄16" roundover bit. Final sand to #180 grit and apply three to four coats of an oil/varnish blend following the product directions, then add a top coat of furniture wax.

After following the instructions in "Painting the Base" below to paint and age your base, attach the top to the base with the wooden clips and #8 x 1¼" wood screws.

You and your table are now ready for years of family dinners with no concerns about sliding the ham or vegetables onto the floor because of a banquet table that's less than sturdy. **PW**



With the top milled to size, mark a 5⁄16"-thick x 1"-wide tongue on each end with your marking gauge. Then use a straightedge and a ¾" pattern bit to shape the tongue on both sides of the top.



After marking and cutting the tenons on the breadboard tongue, use the finished tenons to locate the mortises in the already-grooved breadboard ends.

PAINTING THE BASE

A simple coat of paint on the base may suffice for many, but it looked too new and shiny for my taste, so I added an antique finish to the piece.

Begin by staining the piece and applying two coats of shellac. Sand the finish.

Next, mix Olde Century Colors lampblack acrylic paint with fine sawdust particles and paint the mixture onto the base. As the paint dries, wipe with a very wet rag. The wiping will remove paint and dislodge some of the sawdust pieces leaving a "worn" surface.

Once the paint is dry, apply a coat of Maloof's Oil/Wax finish. Simply brush it on and wipe with a clean rag. This step provides a dull sheen to the paint, adding the look of years of polish.

A simple coat of paint looks too new and shiny for a traditional Shaker piece of furniture.

Here I've wiped the piece with a very wet cloth as the paint dried, which removed some of the paint, creating an antique finish.

WOODWORKING ESSENTIALS

BY NICK ENGLER

CHAPTER 1

Fixed-base Router

The router is perhaps the most versatile tool in your shop. You can rout not only decorative shapes, but also many joints.

Reduced to its simplest form, the router is a motor and a shaft with means of holding interchangeable bits. Once you understand that, using the router becomes a much simpler task. But first, you should know what all those other parts are, and why they're there.

Types of Routers

When you look for a portable router, you will find that they can generally be classified into four categories:

■ The Basic Router

Sometimes called a fixed-base router, this is just a motor mounted on a base. Most offer ½- to 1½-horsepower motors, and their collets will accept router bits with ¼" or ½" shanks. The bases are usually 6" in diameter. This is the router we will be discussing here.

■ The Laminate Trimmer

A scaled-down version of the basic router, this has a smaller motor and base. It has a ¼" collet and is used for trimming laminates and veneers, and is especially handy when you are balancing the tool on thin or narrow workpieces. It's also useful for chores that require finesse, as opposed to strength. Some laminate trimmers come with interchangeable bases that let you work in tight areas or will allow you to rout at an angle, which no full-size router can.

■ The Rotary Tool

This lets you use very small bits and accessories for more delicate work. It's a carving or engraving tool (such as a Dremel) that can be mounted in a router base accessory. It usually has interchangeable collets for 1/16" or ⅛" shanks. The small size lets you rout inlays, cut mortises for small hardware, make delicate joints or do other jobs where a standard-size router would be too clumsy or difficult to balance.

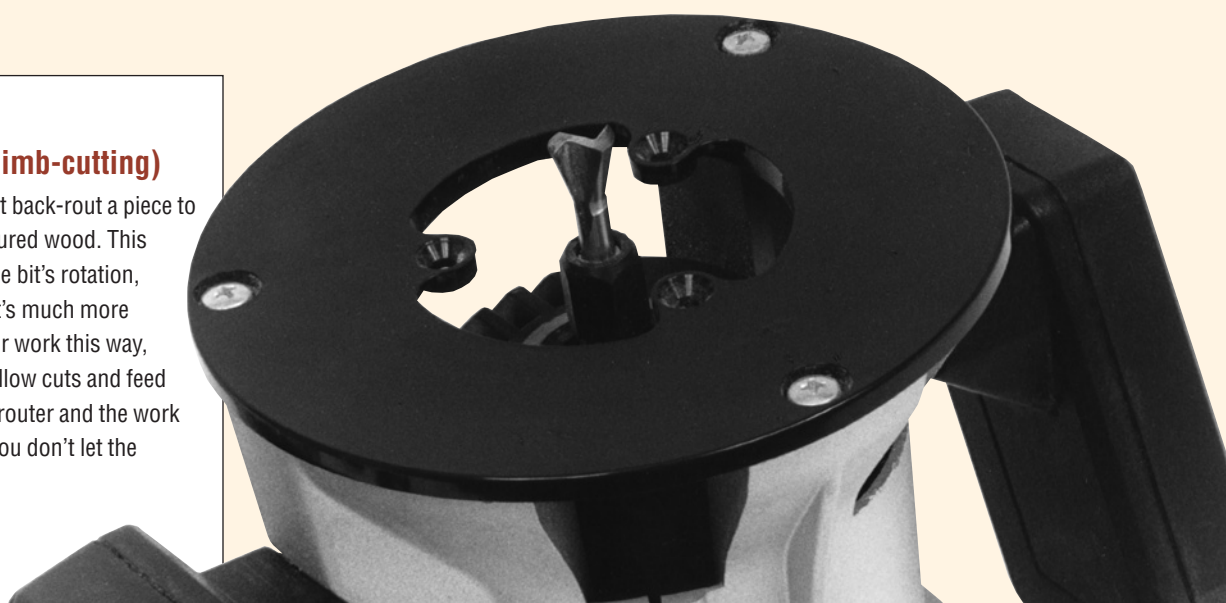
■ The Plunge Router

This does all the things that the basic router can do, plus it makes "plunge cuts." Its motor is mounted on two spring-loaded slides above the base, which let you position the motor above the work, push the bit into the wood and begin cutting. The plunge router excels at cutting joints, such as mortises. *[Editor's Note: We will focus more on the plunge router in Chapter Two.]*

PRO TIP:

Back-routing (climb-cutting)

Occasionally you must back-rout a piece to reduce tear-out on figured wood. This means you cut with the bit's rotation, instead of 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 you don't let the bit chatter.



TIPS & TRICKS

PRO TIP:

The Need for Speed

Despite a popular misconception, speed controllers will not harm universal motors (the type of motor found in all routers and most hand-held power tools). However, they can ruin induction motors. If you buy an in-line speed controller, be sure you use it for your portable power tools only.

GREAT TIP:

A Better Bit Goes a Long Way

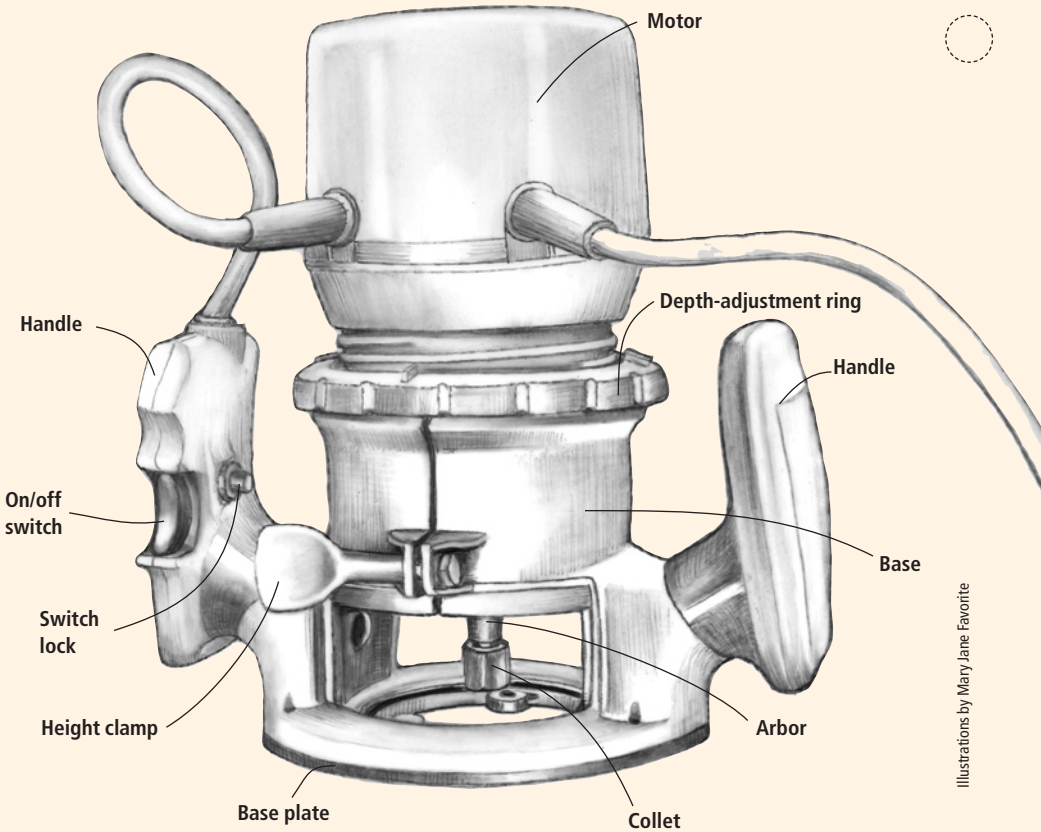
You should put as much, if not more, care and consideration into choosing bits as you would the machines that run them. After all, it's not the router that does the actual cutting – it's the bit. A mediocre router outfitted with a better-than-normal bit will cut a lot better than the world's greatest router with a mediocre bit.

GREAT TRICK:

Offset Baseplates Keep Your Router from Tipping Over

Even with half of the router base in contact with the wood surface, it can be difficult to keep the tool from tipping. When you must hang the router over an edge, as when routing an edge detail, make sure you attach an offset baseplate to the router's base. Keep the offset portion of the plate over a solid surface and press down on it as you work, thereby steadying the tool.

Photo courtesy of Patrick Warner, patwarner.com



Illustrations by Mary Jane Favorite

The bulk of the router is its motor. An arbor protrudes from the bottom of this, and the end of the arbor is fitted with a collet to hold a bit in place. These three pieces are mounted in a base, which incorporates a depth-adjustment ring to raise or lower the motor, and a height clamp to secure it in position – these clamps differ for the plunge router, as you'll see in the next chapter. A router also has handles so it can be guided, with a nearby on/off switch. This entire assembly rests on a removable plastic base plate or sole.

Router Features and Capabilities

No matter what kind of router you opt for, there are several features you need to understand that are important in the operation of the tool:

- **Collet**

Although it might seem small and insignificant, the collet is crucial – a poorly designed one might let the bit slip, ruining the cut. To compensate, many woodworkers overtighten the collet, which only aggravates the problem. Overtightening makes the bits hard to mount and dismount, and can cause excessive wear on your tool.

To avoid this, make sure you get a router with a good collet. You can judge if a collet will give you problems by learning how it works. A collet is a split or segmented collar at the end of the arbor that holds the shank of the bit. Tightening a nut squeezes the collar around the shank, locking the bit.

Generally, the more segments on a collet the better, because these make the collet more flexible so it can get a better grip on the bit shank, as you can see in the drawing at right. Routers with multiple-segment collets tend to be a bit more expensive, but the potential headaches they eliminate are well worth it.

Some routers have split arbors, rather than collets. Either way, the same rule applies: the more segments, the better.

Collets come in three standard sizes – ¼", ⅜" and ½", which is the measure of the inside diameter. Most router bits have ¼" and ½" shanks. If you want to take full advantage of all the bits available, you should look for a router with interchangeable collets.

Some routers have only ½" collets, but come with split bushing so you can adapt them to hold ¼" and ⅜" bits. This

is OK, but not as desirable as interchangeable collets.

Power

The type of woodworking you want to do with the router will determine the horsepower you need. If you just want to make a few occasional mouldings and joints, a 1-horsepower router should be more than sufficient. On the other hand, if you expect to do a lot of routing or if you want to use bits with large flute diameters, you should look at 2- or 3-horsepower models.

Speed

Most single-speed routers operate between 20,000 and 30,000 rpm. This is adequate for bits with flute diameters of 2" or less. But larger bits should run at slower speeds; otherwise they'll overheat and burn the wood.

If you intend to use large bits often, it might be wise to invest in a variable-speed tool or a method of altering the speed, such as a rheostat or an electronic speed controller. Rheostats reduce the line voltage, which lowers both the speed and the available torque – the ability of your router to do serious work. Electronic speed controllers, on the other hand, have a feedback mechanism that boosts the available torque at low speeds, which means the tool is less likely to quit when the going gets tough.

Height Adjustment

Most basic routers can be raised or lowered up to 2". If you think you'll need more movement than this, you'll want to look at the plunge router. But whichever router you choose, consider the ease and accuracy with which you can change the height. Because you'll be changing the height quite often, you'll want to make it as easy as possible on yourself.

On some basic routers, the motor housings are threaded in the base so you can screw them up or down. This allows you to make minute height changes accurately. But in some respects, this arrangement is a pain in the neck. Because some on/off switches revolve with the motor, you never quite know where the switch is. And if you mount the router to a table or a stationary jig, the cord can quickly become twisted.

Switches mounted on handles or heights that adjust without spinning the motor remove this concern.

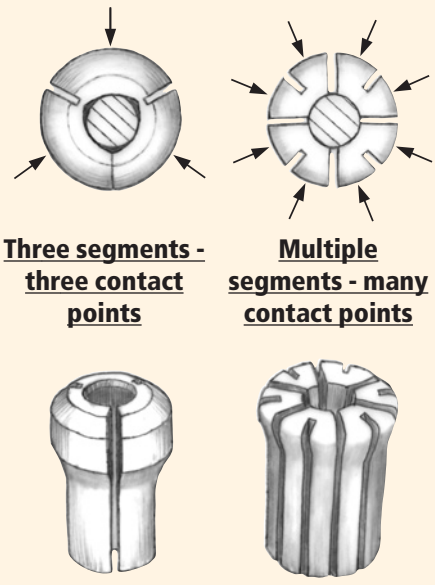
Configuration

For this, you just have to ask yourself how the router feels to you:

Is it too heavy or too light when you are holding it and working with it?

Can you reach all the controls without taking your hands off the handles?

Is it well-balanced or does it seem top-heavy and ready to tip?



Collets with just 2-3 segments (left) don't squeeze router bit shanks evenly. In fact, they make contact at just a few points. Collets with multiple segments (right) are more flexible and make contact all the way around the shank, which helps keep the bit from slipping.

Does the shape of the base help you see what you're cutting or is your workpiece hidden by the base or baseplate?

Will the size/shape of the base help or hinder your work?

Router bases come in a variety of sizes and shapes. The round base found on many basic routers (left) is useful for most operations, but may be slightly inaccurate when following a straightedge. If the base isn't perfectly round or perfectly centered on the router bit, turning the base (riding against the straightedge) during operation can change the distance from the bit. The D-shaped plunge router base (middle) has one straight side so you can accurately follow both straight and curved templates without concern of changing the distance to the bit. The laminate trimmer (right) has a square base with rounded corners, so you can follow straight and curved templates no matter how you turn it. You can buy an accessory base for the fixed-base router that has a straightedge, too.

TIPS & TRICKS

PRO TIP:
The Bigger They Are, the Harder They Work

The larger the diameter of the bit, the more the router has to work to turn it. Just because you can fit a 3½"-diameter panel-raising bit in your 1½-horsepower router doesn't mean the motor has the proper torque to use that bit efficiently. If the router isn't equipped to handle the torque load for that size bit, the motor could heat up and burn out.

GREAT TIP:
A Bit of Help for the Collet

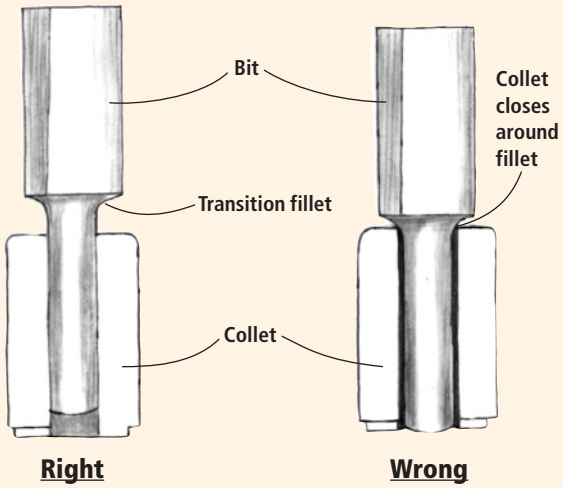
To help position a bit in a collet, stretch a rubber O-ring around the shank to serve as a depth indicator. When the bit is inserted, the O-ring will prevent the bit from dropping down too far in the collet.

GREAT TRICK:
Platforms Help with Mortises

If you are routing a large mortise or removing stock from the interior of a board, your router could become increasingly difficult to balance as you cut away more of the supporting surface. This is even more of a problem with smaller-base routers such as a laminate trimmer. To compensate for this, use a platform (attached to the router base as a sub-base) to form an oversized router sole – this will span the gap between the sides of the recess and keep the router from tipping or dropping into the gap.

GREAT TIP:
Bottom-cleaning Bit Will Improve Your Planing

If you do a lot of planing with your router, invest in a bottom-cleaning bit. Normally used to smooth the bottoms of mortises, it's available in diameters up to 1½" and cuts a wider swath than an ordinary straight bit.



The shank of the bit must be inserted far enough into the collet for the collet to get a solid grip. If possible, the entire length of the collet should contact the shank. However, don't insert the bit so far that the collet closes around the transition fillet – the portion of the bit where the shank ends and the flutes begin. If the bit is positioned incorrectly – inserted either too far or not enough – the collet may not grip the shank securely and the bit may creep out of the collet when you rout.

Routing Rules

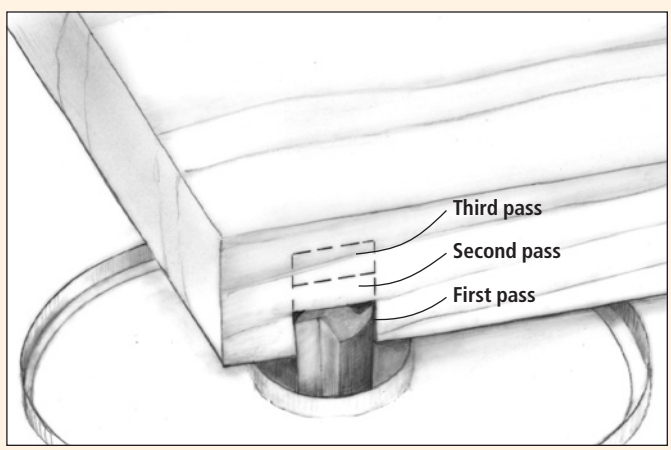
The first step in using any tool is to make sure it is properly aligned and adjusted.

For the router, there are only two things you need to check. If you're using it as a portable tool, check the depth of cut (the distance the bit protrudes beneath the sole) and the position of the guide (if there is one). If your router is mounted in a jig, check the depth of cut (the distance the bit protrudes past the mounting plate) and the position of the fence (if there is one).

Once you've adjusted your router, you'll need to keep a couple of things in mind as you work:

- Before you turn the router on, make sure the bit is properly mounted and the collet is secure. When changing the bits, know that you might have to clean dust out of the collet. A dirty collet won't grip router bit shanks as well.
- Make several test cuts to check your setup; if a job requires several different setups, make sure you have enough test pieces at each subsequent stage to carry you through the entire procedure.
- Remove only a small amount of stock with any single pass. Set your depth of cut to take shallow cuts, usually ⅛" or ¼" deep. The illustration below explains this concept in more detail.
- Keep the router moving as steadily as you can while you cut. If you pause in the middle or move too slowly, friction will cause the bit to heat up and burn the wood. However, if you feed the router too quickly, it will leave scallops or mill marks in your piece.
- Cut against the rotation of the bit whenever possible, as shown in the drawing at right. If you use a fence or a straightedge, use the rotation to help keep the work (or the router) against it.

Never "hog" the cut when using a router – the tool is designed to remove only small amounts of stock at any one time. If you need to make a deep cut, rout your piece in several passes, cutting just ⅛" to ¼" deeper with each pass. Generally, the harder the wood, the less you should remove with any one pass.



■ Take note of the wood grain direction and rout with the grain as much as possible. When you must rout across the grain, back up the wood where the bit will exit. This prevents the bit from tearing and chipping the wood.

Guiding the Router

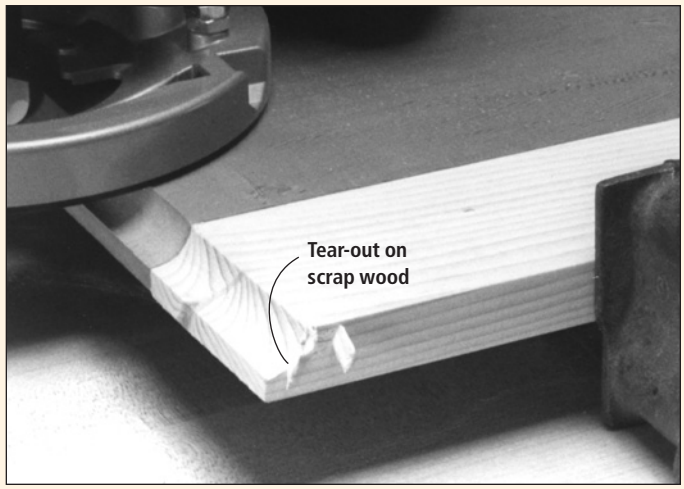
In addition to those rules, here are some extra tips on guiding the router. You can use these whether you're routing hand-held or with a jig:

■ Always hold the router firmly with both hands. Be prepared for the initial jerk when you start it up – that annoying momentary wrench can be difficult to control on some of the more-powerful routers. You may want to buy a router with a "soft-start" motor to eliminate this unnerving tendency – but we think that once you start using your router more often, you'll get used to this and become more comfortable.

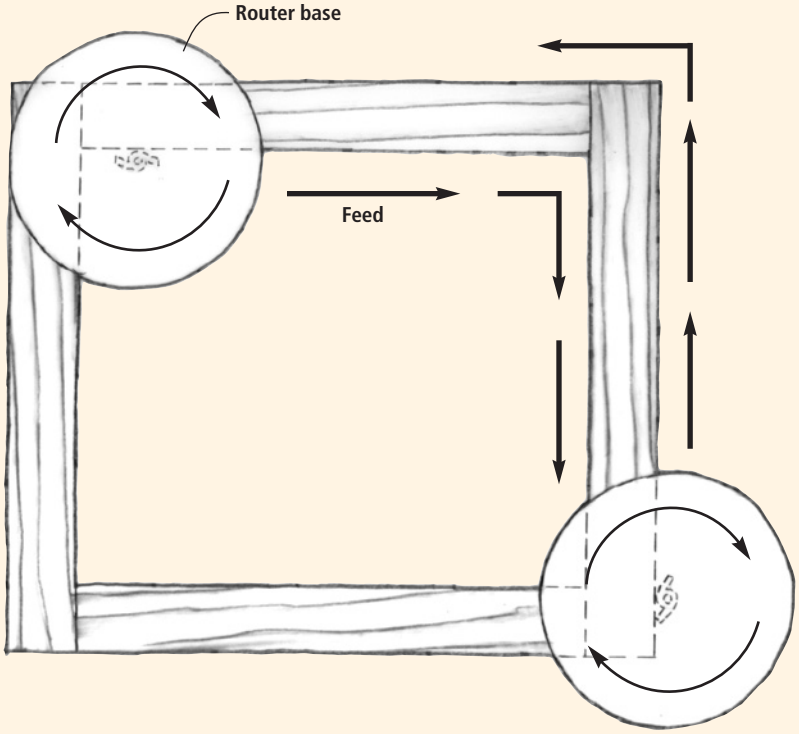
■ A router motor, like any other spinning body, generates lots of centrifugal force, which is the force that draws a rotating body away from the center of rotation, caused by the inertia of the body. Because of this, your router will resist any effort to cut in a straight line. As you push it along, it will want to drift to one side or the other, so you have to exert some force against your guide or edge to keep it tracking correctly.

■ Make sure the router base is properly supported. When used hand-held, routers are top-heavy. If the workpiece is too narrow, it may be hard to balance the router. A good tip to help you with this is to clamp a wide scrap piece to the work (doubling its thickness in many cases) to provide additional support.

■ It's not usually a good idea to rout freehand (with the router unguided). The cuts won't be very accurate, and the router will try to pull itself all over the workpiece. There are four things you can use to help you guide the router while you cut – **a piloted bit**, which has a ball bearing guide or bushing to guide the cut; **a guide collar**, which attaches to the router's base and follows a surface with the bit protruding through it; **an edge guide**, which is really just a small fence that attaches to the router's base; or **a straightedge** clamped to your workpiece.



If your project requires you to rout across the end grain, clamp a scrap to the edge of the board where the bit will exit. This will prevent splintering and tear-out. If routing all four edges of a board, start with a cross-grain edge so the long-grain pass will remove any tear-out.



Whenever possible, cut against the rotation of the router bit – this will help control the router. If you rout with the rotation, the router or the workpiece will try to pull itself out of your hands. To make sure you're routing against the rotation, just remember that the bit rotates clockwise when the router is used right-side up. To rout the inside of a piece, move the router clockwise within the perimeter; when routing the outside, move it counterclockwise. Treat fences and straightedges as if they were the outside of a workpiece – envision yourself cutting counterclockwise around these guides.

There is one application for routing with the rotational direction. This is known as "climb-cutting" or back-routing. While this action demands better control of the router by the operator, climb-cutting can reduce tear-out when routing highly figured or irregularly grained woods. You must be very comfortable with router use before attempting this.

TIPS & TRICKS

GREAT TIP:
Loose Tenons for Easy Joints

Instead of cutting perfectly fit mortise-and-tenon joinery on your workpieces, all you have to do is rout two matching mortises – then make a loose tenon to complete the joint. A single loose tenon (easily fit to both mortises) bridges the two mortises. As long as you get a good fit, this joint will be as strong as a traditional mortise-and-tenon joint.

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 TRICK:
Back Up Your Work When Utilizing a Miter Gauge

Tear-out when routing in end grain can be a real problem. In a router table, when using a miter gauge to rout across the wood's grain, always use a piece of scrap placed behind the work piece to prevent tear-out.

Using a Straightedge or Fence

The difference between a straightedge and a fence is all in how you hold the router. A straightedge guides a hand-held router over the work, while a fence guides the work over a table-mounted router. *[Editor's Note: We will focus on the router table in Chapter Three of this series.]*

Whether using a straightedge or a fence, keep whatever is moving pressed firmly against it. Feed the work or the router slowly and steadily – do not pause or speed up if you can help it.

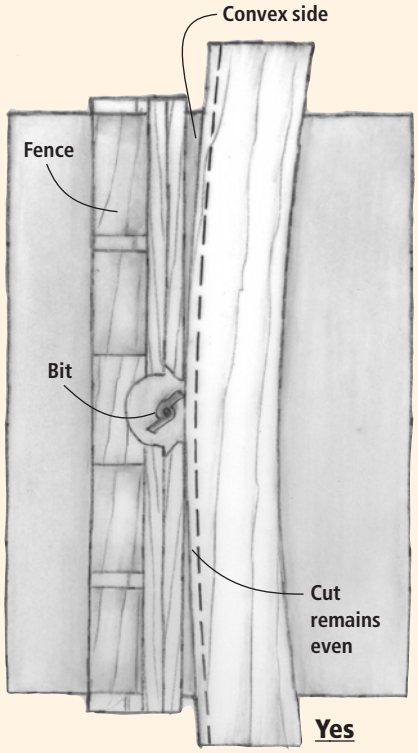
Here are other things to remember:

- Make sure the straightedge or the fence is straight and flat. Otherwise, the cuts won't be accurate.
- Always read the warp or bow in a board before routing (see illustrations at right). Keep the convex surface against the fence or straightedge as you cut it.
- If the router sole is circular, paint a spot on the edge of the base plate. Keep the spot turned toward you and away from the straightedge as you rout. The bit is never perfectly centered in the base plate. If you allow the router to turn as you follow the straightedge, the cut will not be perfectly straight.

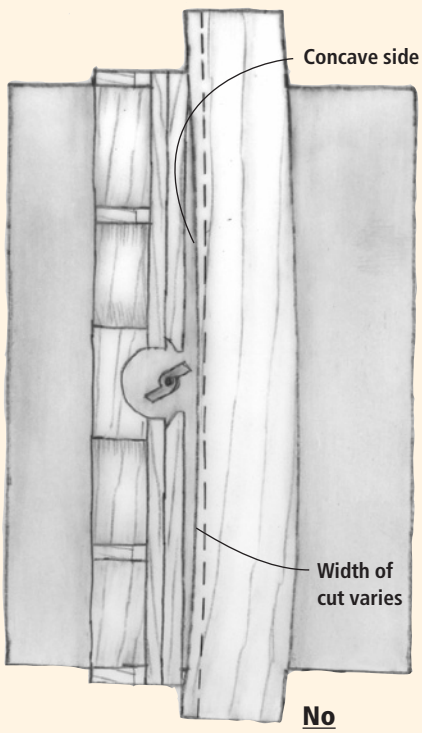
A Gauge will Help

When guiding the router with a straightedge, make a gauge to help position the straightedge when setting up the cut. To make a gauge the proper width (the distance from the router bit to the base edge), stick a thin piece of hardboard to a scrap piece with double-faced carpet tape, flushing one long edge of both pieces. Position your straightedge against the flushed edges. Mount the bit you plan to use in the router and rout along the straightedge and through the hardboard. The strip of hardboard now functions as your gauge.

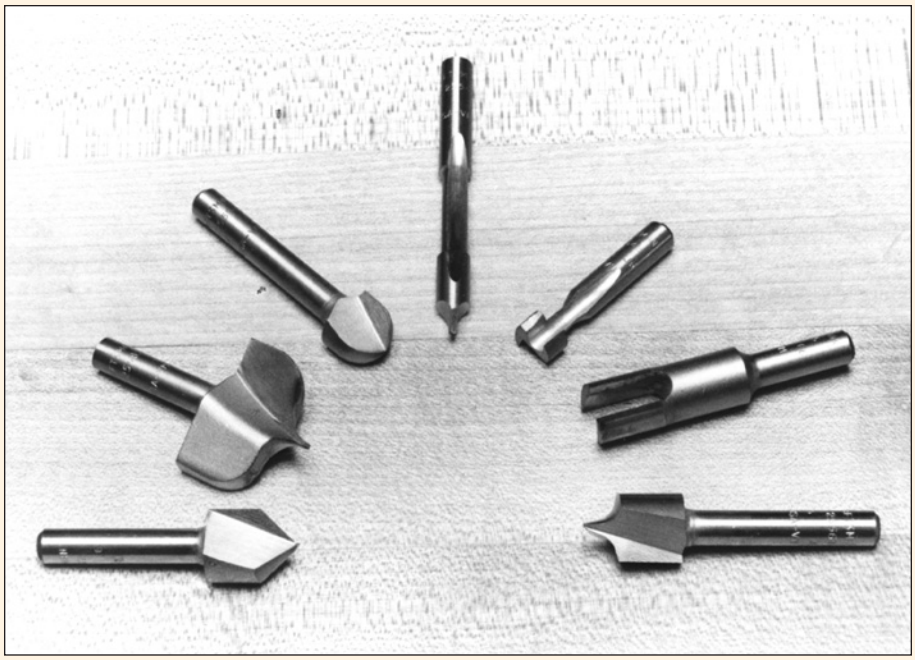
Then just lay out the cut you want to make on the work. Position the straightedge on the work parallel to the edge of the cut and offset it the width of the gauge by using your gauge piece to guide you. Secure the straightedge to the work and make the cut, keeping the router firmly against the straightedge.



If your workpiece is warped or bowed – even slightly – keep the convex side of the bow against the fence or straightedge as you cut. The width of the cut will remain the same from one end of the board to the other.



If you turn the concave side toward the fence, the cut will be narrower toward the middle of the board than it will be at the ends.



Most unpiloted router bits have either top-cut or point-cut flutes – flat or pointed cutting edges on the ends of the flutes as well as the sides. This feature lets you cut downward into the stock to make grooves, mortises and other cuts in the interior of a workpiece. For example, a point-cut beading bit (far right) lets you cut quarter-round and half-round shapes in the surface of a piece, not just on the arrises and corners.

Selecting Bits

There are an enormous number of router bits available, many more than can be shown here. But all these cutting accessories can be organized into four simple categories: **decorative**, used to cut molded shapes; **joinery**, used to make woodworking joints *[Editor's Note: We will focus more on joinery and joinery bits in Chapter Four of this series]*; **trimming/cutting**, used to trim or cut various materials; and **utility**, used to do all three of these tasks.

The cutting edges of the bits are called flutes. Most router bits have two symmetrical flutes, although there are some with just one.

When selecting which bit to use, know that you have a range of diameters to choose from. Router bits vary from a diameter of 1/16" up to 3 1/4". Some bits, particularly straight bits, are available with different types of flutes for cutting various materials.

When it comes to the material the bit is made from, almost all bits these days are made out of tungsten carbide. A few years back, most bits were made out of high-speed steel (HSS), which was cheaper and easier to make. But now, tungsten carbide is pretty much the only kind that's available. The flutes of most carbide cutting tools are tipped or faced with carbide, while the bulk of the tool is HSS. Carbide is brittle and won't be as sharp as HSS, but it lasts up to 15 times longer than HSS bits.

Custom Router Bits

If you find yourself looking for a specific kind of router bit and can't seem to find it anywhere in your woodworking supply store or catalogs, check this out – you can have custom router bits made to your specifications. These are a little more expensive, but if you use them continually, they could be worth the money.

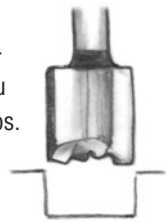
Some places where custom bits are available include:

- Freeborn Tool Co.: 800-523-8988 or freeborntool.com
- Router Bits Online: 800-821-8378 or routerbitsonline.com
- True Cuts: 800-CNC-BITS or truecut.net
- Whiteside Machine Co.: 800-225-3982 or whitesiderouterbits.com
- Carbide Specialties Inc.: 800-678-3313 or carbidespecialties.com
- North American Products: 800-634-TOOL or www.naptools.com

A BIT OF ADVICE

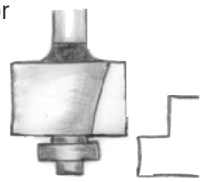
A router bit consists of a cylindrical shank (usually 1/4" or 1/2" in diameter) and one or more flutes or cutting wings, usually comprised of a piece of carbide brazed to the metal body of the bit. Throughout this series, we will be providing a closer look at a many of the most common (and some specialized) bits that you can use with your router.

Straight Bit



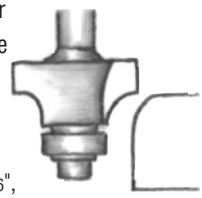
The most basic groove-forming bit will give you clean grooves and dados. Diameters range from 1/16" to 1 3/4".

Rabbet Bit



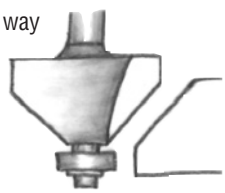
An often-used bit for edge-forming. Change the bearing size to vary the width of the rabbet. The carbide height is usually 1/2", with the various bearings making rabbets possible from 5/16" to 1/2" wide.

Roundover Bit



This is a great bit for quickly changing the appearance of any project. Depending on the radius of the roundover used (3/16", 1/4" and 3/8" are common), a sharp edge can be softened or almost entirely rounded over. Add a smaller bearing, and the roundover bit becomes a beading bit.

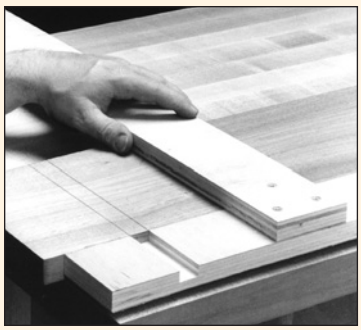
Chamfer Bit



If you prefer a less-rounded appearance but still want to soften the edges, a chamfer bit is the way to go. Commonly available in 15°, 30° and 45° bevels.

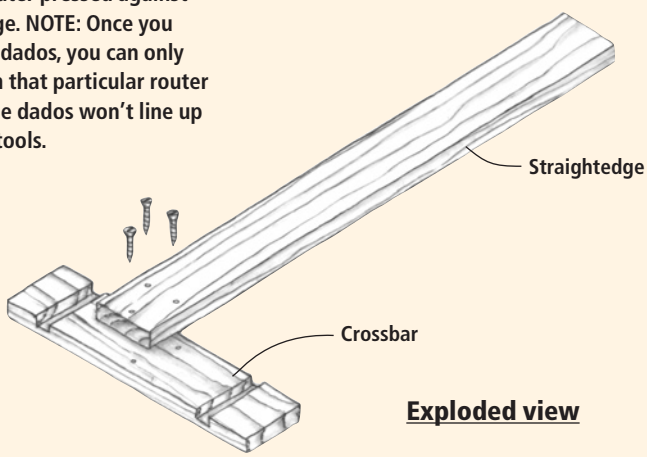
T-square Router Guide

When using a hand-held router to cut dados, grooves and rabbets, the part of the setup that eats most of your time is positioning the edge guide or straightedge. This T-shaped jig simplifies that chore – just use the short crossbar to instantly position the longer straightedge.

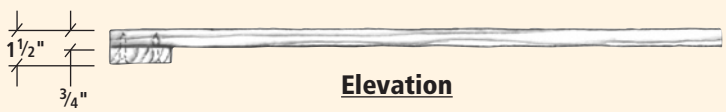


Before you can use this jig, you must cut dados in the crossbar – one on either side of the straightedge. Place the jig over a large wooden scrap and butt the crossbar against an edge. Clamp the jig to the scrap and cut the dados with a straight bit, keeping the router pressed against the straightedge. NOTE: Once you have cut these dados, you can only use the jig with that particular router and that bit. The dados won't line up with different tools.

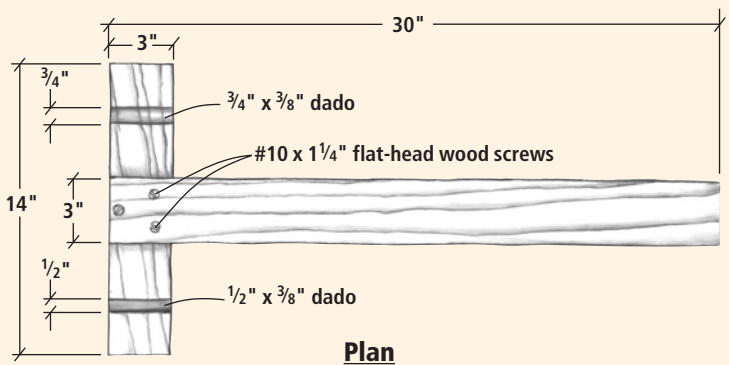
Lay out the joints on the workpiece. Place the jig across the wood, butt the crossbar against an edge or end and line up one of the dados with the layout lines. Then clamp the jig to the workpiece and cut the joint using the straightedge to guide the router, just as you did when you made the dados in the crossbar.



Exploded view



Elevation



Plan

Everything you need to know about the router in one special section!

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 1
Fixed-base Router

An in-depth look at the basics of router set-up, rules every woodworker should know, vital bits to have in your shop and loads of tips & tricks.

COMING IN FUTURE ISSUES

Chapter 2
Plunge Router

A look at versatile plunge routers and information about router maintenance.

Chapter 3
The Router Table

Which routers work best in a router table? Plus lots of table tricks.

Chapter 4
Router Joinery

A great tool for joinery, we tell you how to rout all kinds of tight joints.

Chapter 5
Use Your Router to Build Drawers

An excellent application for a table or hand-held router.

Chapter 6
Edge & Surface Treatments

Spice up your projects with these special edge shapes.

Chapter 7
Advanced Techniques

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

CIRCLE NO. 136 ON FREE INFORMATION CARD.

CIRCLE NO. 137 ON FREE INFORMATION CARD.

CIRCLE NO. 155 ON FREE INFORMATION CARD.

10 TRICKS FOR TIGHT JOINTS

Learn some of our editors' favorite ways to get seamless, rock-solid joints.

You've cut all your pieces and are putting everything together when you first notice it – a gap. A dark void where there should be none.

Don't panic – it happens to the best of us. For whatever reason, there are instances when your joints just don't fit perfectly and you have to decide what to do: Do you scrap all the time, energy, money and hard work you've put into the project and start over, or do you just let there be a little gap and move on?

Well, we're giving you a third option. We put our heads together and have come up with a list of the best tricks to help you tighten your joints. These tips should help you eliminate those unsightly, embarrassing gaps and point your joints in the right direction.

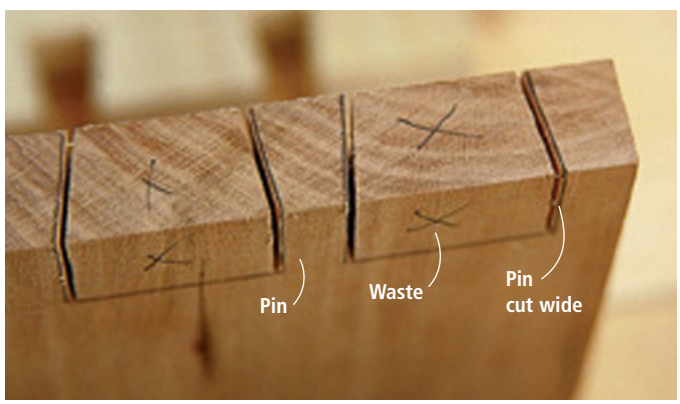
Compression Makes Dovetails Tight

Hand-cut dovetails are some of the most challenging joints to fit perfectly. Many woodworkers will spend hundreds of dollars on router jigs or woodworking classes to get an airtight fit.

If you decide to hand-cut your dovetails, there are a few ways to make sure you get it right.

Because wood is – on a cellular level – similar to a bunch of soda straws glued together, you can compress it a little bit. Usually, compression is a bad thing, such as when you drop a hammer on your work and it dents. But a little bit of compression is good when dovetailing.

Here's how it works: Cut the first half of your joint as you usually would – I usually cut the tails first. Then use that first half to knife in the second half of the joint – in this case, the pins.



Wood compresses, and you can use that to make your dovetails tighter. Cutting your pins just slightly wide will force them to compress the tails.

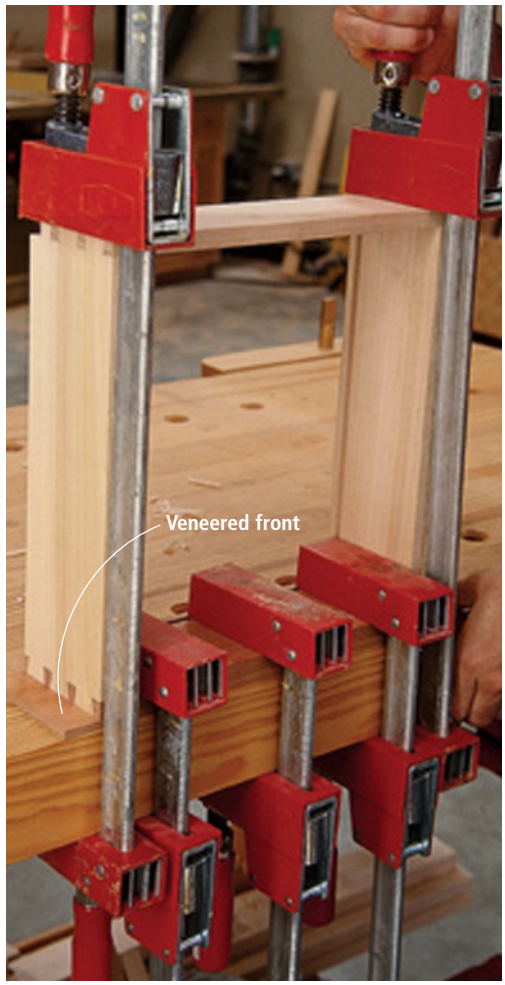
Next, when you saw your pin lines, don't saw right up against the knife line you marked, as most books tell you. Instead, saw slightly wide. How wide? The whisker of a gnat would be a good place to start. Here's how I do it: After I knife in my joint lines, I run a pencil over each knife line. Then I start my saw cut to leave the entire pencil line.

Like all things pertaining to dovetails, this takes practice. Cut some sample joints to get a feel for it and use a magnifying glass to gauge your progress.

Once you cut your pins, use a knife to ease the inside edges of your tails, which will be inside

Photo by Al Parrish

Through-dovetails are easier to cut than half-blinds. To make life easier (and to stretch your stock of valuable wood) cut through-dovetails when joining your sides and drawer fronts. Then add 1/4"-thick veneer to the drawer front.



Use your workbench as part of your clamping setup when applying the veneer to the drawer. This setup helps spread pressure evenly across this large surface.

the joint. When you join your two pieces, the too-tight pins will compress the tails and the joint will be seamless. If you try to compress too much, one of your boards will split as the two boards are knocked together.

This compression works especially well with half-blind drawer joints where you are joining a secondary softwood for the sides (such as poplar) with a hardwood drawer front (such as oak), because the softwood compresses easily. But be careful: This trick doesn't work when you are trying to join two pieces of dense exotic wood, which doesn't compress much at all.

— *Christopher Schwarz*

Fake Half-blinds for Dovetail Joints

Half-blind dovetails are trickier to cut than through-dovetails, but they don't have to be. I picked up this trick from dovetailing maestro Rob Cosman, who has two excellent videos on dovetails that are available from Lie-Nielsen Toolworks (lie-nielsen.com or 800-327-2520).

Essentially, you first build a drawer with the easier through-dovetails and then glue a 1/4"-thick piece of veneer over the drawer front, making them look like half-blind dovetails.

Usually with drawers you have 1/2"-thick sides and a 3/4"-thick front. To do what we're suggesting, make your drawer front with 1/2"-thick stock, too. Then join the sides to the front using through-dovetails.

Then, using your band saw, resaw a piece of 1/4"-thick veneer from a piece of really nice figured wood. Make it a little larger than the finished size of your drawer front. Then glue that veneer to the drawer front, let the glue dry and trim it flush.

This makes excellent half-blind dovetails and allows you to stretch your supply of nicely figured woods for your drawer fronts.

— *CS*

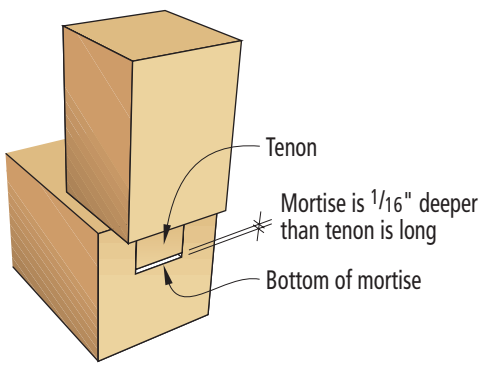
Deeper Mortises Close Gaps

It's easy to get gaps when using a traditional mortise-and-tenon joint. Luckily, it's also straightforward to get rid of them.

If you make your mortises exactly as deep as your tenons are long, you're asking for trouble. By doing this, you haven't created a place for any excess glue to go, so it will be forced out of the joint. And if there is even a little bit of gunk at the bottom of your mortise, the joint won't close tightly no matter what you do.

To fix this, make your mortises 1/16" deeper than your tenons

Making your mortise a little deeper prevents gaps at the shoulders.



are long. This trick will save you time because you don't have to clean up the bottoms of your mortises as much, and it will prevent glue from squeezing out if you use too much in the joint.

— CS

Paring Your Shoulders in a Mortise-and-tenon Joint

Before you assemble your joints, you should always clamp them up without glue. That way, you can disassemble everything and fine-tune your joints if you find ugly gaps at this stage. But what if you can't track down the problem? We've found that tuning up the shoulder of the joint will help you fix a variety of problems and make sure you don't hurt the strength of the joint.

First, clamp the tenon in your bench's vise with the tenon pointing straight up. With a sharp chisel, pare away the inside of the shoulder without cutting the outside of the shoulder that shows. Pare away about 1/32" all the way around and then test the fit again.

This should help you solve problems where your shoulders are angled a bit because of miscutting. It also helps out when the tenon's mating surface isn't perfectly square – it's quite common to sand or plane that area so it's bellied a bit.

— CS

Tighten Mortise-and-tenon Joints with a Shoulder Plane

A common problem with a mortise-and-tenon joint is that it's easy to make the joint too tight (so it won't go together) or too loose (where it will fall apart).

Even expertly machined joints have this problem because it's tough to hold all your parts with exactly the same pressure as you cut them on your table saw or router table. A 1/128" difference can make or break this joint.

Your tenons should slide into your mortises with hand pressure only. The fit should be firm but not forced. To get that every single time, I make all my tenons so they are slightly oversized. Usually I shoot for a tenon that fits a bit too tightly but would go together with a mallet.

Then I get ready for a dry assembly and use my shoulder plane to tune up each joint. A good shoulder plane removes just a couple thousandths of an inch in a pass. This allows you to sneak up on a brilliant fit with only five or six swipes of the plane. It takes about 10 seconds per joint.

Be sure to remove the same amount of material from each face cheek of the tenon by taking the same number of passes on each side of the tenon.

Shoulder planes are available new from Lie-Nielsen, Clifton, Stanley and some other custom plane-makers, such as Shepherd Tool. You also can find them at flea markets or on the Internet.

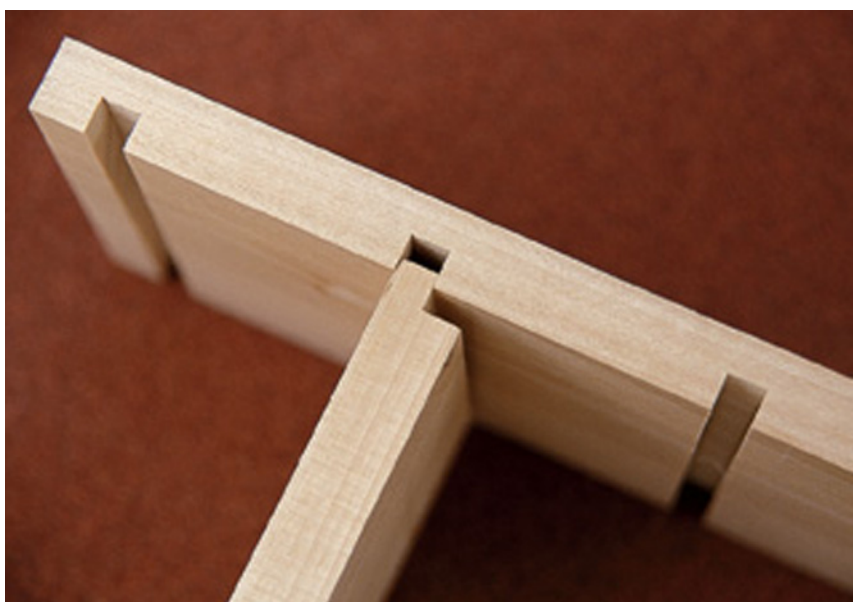
— CS

Add Rabbets to Dado Joints

Dados are deceivingly simple: You just cut a trench in your work that

Pare the shoulder all around the tenon to help eliminate gaps in this joint. Be sure not to cut the edge of the shoulder, or you'll make your gap worse instead of better.

To get your tenons fitting perfectly, learn to use a shoulder plane. This handy tool will fit your tenons in an extraordinarily controlled manner.



Dados are a pain to get sized just right. So don't bother sizing the dado to the material. Cut the dado undersized and then cut a matching rabbet on its mate.

A sharp and tuned smoothing plane can reduce your thickness in small increments, allowing you to sneak up on a seamless dado joint.

is exactly the same width as the thickness of its mating piece.

The problem is getting the dado sized exactly right so you don't have an ugly gap at the front of your joint or along the trench where the boards meet. Of course, to precisely size your dados you can use shims in your dado stack, buy undersized router bits or cut your joint in a couple of passes.

Another option is to cut a rabbet on the mating piece. Using a rabbet requires an extra machinery setup, but it is worth the trouble. Cut your dado so its width is 1/8" undersized. For example, if you were planning on a 3/4"-wide dado, make a 5/8"-wide dado instead.

Then cut an 1/8"-deep rabbet on your mating piece that allows the two pieces to nest together. You can tweak the size of the rabbet to get the joint just right.

— *Steve Shanesy*

Use a Hand Plane for Dados

Another way to get perfect dados is with the help of a smoothing plane. If you can sharpen and set up a plane, this is for you.

First, cut your dado so it is slightly undersized. I've found that the dado made by dado stacks is always a few thousandths of an inch less than the width you require. To cut a slightly undersized 3/4"-wide dado, I merely install all the chippers for a 3/4" dado. This has always worked, regardless of the brand of dado stack (Forrest, Freud and others).

Then I just plane down the mating piece on both sides to sneak up on a perfect fit. Make sure you set your plane to make the finest shaving possible, and this should work for you.

— *CS*

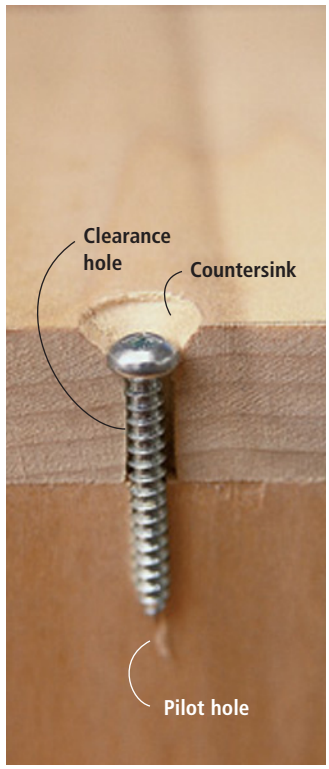
Stop Bridging Your Screws When Using Butt Joints

There definitely are ways to improve your butt joints if you find gaps appearing. Screws and biscuits – used correctly – can make the joint tighter and more durable if you know how to use them.

While dovetails and mortise-and-tenon joints are excellent options, we know that a lot of woodworkers use screws to simply pull butt joints tight. There's nothing wrong with that, but using the correct screws and techniques will ensure that your joint actually is tight.

Lots of woodworkers are using sheet-metal screws and drywall screws to assemble projects. These will work, but there's a reason woodworking screws exist.

The thread-free part of a wood screw shank (under the screw head) allows the threads to bite into the second wood piece, while the first piece (the one being attached) is able to pull tight against it. If there are threads over the entire length of the screw shank, the threads will bite into the wood in the attaching piece and will



The trick to a tight butt joint is drilling a proper clearance hole before you drive in a sheet-metal screw. The clearance hole prevents the threads from catching in the top piece.

Biscuits keep the shelf aligned vertically and the pocket-hole screws help clamp the middle of the panel. Add some glue, cinch the screws down tight and you're done – it's that easy. And here's the best part: No clamps required.

stop the first piece from seating tight when the screw head reaches the wood surface. This is something called "bridging," and you'll never get a tight joint.

Using a standard wood screw with a partially-threaded shank will solve this, or you can make sure the clearance hole in the attaching piece is large enough to keep the threads from catching in the wood. Either way, your joint will end up tight and solid.

— *David Thiel*

Improve Butt Joints with Pocket-hole Screws, Biscuits

We like pocket-hole screws to build utility cabinets and frames because no other joint is as fast or requires as little clamping.

But there is one downside with pocket-hole screws when you are joining a shelf, top or bottom to a side. It can be quite difficult to hold the shelf in perfect position as you drive the screws home. If the piece shifts even the slightest bit, you'll have a shelf that is cockeyed with an ugly, obvious gap on one side.

To get around this, we combine biscuits and pocket-hole screws to get the best of both worlds. The extra time the biscuits take is minimal. First, cut your biscuit slots in your shelf and side piece. Then cut the pocket holes in the underside of the shelf.

Put glue and biscuits in the biscuit slots and put the shelf in place. Then you can drive the pocket-hole screws home. Why do we like this method so much? Well, there are three reasons:

• The biscuits hold the shelf in place as you drive the screws so it cannot shift and your case will be perfectly square.

• The pocket-hole screws hold the shelf and side pieces together as the glue dries. This is especially helpful with the middle part of the shelf, which is difficult to clamp if you use only biscuits. The pocket-hole screws pull the pieces together across the shelf without a single clamp.

• If you are a cheapskate, you can remove the screws once the glue is dry and reuse them.

— *CS*

The Best Way to Clamp Miters in Casework

Joining your cabinet's sides and face frame with a miter is a classy way to dress up an ordinary box – and it is a signature of contemporary furniture design. But accomplishing this joint without an ugly gap somewhere along that miter is another story.

Many people spend lots of money on corner clamps and clamping jigs. Or they construct convoluted cauls. My solution is tape. Yes, tape.

I was shown this technique of cutting straight and clean joints and taping them together when I worked in a large production cabinet shop where time was money. I've used this technique on mitered joints that were 10' long and it worked flawlessly. It also works great for gluing compound miters.

To cut a clean miter using your table saw, set the blade to 45° and clamp an accessory fence to your saw's rip fence. The accessory fence should be made using a softer wood, such as poplar or pine. A harder wood will ruin the sharp tip of your miter. Raise the blade while it is spinning until it kisses the accessory fence. Now you can cut your miters.

The real trick to dead-on miters is how you glue them. As shown in the photos, tape the outside of the joint together, spread glue on the joint and then fold the parts to assemble things. Band clamps or more tape will hold the parts together as they dry. **PW**

— *Jim Stack*

When taping your miters, lay the parts face up so the mitered edges are touching. Then tape the joint with clear packing tape.

Next fold the assembly and use tape to hold it square until the glue sets.

German Work Box

A fold-out, carry-anything tool chest on wheels.

During a recent trip to Germany, our publisher, Steve Shanesy, snapped some pictures of a utilitarian, but also clever, rolling tool cart used in one of the woodworking shops he visited.

The cart was designed to hold your tools so your bench or assembly platform remained tidy. It had doors and drawers on the lower section, plus wings that opened on top to reveal three tool wells that kept things orderly and prevented items from falling onto the floor. When not in use, the cart closed to a nice size and could even be locked.

The staff agreed that the idea was a good one, but we decided to put a *Popular Woodworking* spin on it. We divided and detailed the lower drawer space some more and added a tool till inside the center well with magnetic tool holders.

Plus we made sure the construction was simple. Mechanical fasteners do all the hard work. You could easily build this cart with a circular saw, a drill and a router, making it a great project for beginners or even a professional cabinetmaker in a production shop.

Affordable Space

While we didn't start out worrying about price, the finished bill is worth talking about. Using two sheets of good-quality ¾" shop-grade plywood and one sheet of ½" Baltic birch ply for the drawers, wood costs came in at about $125. The necessary hardware (there's a lot more than you might think imagine) comes in at less than $150 if you build it exactly as we have. So

By David Thiel & Michael A. Rabkin

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com. Contact Michael at 513-531-2690 ext. 1327 or michael.rabkin@fwpubs.com

Photos by Al Parrish


BOSCH
3100
9.6V
DEWALT
12

SOURCES

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

1 set • 2" metal drawers (5)
#05K98.25, $23.50

1 set • 1" metal drawers (5)
#05K98.10, $19.95

2 • gripper mats
#88K18.05, $5.95 ea.

3 • 12" magnetic bars
#93K75.12, $7.95 ea.

Woodworker's Hardware
800-383-0130 or
wwhardware.com

3 • 1½" x 48" nickel piano hinges
#LA11248 14A, $8.98 ea.

2 • 2½" swivel casters
#JH25 S, $4.16 ea.

2 • 2½" swivel casters w/brake
#JH25 SB, $4.81 ea.

1 • lid stay
#KV0472 R ANO, $2.67

2 • 4" chrome pull
#UFWP4 SS, $2,60 ea.

4 • 1" pull screws
#SC832 1SS, $.23 ea.

2 • roller catches
#A09714 A2G, $.96 ea.

1 • 18" 100# full extension slide
#KV8417 B18, $11.45 pr.

Woodcraft
800-535-4482 or
woodcraft.com

2 • Miller Dowel 1X walnut packs (25)
#144735, $6.99 ea.

1 • stepped dowel kit 1X
#144570, $27.99

Woodworker's Supply
800-645-9292 or
woodworker.com

1 • 13/16"x 50' PSA birch edge tape
#934-960, $13.95

Prices as of publication deadline.

for $275, you're still getting a lot of storage for the price and the space is arranged to be exactly what you need, unlike a store-bought toolbox.

The Basics

While this is a utilitarian work cart for the shop, we expended a little extra effort (veneer tape on the plywood edges and no exposed screw heads) to make it a more finished-looking project while maintaining the solid, simple construction details.

The cart joinery is a collection of butt joints. We used a new product on the market, Miller Dowels, to assemble all the butt joints. This is a stepped wood dowel that replaces the screws and plugs the holes left by the drill bit at the same time.

The back is ¾" plywood (plywood offers great gluing strength on edge because of the long grain part of the plywood core). This size back offers excellent stability and the opportunity to square-up the case without worrying about wood expansion because of changes in humidity.

On the interior plywood drawers we used simple rabbet joints to add some extra strength. The bottoms of three of the drawers are screwed to the drawer boxes and stick out past the drawer sides to serve as effective drawer guides, emulating the metal drawers used on the right side of the case.

Begin with the Big Box

First cut the plywood panels to size according to the cutting list below. We've posted an optimization chart at popwood.com (click on "Magazine Extras") to help you get all the pieces from your plywood sheets.

To allow the three smaller drawers to slide in and out of the case, you need to cut ½"-wide x ⅜"-deep dados in the left side of the case and in the left side of the center divider. Lay out the dado locations – according to the illustrations – then cut them using either a dado stack in your saw, repeated cuts with a circular saw, or with a straight bit, using two passes to achieve the full depth. There is ½" of space between each of the drawers and we worked from the bottom up, leaving a larger gap above the top drawer to allow clearance for the door catches.

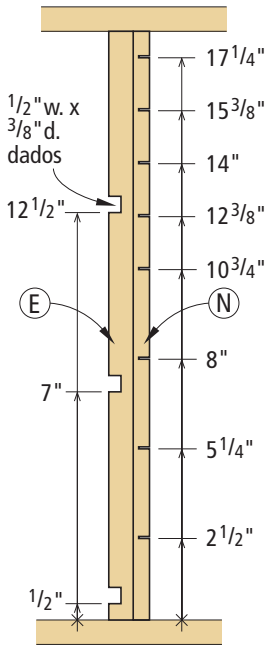
Dowels and Glue

As mentioned, we used veneer tape to dress up the edges of the plywood. We had been using iron-on veneer tape for years, but recently discovered a self-adhesive

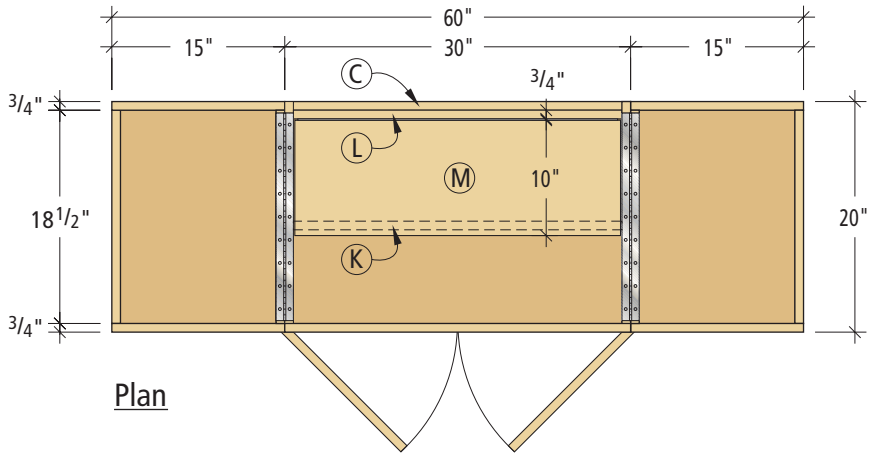
GERMAN WORK BOX

	NO.	LET.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
Case							
❑	2	A	Sides	¾	19¼	32	Shop plywood
❑	3	B	Shelves and bottom	¾	18½	28½	Shop plywood
❑	1	C	Back	¾	28½	32	Shop plywood
❑	1	D	Front	¾	6⅞	30	Shop plywood
❑	1	E	Divider	¾	18	18	Shop plywood
❑	2	F	Doors	¾	14 15/16	25	Shop plywood
❑	4	G	Wing front and back	¾	6 15/16	15	Shop plywood
❑	2	H	Wing sides	¾	6 15/16	18½	Shop plywood
❑	2	I	Wing sides	¾	6¾	18½	Shop plywood
❑	2	J	Wing panels	¾	13½	18½	Shop plywood
❑	1	K	Till support	¾	5½	28½	Shop plywood
❑	1	L	Till lid spacer	¾	¾	28¼	Maple
❑	1	M	Till lid	¾	10	28¼	Shop plywood
❑	2	N	Drawer section sides	½	12	18	Shop plywood
Drawers							
❑	2	O	Drawer front and back	½	4	15¾	Baltic birch
❑	2	P	Drawer sides	½	4	17½	Baltic birch
❑	2	Q	Drawer front and back	½	4½	15¾	Baltic birch
❑	2	R	Drawer sides	½	4½	17½	Baltic birch
❑	2	S	Drawer front and back	½	5	27½	Baltic birch
❑	2	T	Drawer sides	½	5	17½	Baltic birch
❑	2	U	Drawer front and back	½	5½	15¾	Baltic birch
❑	2	V	Drawer sides	½	5½	17½	Baltic birch
❑	3	W	Drawer bottoms	½	16¾	18	Baltic birch
❑	1	X	Drawer bottom	½	17½	27	Baltic birch

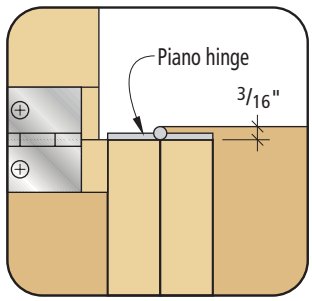
Cut the drawer dados in the case sides prior to assembly. We used a router to make the dados and a store-bought guide that clamps across the plywood to guide the router. You could just as easily clamp a straight board to the side to serve as a guide. Use two passes on each dado to achieve the full depth. This puts less strain on the router and the bit.



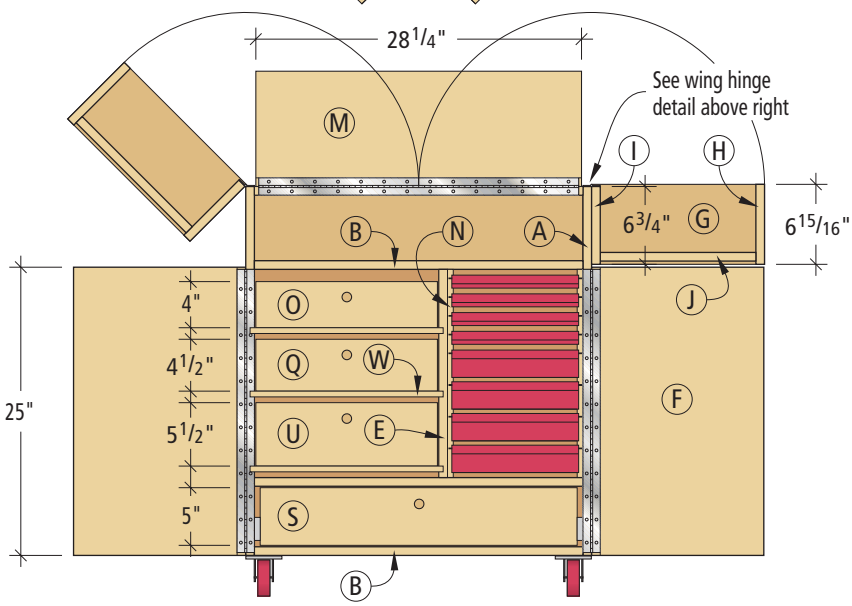
Drawer dado layout



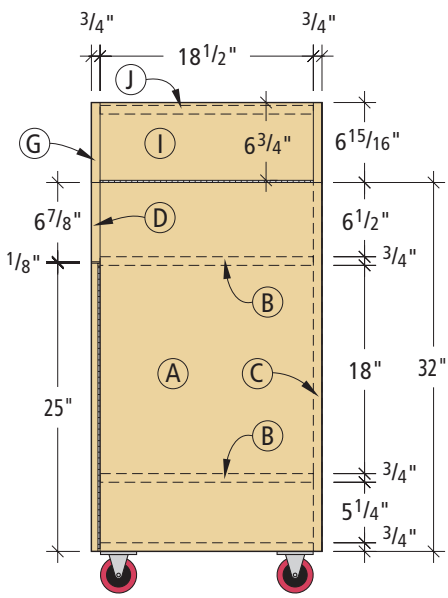
Plan



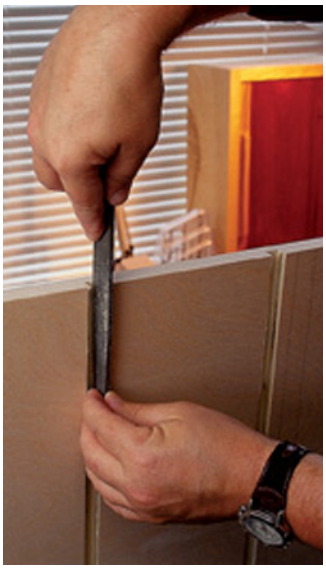
Wing hinge detail



Elevation



Profile



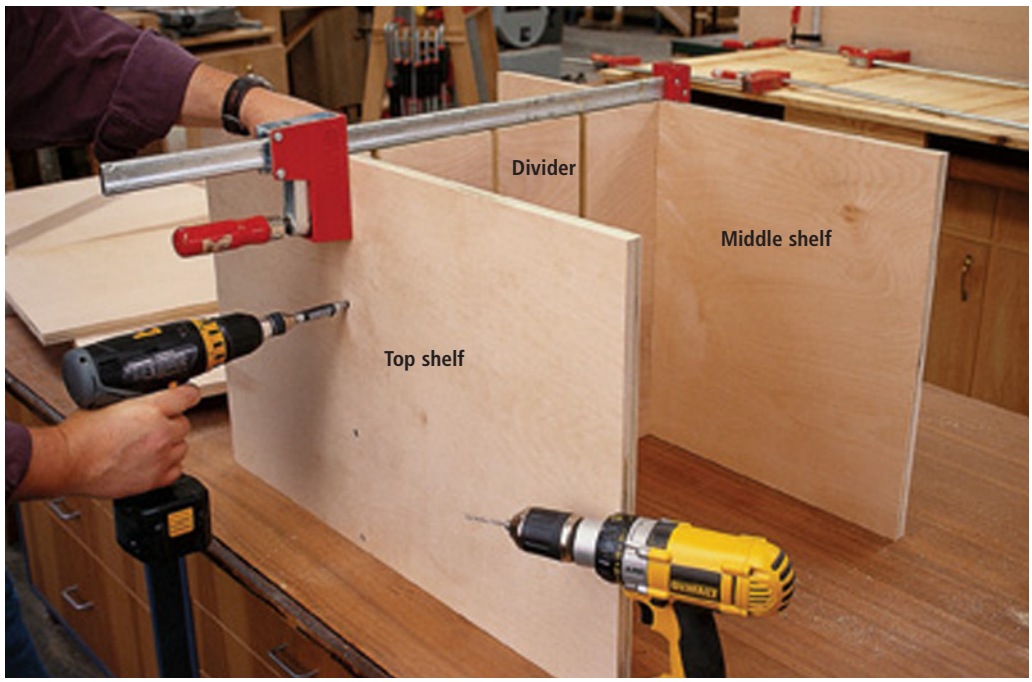
The veneer edge tape is easy to use and quickly adds a finished appearance to the cabinet. Even though we ended up painting the exterior, the paint still applied better to the veneer tape than on a bare plywood edge. You'll need to notch the tape with a file at the dado locations in the left case side.

veneer tape that is much simpler to use, takes the concern out of the glue melting evenly and sticks very well to the work.

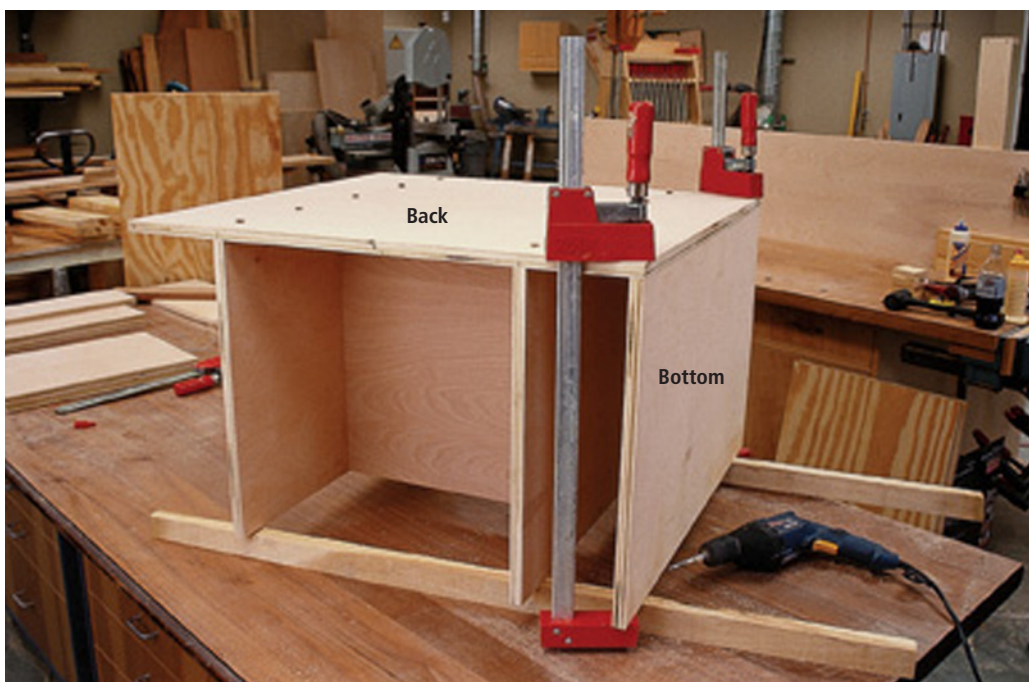
After veneering all the exposed edges, sand the interior surfaces through #150 grit. Now you're ready to assemble the case.

Start by clamping the divider between the upper and middle shelves, holding the front edges flush. We used regular #8 x 1¼" screws here because they would be hidden inside the case. Drill and countersink 3/16"-diameter clearance holes through the shelves and drill 3/32"-diameter pilot holes in the divider. Add glue and screw the assembly together.

Next use either screws or Miller Dowels to attach the back to the center assembly. Check the spaces to ensure they are square, then add the bottom shelf to the back,



Screw the divider between the top and middle shelves by first drilling a pilot hole for the screws and countersinking the flathead screws to the shelf surfaces.



Attach the back to the center assembly using the Miller Dowels. Put glue on the back edges of the center pieces, then position the back and clamp it in place. After using the proprietary stepped drill bit to make the holes, add glue to the dowel and then tap it into place in the hole. Lastly, attach the bottom to the back with stepped dowels.

holding the back flush to the bottom side of the shelf.

Clamp your center assembly between the two sides, drill the appropriate holes, add glue and assemble the rest of the case. It's a good idea to trim the dowels flush to the case side before flipping the case onto that face: It's more stable and there's less chance of messing something up.

Add the front piece to the front edges of the sides, holding it flush to the top edge. The front will overlap the top shelf, leaving ¼" of the shelf edge exposed. This allows room to attach the front to the shelf with brad nails. The exposed edge will act as a door stop once hinges are installed.

The wings go together like simple versions of the case. The side closest to the cabinet on each wing is 3/16" narrower than the other. This creates a recess to house the hinge to mount the wings to the cabinet.

We recessed the captured panels ¼" in from the outside edges to avoid any alignment problems. Using the stepped dowels, attach the wing sides to the wing panels. Attach the fronts and backs to complete the assembly.

Storage Details

Start by adding the till lid to the back with a length of continuous (or piano) hinge. Because of the way the hinge needs to mount inside the cabinet (so the wings can close) we added a ¾" x ¾" maple strip to the back ⅛" down from the top edge. This allows the till lid to open to about 110°. Mount the lid to the strip with a length of piano hinge. Carefully check it for clearance between the two sides as it closes.

Next, attach the till support to the top shelf by screwing into the support through the shelf. The support is set back ½" from the front edge of the till lid to allow you to get your fingers under it to lift the lid. Add some glue and a couple of stepped dowels through the sides to hold everything in place.

Now you need to attach the two wings to the case with more piano hinge. Clamp the wings to the case in the open position (flush to the front) while attaching the hinges to ensure even and well-supported wings.

Lastly, attach the doors to the case (use a piano hinge again).

Before attaching the second side, it makes sense to cut the dowels on the first side flush to the surface. I used a Japanese flush-cutting pull saw that has teeth with very little set to them, reducing the chance of scratching the cabinet side. By applying pressure on the blade to keep it flat to the cabinet surface, I further reduced the chance of scratches. Do a little sanding, then flip the cabinet over and attach the second side, then the front.

The next step is to attach the first side (which side doesn't really matter). Carry your location lines from the back around to the side and use them to lay out the dowel locations. Add glue, clamp, drill and dowel the joint.

After attaching the till lid, the wings are ready. The wings are held flush to the front and are tight against the cabinet side. The recessed wing side is the attachment point for the piano hinge, allowing the lid to close flush against the top of the cabinet.

To get the doors to seat flush against the cabinet front, cut a shallow rabbet (3/16" deep, the thickness of the hinge) the width of the closed hinge on the back of the door on the hinge side. This cut can be done with your router or table saw.

When attaching the doors, pay careful attention to the height. Preferably they will be about 1/8" below the wings when open to keep things from bumping.

You'll also notice that the left-hand door's hinge covers the dados for the drawers. Rather than place the hinge on the outside of the cabinet (making it too visible), we opted to simply file out the hinge to match the dado locations, as shown below.

Drawer Space

Ultimately you'll decide how the interior space in your cart is used. We've used drawers because our experience has shown that low shelving just collects junk at the back of the case that you can never see or reach easily.

We've used a selection of drawer types for this project, both shop-made and purchased. You can follow our lead or choose whatever style you prefer.

The lower shop-made drawer is simply a Baltic birch box drawer mounted on full-extension, 100-lb. drawer slides. This is a fine heavy-duty drawer joined at the corners with simple rabbet joints. We used a 1/2" bottom fit into a rabbet in the sides. While we usually would have recommended a 1/4" bottom, we had the 1/2" material and didn't feel like by buying a whole sheet of 1/4" for just one drawer.

The store-bought drawers are metal, lighter-duty drawers of 1" and 2" depths and have metal flanges that ride on dados cut into the sides of the case. With these, the front of the drawer overlaps the case sides to both hide the dados and serve as a drawer stop. As this would interfere with the door hinge, we added two drawer section sides made of 1/2" Baltic birch and set them back 1" from the front of the case. This also made it possible to cut the dados in the section sides after the case was assembled.

The three drawers to the left use the best of both worlds, finishing off some of the wood at hand and avoiding the cost of more drawer slides by using the "lip and groove" concept of the metal drawers. On all the wood drawers, a simple 1" hole drilled in the front serves as an adequate drawer pull.

Finishing Touches

The last steps are adding a finish (we opted for two coats of dark green latex paint on the outside; the inside was left as-is) and then some sturdy 2 1/2" casters to the case and placing and organizing your tools. The photos will show you a couple of storage tricks and items available for sale to help keep things neat and tidy. **PW**

MILLER DOWELS

Miller Dowels are a clever concept that can make some types of assembly faster and easier. Essentially, the stepped-dowel idea offers the strength of a standard dowel with the ease of a tapered dowel. Alignment and splitting difficulties often associated with standard dowels are reduced, while the strength offered is actually better than with a standard dowel thanks to the ribbed design (increasing glue coverage).

These stepped dowels can be used in place of screws (as we've shown in this project) – think of them as self-plugging screws.

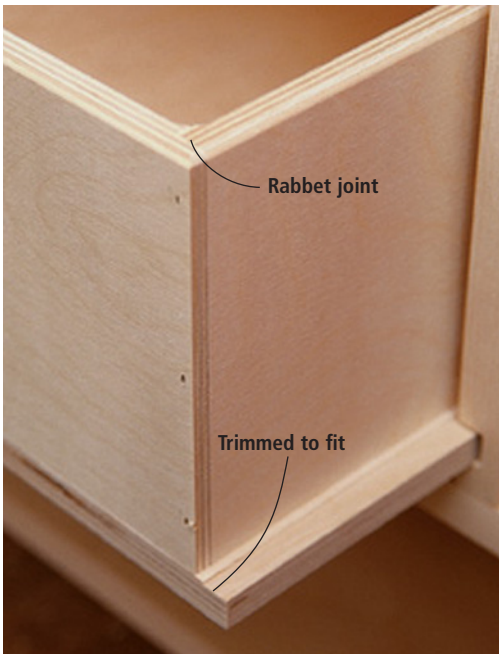
We're going to stop short of advocating Miller Dowels as a replacement for all screws, though. While the strength is good, they still won't pull up an ill-fitting joint, and if the glue is not allowed to cure before removing the clamps, there is the potential for the joint opening slightly after removing the clamps. So proper clamping and glue-curing time is still essential.

Then there is the economic consideration. A pack of 50 dowels (2 3/4" or 3 1/2" long) and the necessary bit cost about $30. Packs of 25 dowels cost about $7. That's about 28 cents per dowel versus 4 cents per #20 biscuit or about 8 cents per premium screw.

All things considered, we like the idea of an all-wood, strong and simple joint – but we'd recommend choosing your application carefully.

The dowels are available in birch, red oak, cherry and black walnut, and more weather-resistant species are on the drawing board. For details, contact Miller Dowel at 866-WOODPEG (866-966-3734) or millerdowel.com.

You can see the two sets of dados for the drawers with a few drawers removed. Also, notice the notched piano hinge to allow the drawers to slide in and out.



This shot of one of the drawers shows the rabbet joinery used. Also note that the bottom was trimmed slightly in width to allow the drawer to move more smoothly in the dados.

Pads line the bottoms of the wing and till sections to keep tools from rolling and to help trap dust. Dividers in the till section can be customized to fit the tools you need. The magnetic bars on the till lid provide secure storage for small ferrous tools. Small-parts storage is easily accomplished with a couple of plastic storage bins held in place in one of the metal drawers with some hook-and-loop fasteners.

Japanese Saws vs.

The difference is more than just pushing or pulling.

It might shock you to hear this, but in the last decade or so more than three centuries of a Western tool-making tradition has been undone.

"You cannot push a chain in a straight line. But you can pull a chain in a straight line. Pushing a saw makes no sense. I can saw upside down and over the back of my head with a Japanese saw with no problem."

— Harrelson Stanley of JapaneseTools.com

The Western handsaw, a tool that cuts on the push stroke and was the pride of the English-speaking world, isn't the tool most woodworkers now reach for when they need a handsaw.

It has been replaced by the Japanese saw, which cuts on the pull stroke and once was mocked by Westerners as "backwards."

The numbers tell the story best:

- Sixty percent of the saws sold by Lee Valley Tools are Japanese-style, says Rob Lee, president of Lee Valley, one of the world's largest hand-tool catalogs.
- Woodcraft Supply Corp. sells 100 Japanese saws for every Western saw, says Peter Collins, a product manager for the large catalog and retail company.
- And Japan Woodworker, which sold many Western saws 30 years ago, now sells 1,000 Japanese saws for every Western saw, says Fred Damsen, the owner.

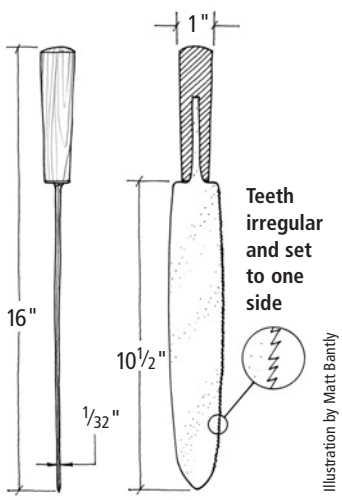
What caused this shift to Japanese saws? While some say it's because sawing on the pull stroke is superior to sawing on the push stroke, the issue actually is more complex.

And which saw is best? The prevailing wisdom says Japanese saws are superior and easier for beginners to learn. But if you've ever worked with a sharp, well-tuned Western saw, you know this can't be entirely true.

To answer these questions, we decided to scrutinize the two types of saws to learn their true differences, beyond the information in catalogs. Armed with this knowledge, you can choose a saw that's right for your woodworking and your budget. Our journey begins in ancient Egypt.

The First Handsaws

Modern woodworkers would almost immediately recognize the first known metal saws, which were excavated in Egypt.



Egyptian handsaw

by Christopher Schwarz

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

Photos by Al Parrish

Western Saws

They had a long, knife-like blade, a straight grip and cut on the pull stroke, like a Japanese saw. Why the pull stroke?

Early Egyptian saws were made with a thin sheet of copper (as thin as 0.03") and had no rigid spine like the modern backsaw.

"(If they had been used) on the push stroke, the saw would have buckled and bent," according to Geoffrey Killen, author of numerous books and articles on Egyptian woodworking and the head of faculty at the Design and Technology Department of the Stratton Upper School and Community College in England.

What is unusual about these saws is that all the teeth were set (meaning they were bent) to one side of the blade. This makes the saw difficult to steer, and the Egyptians had to come up with ingenious ways of wedging the saw kerf open during each cut, according to Killen.

The advent of bronze tools brought some refinements, as did the iron saws developed by the Romans. But the basic form was still a pull saw with a thin blade.

It was the invention of the frame saw (plus teeth set to both

"I continue to use Western-style saws mostly because they work for me, and I don't see enough advantage in pull saws to completely change the way I work and the appliances I use."

— Don McConnell, contributing editor to *Popular Woodworking*, professional woodworker and longtime student of traditional woodworking

The Western handsaw, shown here being used by Don McConnell with an overhand rip grip, cuts on the push stroke.

ADVANTAGES OF JAPANESE SAWS:

• Thinner kerf removes less wood, which means less effort.

• The inexpensive saws are of high quality and work very well right out of the box.

• The teeth are generally harder and can go longer between sharpenings. The best Western saws are 52-54 on the Rockwell "C" scale. Japanese saws are 51-58 for the handmade saws, and 61 and higher for the machine-made impulse-hardened saws. While the harder teeth stay sharp longer, they also are more brittle and prone to break.

• There are many manufacturers who sell a wide variety of saws with different teeth configurations (more than 100 kinds, by Harrelson Stanley's count) for every woodworking task and every type of wood.

DISADVANTAGES:

• It's almost impossible for a woodworker to sharpen a Japanese saw. The teeth are too complex on handmade saws and too hard on the impulse-hardened ones. Handmade saws usually go to Japan for sharpening. Impulse-hardened saws become scrapers or go in the garbage.

• The crosscut teeth are more delicate. If you hit a knot or cut quickly into particularly tough wood, you could lose a tooth or two.

• The saws are easier to ruin. Because the blade is thin, you can bend it on the return stroke if you push too hard and the saw isn't aligned properly in the kerf.

• Japanese saws pull sawdust toward you, obscuring your line.

• Japanese saws made for dimensioning lumber (not joinery) have shorter blades than full-size Western handsaws. Depending on the saw, the pull saw might require more strokes to do the same work.

• Japanese saws are designed to be used in traditional Japanese fashion on low benches. When used in Western fashion, some Japanese saws are not always as effective as they should be.

"Here's a tip for starting a ryoba saw in a rip cut: Start the cut with the crosscut side (to begin your kerf) and then switch to the rip side."

— Fred Damsen, Japan Woodworker

sides of the blade) that allowed these thin metal blades to be used on either the push stroke or the pull stroke – much like a modern coping saw or bowsaw, according to "The History of Woodworking Tools" (G. Bell & Sons) by W.L. Goodman.

The frame saw might not have been invented by the Romans, but they certainly refined it and produced a wide variety of them.

This is an important fork in the road in saw history that affects us to this day. The Japanese developed pull saws like the Egyptians, but they never seem to have developed frame saws, according to several students of Japanese history (though a Chinese frame saw did come into use in 15th century Japan).

So the Japanese, with their scarce metal resources and their traditions of working low to the ground, stuck with the pull saw and refined it to a high art.

In the West, most of the European continent stuck with the bowsaw. But the Dutch and English took a different path. In the mid-17th century, wider steel blades became possible thanks to water-driven mills, and the modern handsaw that cuts on the push stroke was born.

Instead of benches, Japanese craftsmen use low trestles. Sawing a tenon with a Japanese saw this way is efficient and requires sawing at a less awkward angle than at a high Western bench. However, you need to be in good shape to work this way.

The West Stumbles

The 19th and early 20th centuries were the golden age of Western handsaws. There were hundreds of saw manufacturers, fierce competition, high-quality tools and a very hungry market.

But as the demand for quality hand tools declined, so did the number of manufacturers. And quality slipped dramatically.

"Western manufacturers thought it was OK to ship a saw that was poorly set, dull and had a handle that looked like it was made by a third-grade art student," says Thomas Lie-Nielsen, owner of Lie-Nielsen Toolworks. "You couldn't use the saws right out of the box. It's no wonder the Japanese ate their lunch."

When Western saws suitable for cabinetmaking disappeared off the shelves, the Japanese saws picked up the slack.

"In Japan, the product lines have not been cheapened," says Lee of Lee Valley Tools. "Even products that have been mass produced have not been cheapened."

So while it was tough to find a decent new Western saw at almost any price, the Japanese exported saws to the West that were sharp, straight, perfectly set and inexpensive. A good Japanese backsaw still costs only about $40. So it's little wonder that the Japanese saw now is in many North American workshops. It was, in many ways, a simple matter of economics.

Facts About Japanese Saws

Japanese craftsmen would be quite curious about the way Westerners use their saws. For one, we work on a high bench and clamp our work when sawing. The Japanese furniture maker works on a low sawhorse (6" high or so) and does not generally have a vise.

"(Westerners) tend to clamp everything," says Harrelson Stanley of JapaneseTools.com. "The Japanese don't clamp unless they have to. They do some wedging. Mostly they saw in toward a solid object," such as the work, which is secured by their foot, he says.

A second difference is that many Westerners use the crosscut dozuki saw (a saw with a rigid spine) for cutting dovetails, which is primarily a ripping operation.

The Japanese woodworker instead uses a rip-tooth dozuki (which is uncommon in the West) or a rip saw without a back, says Damsen of Japan Woodworker. That's because the Japanese philosophy on dovetails and tenons is, at times, different than the Western approach.

"When they cut dovetails they don't want the cut too smooth," he says. "They compress the joint before assembly and let it expand and lock the joint."

Westerners want a smoother cut and are willing to sacrifice the speed of a rip tooth. Many Japanese dovetail saws for the Western market have some sort of combination tooth, in some cases a tooth that was designed to cut plywood that also works quite well for dovetails, Damsen says.

"Don't choose a tool based on hype. There's no reason you should have to buy something made 10,000 miles away to cut wood."

— Pete Taran, Vintage Saws

Types of Japanese Saws

But one thing Japanese and Western craftsmen share is having to choose what type of Japanese saw to buy: a machine-made saw or a craftsman-made saw. There are important differences:

- A good-quality machine-made saw costs about $20-$50. The price of a craftsman-made saw averages $150, and the premium tools are about $250.
- Generally, craftsman-made saws have softer teeth than the machine-made saws, which are typically impulse-hardened. Impulse hardening is a fast, high-voltage process that hardens only the teeth. While the machine-made saws stay sharp longer, they cannot be resharpened.

Craftsman-made saws can be resharpened and even customized to the way you work. But this is meaningless to Western woodworkers, says Frank Tashiro, owner of Tashiro Hardware, which sells the line of ZETA Saws.

"(The sharpener) doesn't know your work so he does the best he can, so it doesn't work out," says Tashiro, who adds that the best value and performance come from a Japanese saw with replaceable impulse-hardened blades.

But replaceable blades rankle woodworkers who don't believe in disposable tools.

To counter that, Japanese saw manufacturers say that once your impulse-hardened saw becomes too dull for woodworking, it is still plenty sharp for work in the garden as a pruning saw.

"You can make a nice scraper out of the blade, too," Damsen says of the saws.

- Another difference is that

For crosscutting in joinery, the Japanese will use a dozuki (which means "shoulder of a tenon"). There are various ways to grip the saw.

ADVANTAGES OF WESTERN SAWS:

- The teeth are more durable than those on Japanese saws and are highly unlikely to break, even under the worst conditions. The blades themselves are thicker and less likely to buckle in use.
- They will last you a lifetime. The teeth can be resharpened many times. Saws can even be refiled by the user to a different tooth configuration if their needs change.
- With a little practice, you can sharpen a Western saw with inexpensive and easy-to-obtain tools.
- Western dovetail saws that are properly filed for a rip cut will cut more aggressively than the crosscut-filed dozuki that's commonly used for dovetails in the United States.
- They push the sawdust away from your cut line.
- High-quality secondhand Western saws are both plentiful and inexpensive in most parts.

DISADVANTAGES:

- High-quality new or restored Western saws are more expensive than their Japanese counterparts. Japanese joinery saws average about $45; the equivalent quality Western saw costs $125.
- Inexpensive new Western saws are – in general – dull and poorly set compared to similarly priced Japanese saws. Learning to saw with these less-expensive tools frustrates many beginners, swearing them off Western saws.
- While vintage Western saws are plentiful in most parts of the United States, you must first learn to restore them before putting them to work: straightening the blades, fixing the teeth and sharpening.
- The teeth are softer and require more frequent sharpening, though it is a task you can do yourself after a little education and practice.
- In general, the saws are heavier and have a thicker kerf, so they require more effort to use.

Some students of woodworking history think the push stroke was developed in the West because we work on high benches, unlike Japanese craftsmen who work near the floor on low trestles or beams.

many craftsman-made saws are more delicate because of their thinner blades. Even the most robust craftsman-made saw should not fall into the hands of a beginning woodworker.

"Just because you have a $200 saw doesn't mean you will saw better," says Stanley. "It's important to practice the technique. Start with impulse-hardened saws. Don't get a $250 saw and break it. As your skills improve you can use thinner saws."

When using Japanese joinery saws, most everyone agrees that you shouldn't be aggressive or saw at a radical angle. Just a bit of downward pressure on the pull stroke is all it takes, and you shouldn't apply any downward pressure on the return push.

Facts About Western Saws

No one can deny that Japanese saws cut very well, but so do Western saws that are sharp and properly set. The problem is finding Western saws suitable for woodworking. There are still some manufacturers of full-size Western saws that do a decent job for woodworking, including E. Garlick & Son, Pax, Paragon, Sandvik/Bahco, Lynx and Augusta. Some of them also make joinery saws – backsaws with a rigid spine on the blade. And companies such as Lie-Nielsen and Adria now make premium joinery saws that are the equal of the outstanding saws of the 19th century.

But by far, the biggest sources of quality Western saws are flea markets and auctions. Top-of-the-line Disston, Simonds and E.C. Atkins saws can be purchased for $5-$25. These, however, can be rusty, dull and bent. If you have no desire to restore one of these old saws, there is an alternative.

Pete Taran runs the web site VintageSaws.com, which is a sawyer's paradise. He takes classic handsaws and backsaws and returns them to their former glory by making them sharp, properly set and ready to cut. A vintage highly tuned handsaw or backsaw will cost between $80 and $150 at Vintage Saws.

The site also is a treasure trove of good historical information on saws. One of Taran's primary goals is to teach woodworkers how to sharpen their Western saws, which is easier than you might think.

He sells the files and saw sets you need, plus there is a fantastic tutorial on his web site that explains the process from start to finish. And if you just want to get your feet wet, Taran even offers a saw filing kit to get you started. The kit comes with a user-grade saw with freshly cut teeth, a file, a file handle and complete instructions. When you're done, you'll have some more confidence and a saw that cuts very well.

Sharpening a Western saw is probably one of the biggest stumbling blocks for woodworkers.

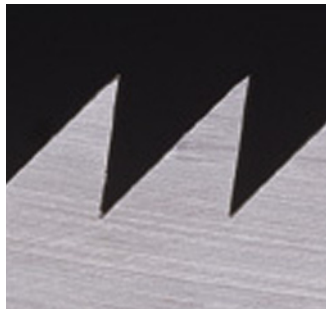
"No one knows how to sharpen Western saws," says Graham Blackburn, author of "Traditional Woodworking Handtools" (available at blackburnbooks.com) and an instructor at Marc Adams Woodworking School. "I ask the students to bring in their worst plane and their worst saw. Once they sharpen their saws they never go back to Japanese saws."

But if you don't want to learn to sharpen, you still can get a flea-market saw professionally tuned.

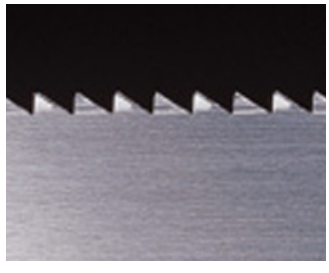
We recommend Tom Law of Smithsburg, Md. We mailed a dull, unusable Disston backsaw to Law, who charged us $10 to reshape the teeth, $5 to set the teeth and $10 to sharpen the 14-point rip saw. That $18 saw now cuts dovetails like a dream. (See the "Saw Sources" box for contact information. Law also has a tutorial video, "Hand Saw Sharpening.")

"My favorite illustration has been pruning a tree. Imagine standing 30 feet up, hanging onto a trunk about to remove a branch above you. Would you rather be pushing or pulling?"

— Rob Lee, president, Lee Valley Tools



Japanese Rip Teeth • The length of the rip teeth are graduated on Japanese saws. They start small near the handle and get larger.



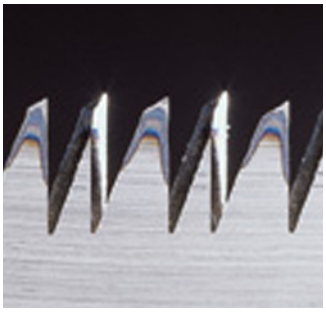
Western Rip Teeth • Rip teeth work like chisels, levering out the grain. Crosscut teeth work like knives, severing the fibers on either side.

This $18 Disston #4 backsaw cuts incredibly well now that it has been properly sharpened. The handle on vintage Western saws will fit your hand like a glove. Later handles are uncomfortable to use and look crude by comparison.

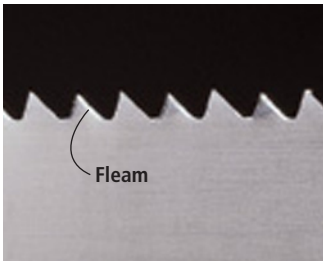
Western Saw Tips

Once sharpened, a Western saw is easier to use than you might think. Here are a few tips:

- Though it sounds obvious, use a rip saw for rip cuts, such as dovetailing. Some dovetail saws are filed for crosscut. They work OK, but not as well as a rip saw.
- Let the saw do the work. Don't use a lot of downward pressure on the kerf – this is surely the No. 1 problem faced by beginners. The saw will wander and you'll never cut straight.
- Don't clench the handle tightly. Hold the saw with just enough pressure to keep it under control. And use only three fingers – your index finger should point down the blade.



Japanese Crosscut Teeth • Note the long slender teeth and three bevels filed on each tooth. The tips are discolored from impulse-hardening.



Western Crosscut Teeth • You can see the simpler secondary bevels (called the "fleam") filed on every other tooth.

Worst of Both Worlds?

All this has to make you wonder why someone hasn't built a saw that merges the best qualities of both traditions. Well, a few companies have tried, though nothing has been able to challenge the dominance of the pure Japanese-style saw.

And the reason might be illustrated by the experience of one veteran woodworker.

A few years ago, Blackburn was poking around a flea market and discovered a beautiful old Spear & Jackson backsaw.

The saw had a perfectly shaped handle, much like the one on the outstanding Lie-Nielsen dovetail saw. But the blade of this Spear & Jackson was horribly bent. So Blackburn hung it on his wall.

> **"I take issue with Japanese saws being easier to use for beginners. I think it's just the opposite. A sharp and tuned Western saw is much easier to learn to use."**
>
> — Thomas Lie-Nielsen, Lie-Nielsen Toolworks

One day a friend noticed the saw and offered to send it to Japan to see if they could straighten it out. Blackburn agreed. The saw came back a few months later straight as an arrow but with one major and shocking change.

They had filed Japanese-style teeth on the blade. Trying to keep an open mind, Blackburn gave it a try. "It cuts well," he says, "but it feels wrong to me. So it still hangs on the wall."

Chalk it up to this: When it comes to traditional hand-tool skills, it's hard to defy tradition. Now you just have to decide which tradition is best for you. **PW**

SAW SOURCES

Adria Woodworking Tools
604-710-5748 or adriatools.com
• Premium Western joinery saws

BlackburnBooks.com
• Books and videos on traditional Western woodworking

DisstonianInstitute.com
• Detailed information on Disstons

EuropeanHandTools.com
888-222-8331
• E. Garlick and Lynx saws

Geoffrey Killen's Egyptian Site
geocities.com/gpkillen/
• Information on Egyptian woodworking tools and furniture

Hida Tool
800-443-5512 or hidatool.com
• Range of Japanese saws

Japan Woodworker
800-537-7820 or japanwoodworker.com
• Full range of Japanese saws and some Western saws

JapaneseTools.com
877-692-3684
• Range of Japanese tools, including some hard-to-find types

Lee Valley Tools
800-871-8158 or leevalley.com
• Impulse-hardened Japanese saws
• Wide range of Western saws

Lie-Nielsen Toolworks
800-327-2520 or lie-nielsen.com
• Premium Western joinery saws

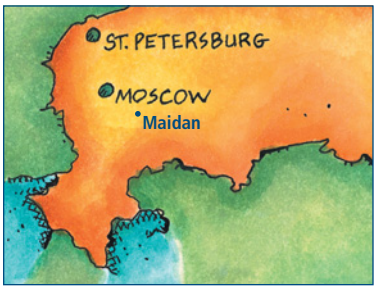
Tashiro Hardware
206-328-7641 or tashirohardware.com
• Impulse-hardened Japanese saws

Tom Law
301-824-5223 or 62 W. Water St., Smithsburg, Md. 21783
• Western saw sharpening

VintageSaws.com
• Restored vintage Western handsaws and sharpening supplies

Woodcraft Supply Corp.
800-225-1153 or woodcraft.com
• Impulse-hardened Japanese saws and some Western saws

Town of Turners



In the sheds behind every house in the small village of Maidan, Russia, there are wooden shavings piled chest-high, remnants of hundreds of matryoshki.

Often, the price of wood in Polkhovsky Maidan, Russia, is a few bottles of vodka. Homemade lathes are built from automotive parts. And behind almost every house is a shed filled to the brim with wood shavings. Maidan is a town full of turners, where men make a living turning doll blanks and women make a living painting them.

The Russian nesting doll, called matryoshka (roughly translated as "little mother"), is actually many dolls inside each other. Yet in its relatively short history, the matryoshka has become a symbol of Russian folk culture, if not Russia itself.

The first matryoshka was turned in 1899 by Vasilii Zvyozdochkin, a master toy maker. Within five years, the city of Sergiev Posad was producing hundreds of these dolls. Sizes and shapes were as varied as the artists who produced them, even including satirical dolls that represented political figures and illustrations of fairy tales, as well as the traditional peasant girl, "Matryona," after which they were named.

In the late 1920s, as Josef Stalin consolidated power, artists who worked in small workshops or their apartments were moved into factories. There, the only acceptable subject was the traditional peasant girl. Essentially all matryoshki that were produced between 1930 and 1990 depicted that peasant girl, wearing a scarf and apron, and decorated with flowers. Each city developed its own traditional look, but none were allowed to stray from the basic subject; political subjects were not allowed.

As the Soviet Union collapsed in the late '80s, different matryoshki appeared. The first anomaly was the "Gorby" doll, poking fun at Mikhail Gorbachev and his predecessors. Soon thereafter, artists started branching out, and today there is no limit to the themes depicted on the dolls.

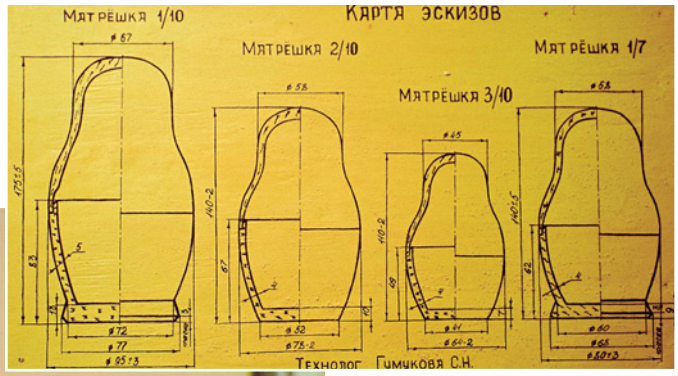
This 30-piece doll is only 8" high. Some of the pieces in the second and third rows are so thin that the black paint bleeds through to the inside of the doll.

by Rett Ertl

Rett Ertl is co-author of "The Art of the Russian Matryoshka" (Vernissage Press) and president of Boulder, Colo.-based TolsToys Inc. (tolstoys.com), a company that imports matryoshka dolls and other Russian folk arts and crafts.

Photos by Rick Hibberd

Often, artists outline the facial features in pencil before painting them.



This is the only official sketch of a nesting doll I have seen. It shows the dimensions of the first three pieces of a 10-piece doll and the first piece of a seven-piece doll. I have never seen anyone actually refer to the sketch.

This man begins the process of forming the bottom piece of the doll. When he makes several of them, he then forms the top piece to fit the bottom. Notice the headwear he uses to keep the sawdust out of his hair.

Although Russia has undergone much change, the technique of making matryoshki has barely varied. Zvyozdochkin would be able to walk into any matryoshka workshop today and pick up right where he left off.

The Raw Material

The finer, hand-turned dolls are made of linden (also called basswood), a fine-grained, soft, deciduous tree. The softness makes it easy to work and the fine grain allows it to keep its shape. Even when the dolls are imported to a dry climate, they rarely crack. Dolls brought to the United States 30 years ago may have faded, but the wood likely has not cracked.

Birch trees, however, are more commonly associated with Russia and are more plentiful and less expensive than linden. Why, then, aren't more matryoshki made of birch? Because birch is too hard and brittle. If a mistake is made in turning birch, the piece may break. The larger dolls have proportionally thinner walls than the smaller ones, making it even more likely that birch would crack if it was used.

Preparing the Wood

Blank matryoshka dolls are produced in a factory or a backyard shed. The larger factories are located in Semyonov, Kirov and Nolinsk, and there are as many as 20 turners (both men and women) working in a large room.

The majority of village-made blanks come from Polkhovsky Maidan (referred to as Maidan). Before Rick Hibberd (co-author of "The Art of the Russian Matryoshka") and I went to Maidan, we asked some people how to find the turners. Once in Maidan, we realized we needn't have asked. For one thing, there are only about five streets in Maidan. More importantly, as far as we could tell, every house in Maidan had a shed behind it where the men turn the nesting doll blanks.

The lathes in most Maidan shops are homemade contraptions consisting of a motor, belts and an axle, all bolted to heavy hardwood benches. These machine parts often come from something that is definitely not a lathe, perhaps the Lada, an automobile ubiquitous in Russia – the product of a Fiat factory built in Russia in the mid-1970s. The tool rest that adjusts alongside the workpiece to support the cutting tool is held by wooden posts that penetrate the bench and are secured underneath by wooden wedges.

As the men in Maidan gouge out the cavities and shape the exterior forms of the dolls on the lathes, great piles of wood shavings build on the shed floors. One of the turners we were watching stood next to a chest-high pile as his brother-in-law amiably drew on a Yava cigarette as he chatted. No one mentioned that sawdust may be flammable. We asked several of the turners what they do with their shavings, and most just answered, "What difference does it make?"

The blanks in Maidan are turned out at the highly variable rate of a five-piece set an hour when there are no other pressing matters. From the backyard shed, the blanks are bagged for market, via a long day's bus ride to Moscow.

The five-piece blank will sell for the equivalent of about $1. Most women in Maidan paint simple, flower-adorned nesting dolls, but most of the blanks are sold to independent artists in Moscow.

With the growth in popularity of the matryoshka, Maidan has become a prosperous village. There is new stretch of road leading to the town, located in the middle of the country. One can see linden logs standing in the yards of almost all of the houses, and almost every house has an outbuilding where turners work.

There is a peculiarly Russian advantage to living near the forests, such as those near Maidan. While a person from Sergiev Posad would have to pay full price for the Maidan logs (and probably a bribe, too), a resident who lives near the forests can get them for much less than the official price – often a few bottles of vodka.

This is one of many backyard lathe sheds in Maidan. The lathe operator builds and maintains his own machinery and keeps his tools sharp. Sweeping the floor, however, is not a major consideration.

Drier is Better

No matter where the blanks are made, the process starts in the forest. After trees are felled, their branches are removed. Then the logs must be dried so that the nesting dolls made from them do not crack or warp.

Most lathe operators are men; however, several older women still work in the factories. This woman, at the AOFIS factory in Sergiev Posad, has been turning dolls for almost 40 years.

The ideal drying period is three years, but many Russian producers use linden that has been dried for less than a year. Lathe operators in Maidan strip the bark before drying. They usually dry the logs vertically, although horizontal stacks work if they are kept covered and have plenty of air circulation. According to the woodworkers of Maidan, if the logs are piled correctly and if the weather is warm and dry, the logs can dry in one good summer.

One of the secrets of good blank-making is to use a slightly more moist log for the top of the doll, so that when the doll is put together the top piece shrinks to fit the bottom one.

If the bottom piece is wetter than the top, it will shrink and cause the top piece to be too loose, which is one of the worst defects a matryoshka doll can have.

Once a log is properly dried, it is ready to be cut. In small Sergiev Posad factories, one or two men pull a log off the pile and cut it into pieces about 2' long. They then put the log into a large hydraulic splitter and the log is split into about six pieces. Next they place the split blanks onto a lathe, where they turn them into a smooth cylinder, perhaps 4" in diameter and 2' long.

In the larger factories, this process is more automated. In Kirov, for example, there is a complete sawmill where the logs are brought to a dock on a crane and then rolled onto a conveyor. Rather than splitting the logs and then turning them into round logs, the workers square them off and then cut the logs into square pieces roughly 4" by 4", depending on the width of the blanks being produced.

Turning the Blanks

Once the rounded or square block of wood has been processed, the blanks (often after drying for another few weeks) go to the fine turner. Unlike the preceding operations, the final turning process is manual, regardless of the size of the factory. In Maidan, where almost all of the lathe operators are men, their fathers and grandfathers before them were turners. Elsewhere, many of the lathe operators are women. Interestingly, most of the women who operate lathes learned their craft in the Soviet period. Since democracy's arrival in Russia, women generally choose to paint.

The turners use gouges to shape the doll. They insert the round piece of wood into a spiked jamb chuck. Using a large, curved gouge, the operators remove most of the wood from the inside of the piece that is to become the bottom half of the nesting doll. Then they use

In the Nolinsk factory, a final sanding is done on a small spindle lathe. The operator protects her fingers with blue electrical tape.

a skew or flat chisel to create the rabbeted edge that will form the joint with the top piece, making an angle that is just a little sharper than a right angle. The outside of the bottom piece is next. If it is the largest doll then it almost always has a notch near the bottom, creating a base. None of the inside pieces has a base, so those pieces are tapered from top to bottom. Finally, a parting tool is used to create a flat bottom to separate it from the rest of the workpiece. Several pieces are made from that one 2' length of wood mounted on the lathe.

Generally, lathe operators will spend a few hours making bottoms of one size and then the next few hours making tops to fit. With the top blank chucked on the lathe, the operator takes the bottom of the doll made earlier and holds it against the spinning wood. This burns a circle in the bottom of the top piece and in the lip of the bottom piece. These burns are guides for cutting the opposing rabbeted joint and the cavity of the top piece. That is why most matryoshki, when opened, have a burned strip around the inside edge.

The only measurement tool turners commonly use is a caliper to mark the starting point for the top. With no templates or patterns, they make the proper curve on the insides of the pieces so the next, smaller doll will fit into it.

When the inside of the doll is finished, the turners round off the top to conform to the curve on the inside. When the top is rounded, turners use the parting tool to cut the piece off the workpiece. After a light sanding, turners attach a finished bottom onto the top piece while it is on the lathe, and run a chisel up and down the doll. To form a smooth transition from top to bottom, a pencil mark is made across the seam, showing the artist how to assemble the two pieces for the best fit.

At some factories, the matryoshki are sent to a finishing lathe. If the blanks do not fit together perfectly, this turner will put the finishing touches on them until they do.

Larger factories have a few automatic lathes, used to turn the inexpensive three- or four-piece birch wood dolls. They duplicate a pattern rapidly and consistently, producing several blanks a minute. Producers maintain that the larger dolls must be made by hand, as the mechanical gouges of the automatic lathes would break a high percentage of the dolls, even if they were made from linden.

Painting the Blanks

Next, the blanks are ready to be painted. In factories, the blanks are put into trays and carried to the starch room where they are rubbed with a liquid starch. The starch seals or sizes the wood so that the aniline paint will apply flat and won't blossom or bleed into unintended areas. When the blanks are ready to be painted, workers carry them on trays to the painting room. In large factories, these are large rooms where about 100 artists work.

As late as 1994 in the Souvenir factory, one artist painted the background colors of the doll, another would outline the face and the apron, a third painted the face, a fourth added the design onto the apron, a fifth added the flowers on the scarf and a sixth painted on the finishing touches. All of the Souvenir artists took

In the factories, where aniline paints are used, workers coat every matryoshka piece with starch so the paint will not run. The starch is applied by hand.

The dolls are lacquered literally by hand – this woman dips her hand in the can, then rubs the lacquer onto the doll. One woman uses diesel fuel to clean the lacquer off her hands at the end of the day.

To paint "micro" matryoshki, paintbrush bristles are brought to a very fine point. To hold the small doll, the artist sticks it onto the end of a disposable syringe needle.

turns – the woman who was painting scarves changed to painting faces the next day to keep from getting bored.

In the small Sergiev Posad factories, the rooms are smaller and about 10 artists sit and work. If the artists are painting traditional dolls, they generally have rows of dolls in front of them, arranged with the largest pieces at the back. They usually paint the background color first on each of the 50 pieces. Then they might add the scarf, then the flowers and so on. Usually, the face comes last, although artists say that the order in which they paint depends upon their mood: If they were painting a more individual artistic doll, they would paint one doll at a time.

One design motif used in several factories is the pinwheel-shaped spiral. It is achieved by rolling folded cloth tightly, then dipping it in paint and applying it, rubber-stamp fashion, onto the heads or other parts of the dolls. Sometimes, real rouge makeup is used for the rosy cheeks.

Lacquering the Dolls

Once the doll is painted, it is taken to the lacquer room. Even the largest factories have only a few lacquerers. The small Sergiev Posad factories have only one lacquerer, and even she does not always stay busy. Most lacquer rooms consist of a series of shelves, reminiscent of a commercial bakery. The lacquer person, who almost always is a woman, takes a painted matryoshka piece from one shelf, dips her hand in the lacquer and rolls the piece back and forth between her hands, just as a child might make a snake out of modeling clay, and then places it on the drying shelf.

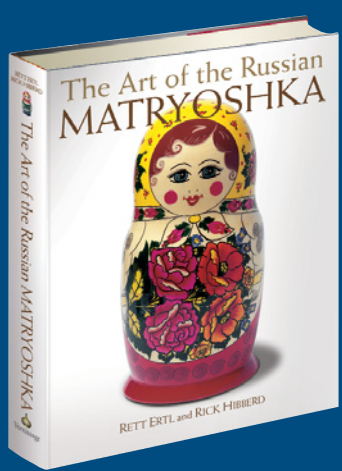
The women who lacquer dolls are unconcerned about the effect the lacquer has on their health. Asked how the lacquer is cleaned from her hands at the end of the day, one woman replied, "With diesel fuel – it makes my hands soft." One woman who lacquers dolls at Factory No.1 in Krasnogvardeiskaya uses sunflower oil to wash off the bulk of the lacquer, and then "a special solvent" to get her hands clean.

The lacquer dries for 24 hours, then the process is repeated. Most factories apply two or three layers of lacquer. The layers need to be thin to avoid accumulations at the top piece's seam and at the top of the bottom piece's base.

On fine-art nesting dolls, lacquer is generally applied with a brush, which is less likely to show flaws. A good brush lacquerer, however, can do only about 10 five-piece dolls per week, whereas a bare-handed lacquerer can easily do up to 10 times as many. Either way, a good lacquerer using glossy lacquer produces such a shiny exterior that some mistake it for porcelain. Would an automated process produce the same effect? Charmingly, no one seems to have tried to find out. **PW**

THE BOOK

"The Art of the Russian Matryoshka" by Rett Ertl and Rick Hibberd (Vernissage Press) offers a complete account of the history, production, variations and creators of Russian nesting dolls. The 240-page book features 330 photos. To order the book ($40), go online to vernissagepress.com. For a limited time, you can get the book and the cover doll for $65.



12 BEST TOOL VALUES

Some tools are worth a lot more than you paid for them.

For the last 60 years, master woodworker George Reid has kept the same folding ruler in his white shop apron.

That ruler has stood by him as he built some of the most incredible reproductions of 18th century American furniture imaginable (visit popwood.com for a sample). And, in return for its loyal service, Reid has never replaced it, despite the fact that it is scored in several places from encounters with his Delta tilting-top table saw.

We all have favorite tools that are worth far more than we paid for them. Recently we came up with our all-time favorites. We narrowed our list to things you can buy new today (or very comparable models) so we wouldn't force you to hit the flea markets for your tools. (Prices are current as of publication deadline.)

— Popular Woodworking editorial staff

SHARK DOWEL/ DETAIL SAW

For quick cutting jobs and unusual sawing tasks, this junior-sized, thin-kerf, $15 Japanese-style saw is the one to grab. Whether you're cutting dowels flush, trimming stock or tackling a dovetail, this is the one. We've even used it in tight spaces to notch studs for a pipe. Because its remarkably sharp teeth run almost to the tip, you can saw with just a ½" stroke when needed. And when you crumple a few teeth, don't worry: Just pop in a new blade ($10) and go back to work.

Shark Corporation: 800-891-7855 or sharkcorp.com

SHINWA 6" PRECISION RULE

To measure accurately and immediately, you need a good 6" steel rule. The Shinwa has nicely etched markings in 1/64", 1/32", 1/16" and 1/8" increments and also has scales on the end of the rule for easy height set-ups. With a nice satin finish, this is almost Starrett quality for one-third the price (item #60N47.01 is only $4.95 at Lee Valley).

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

LIE-NIELSEN 60½ BLOCK PLANE

Without a doubt, the Lie-Nielsen 60½ is the best block plane ever manufactured. No antique or new plane can beat this plane's precision, quality and ease of setup. Armed with this tool, there is little you cannot do. Remove saw marks from the edges of your boards, trim joints perfectly flush and slice off translucent shavings of end grain (yes, end grain) with ease. The plane is heavy, fits perfectly in your hand and is a bargain at $150. If you own only one Lie-Nielsen plane (a tough task for some of us), this is the one.

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

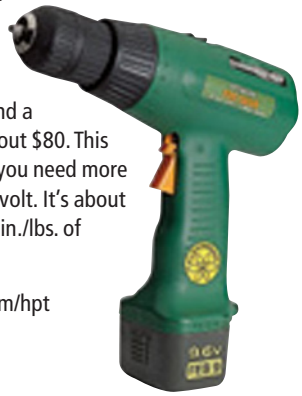
'PONY' BAND CLAMP

There are many times when clamps with bars or pipes won't work or are less than ideal. The solution, quite often, is the modest band clamp. On mitered joints, chairs or boxes, whether square or looking more like a coopered bucket, these clamps pull joints together with ease, exert equal pressure and hold the parts in place to boot. For less than $8, you get the clamp with a 16'-long band and four plastic corners to prevent the bands from crushing delicate edges.

Adjustable Clamp: 312-666-0640 or www.adjustableclamp.com

HITACHI 9.6-VOLT CORDLESS DRILL

While we routinely recommend 12-volt cordless drills as adequate for most woodworking applications, we've also been happily using a 9.6-volt drill in our shop for years. Our Hitachi 3/8" drill (now sold as model DS9DVF2) offers two variable-speed settings (0-280 and 0-850 rpm), two 1.3 amp-hour batteries, a one-hour charger, a five-position adjustable clutch, a keyless chuck and a moveable-head flashlight, all for about $80. This tool performs! And if you still think you need more power, check out the DS12DVF2 12-volt. It's about the same price, but comes with 195 in./lbs. of torque – and a flashlight!



Hitachi: 800-448-2244 or hitachi.com/hpt

MAKITA BO5010 RANDOM-ORBIT SANDER

Random-orbit sanders have changed our lives in the shop, providing quick good-quality finishes, and no other sander has made us as happy as the BO5010 from Makita.

Priced about $60, this lightweight (2.6 lbs.) 2-amp tool removes material quickly while not reducing your hand to a shivering wreck. The pad motion utilizes a pad-control system to maintain a controlled speed at start-up to reduce "pigtail" patterns. The hook-and-loop 5"-diameter pad design makes it easy to quickly change and reuse sanding discs, and the through-the-pad dust collection system is one of the best we've seen. It's been the sander of choice in the *Popular Woodworking* shop for six years and it continues to be the random-orbit sander we prefer.

Makita USA: 800-462-5482 or makita.com

EXCEL MARKING KNIFE

We've tried dozens of marking knives to find one that is long enough and thin enough for marking dovetails. Most are too short to effectively reach into the joint or too thick to maneuver. The Excel marking knife with the company's #102 blade is a perfect $8 solution. The cutting edge is 1 1/2" long and just 0.03" thick. Don't like to sharpen? Replacement blades are just $1 each.

Available at many hobby stores.

GOOD OLD TOOTHBRUSH

Don't laugh – every shop should have at least one. They are especially good at keeping up equipment, cleaning accumulated sawdust from tight corners and scrubbing pitch off saw blades. My cabinetmaking teacher always carried one in his shop apron. Available in any bathroom cabinet.

TITE-MARK MARKING GAUGE

If you're satisfied with your current marking gauge, you should never lay your hands on the Tite-Mark gauge from Glen-Drake Tool Works. Once you use this tool, there is no turning back. The Tite-Mark ($79) is everything other marking gauges are not: It scores perfect lines and is easily adjusted in small increments to put a line exactly where you want it. Sharpen the cutting blade and you can even remove waste from between dovetails pins and tails. Genius.

Glen-Drake: 707-961-1569 or glen-drake.com

5-IN-1 SCREWDRIVER

You can find one of these handy tools in almost every home improvement store. Whether it's a 5-in-1 or 15-in-1, for less than $10 you'll have the tips you use most in one handle. We like the 5-in-1 with #1 and #2 square-drive tips, a #2 Phillips tip and a medium straight bit. Remove one of the tips and it's a 1/4" nut driver! Put one in your car, your workshop and the fix-it drawer in your house.

Available at many hardware stores.

GRIZZLY CABINET SAW

If you're looking to spend about $800 on a contractor saw, don't. Since its release a few years ago, the G1023S cabinet saw has been a better deal than any contractor saw – as long as you have access to 220-volt power. Offering a totally enclosed, 3-horsepower, fan-cooled motor, two solid cast-iron wings, a very nice T-style rip fence and a magnetic safety switch, this saw outperforms any contractor saw. Regularly priced at $825, you often can find it on sale for $795. And this saw now is available in a variety of models with affordable options such as a left-tilt or 110-volt motor. It's a great bargain.

Grizzly Industrial: 800-327-2520 or grizzly.com

LEE VALLEY 4" DIAL CALIPER

Nothing beats a dial caliper for zeroing in on the perfect fit for a joint or the perfect thickness when you're at the planer. But most dial calipers are bigger than you need. (When was the last time you worked with 6"-thick stock?) This inexpensive 4" version from Lee Valley Tools is perfect. It has all the features a woodworker needs and it's small enough to slip into your shop apron. With a price tag of just $22.50, this is far more useful than its more expensive 6" cousins. **PW**

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

Back-roads Bodger

Don Weber keeps traditional chairmaking alive in an old Kentucky general store.

Photos by Al Parrish

Weber turns the tenons for his chair legs on a foot-powered lathe. He built this lathe (which he calls his "kinetic sculptor") in 1979.

The birth of one of Don Weber's Welsh stick chairs begins not in a lumberyard, but in the bohemian Welshman's small side yard that's riddled with logs and rough shavings in the tiny town of Paint Lick, Ky.

Weber, who's a bodger (a 19th century term for a specific kind of British chairmaker), carefully places two wedges on the end of a log and then comes crashing down on them with an iron-bound mallet called a beetle. The log gently splits in two. He then rives the wood into billets with a tool called a froe. Using a side ax, he furiously dresses the wood, sending chips flying.

Then the pieces of oak (what will become the Welsh stick chair's leg stock, stretcher stock and arm material) are taken into the machine room where they begin their journey through the shop.

From Mendocino to Paint Lick

Weber was born in New York, raised in Wales (where he apprenticed as a joiner) and lived in California for 20 years before moving to Paint Lick. His first woodshop in Mendocino, Calif., was "a tiny place alongside a creek." Eventually the bodger moved his shop to higher ground, working under what's referred to in Britain as a "bender" – an outdoor canvas structure. Electricity was unnecessary.

While living in California, he worked, researched and taught traditional woodworking. His activities required him to travel to Appalachia – areas such as eastern Tennessee and Kentucky – where, as Weber explains, traditional crafts have a pure, direct connection to the crafts of the British Isles in the 1700s. (Think Eliot Wigginton's "The Foxfire Book" series – 11 books that include interviews with older Appalachian residents about everything from bear hunting and home remedies to ghost stories and chairmaking. The popular series prompted the creation of the The Foxfire Fund Inc., a nonprofit educational and literary organization supporting traditional crafts and skills. Check out foxfire.org.)

In October 1998, Weber made a trip to teach with the Kentucky Arts Council. While there, he had some time to drive around the Kentucky countryside. He slowed down when he saw a sign that said "Paint Lick."

Once big enough to support five general stores, Paint Lick (an old railroad stop about 40 miles south of Lexington) used to be a busy place. Today the main street is lined with a few antiquated buildings and the old-timers reminisce about the day wild animals ran loose after a circus train wrecked. There's still a post office, an auto-repair shop and a restaurant where almost everyone smokes – including the cooks.

by Kara Gebhart

Comments or questions? Contact Kara at 513-531-2690 ext. 1348 or kara.gebhart@fwpubs.com.

At the end of town is the old Calico and Brown General Store. It is there that Weber saw a "For Sale" sign in the storefront window. He says he always dreamed of buying an old store where he could teach, work and display his pieces in a storefront window. (For information on Weber's class offerings, visit handcraftwoodworks.com.) So he bought the entire building, which required rewiring, replumbing and reinforcement, for $25,000.

A 1,600-square-foot corrugated steel warehouse, once used for storing feed and seed, sits at the back of his shop. Now it stores wood. Behind the warehouse next to Hammock Alley (named after the town's old blacksmith) is Weber's blacksmith shop.

"That's one of the things that the local people appreciated," says Weber, who apprenticed with a blacksmith for six years. "Hearing once more the sound of anvils ring down Hammock Alley."

The bodger's side yard – where he splits his logs – is next to his warehouse. His work flows from the outside in. From the side yard, the oak is taken to the machine room.

Even Bodgers Need a Table Saw

The machine room is a narrow space near the back of the store. Here he prepares his wood before it journeys to the hand-tool room, where it's worked on most intensively. (Ninety percent of Weber's furniture is built by hand.) The green oak is resawn on his 1918 Crescent Manufacturing band saw, which is shown below. Weber also uses the band saw to cut out elm seat blanks and the curve on the oak headpieces.

The band saw, which Weber purchased a few years ago for $200, is cover-less, unless you count the stainless steel heavy-gauge mesh wire, which Weber says is a portion of the cover he's in the process of making for the machine. This band saw is slightly smaller than the 36" monster he had in California.

There are two lathes in the machine room. One's an Oliver, a long-bed lathe that the bodger uses for faceplate turning. The other is an Eggles & Smith, a patternmaker's lathe, which Weber purchased in Berkeley, Calif. The small machine room also holds a 10" Delta Unisaw, an old horizontal boring machine and an 8" jointer.

Once the elm and oak are prepared, the pieces continue their journey to the hand-tool room for further work.

Weber splits a log outside his shop using an iron-bound mallet (called a beetle) and wedges.

This is Weber's hand-tool room. Except for a few drill presses, this room is powered solely by muscle.

Weber's machine room is much smaller than his hand-tool room. Here he prepares the wood before beginning his handwork.

Weber is working on making a cover for his 1918 Crescent Manufacturing band saw. The heavy-gauge mesh wire you see here is part of that cover.

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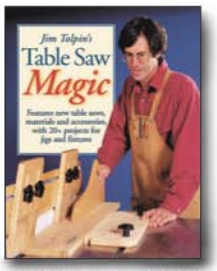

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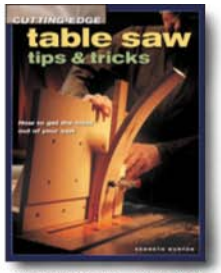

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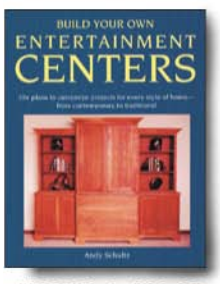

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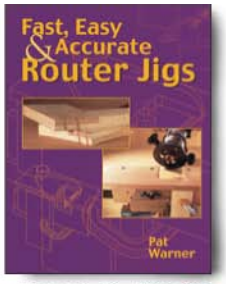

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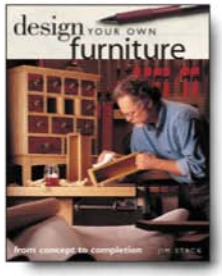

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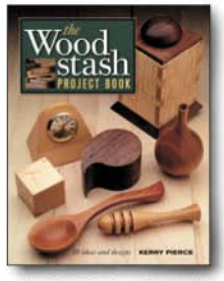

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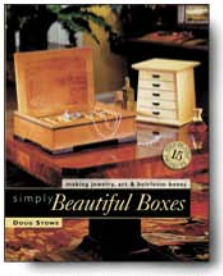

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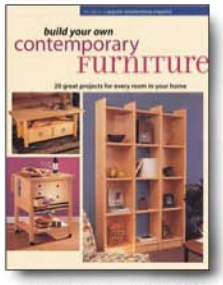

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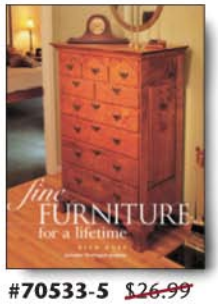

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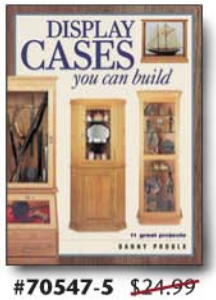

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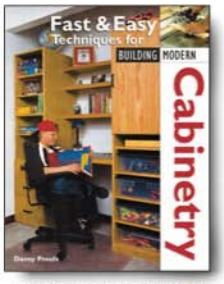

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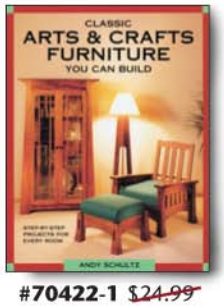

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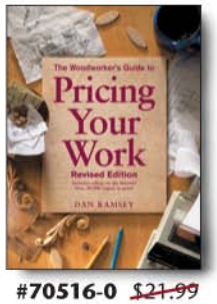

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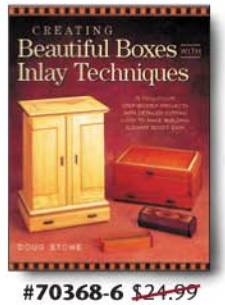

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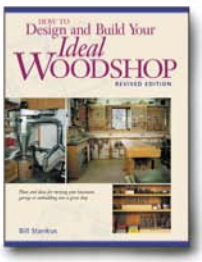

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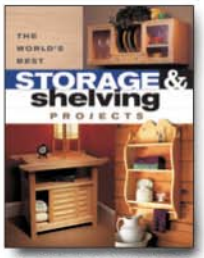

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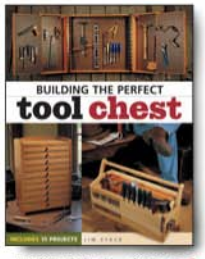

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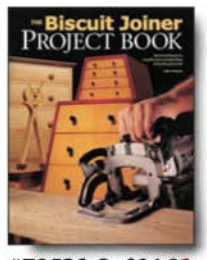

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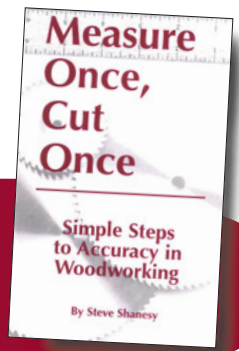

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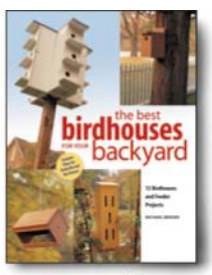

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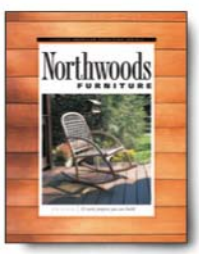

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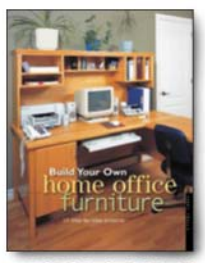

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KAJ03PW

Don Weber is writing an article on how to build the end table pictured here using hand tools. Be sure to look for it in an upcoming issue.

Neanderthal Heaven

The hand-tool room is the largest in the Welshman's shop; it's where the heart of the general store once was. Although designated for hand tools only, a few drill presses line the back wall. Chair spindles and rails spill out of cardboard boxes, and chopping blocks abound. A bookcase is filled to the brim with books on traditional woodworking and a desk is cluttered with dusty piles of papers. At the front of the room is a display area where Weber keeps several finished pieces.

But when entering the hand-tool room from the machine room, you find yourself at the back, next to the kiln. Prepared green oak that needs to be steamed or dried goes directly into the steamer or kiln.

Weber built his kiln by covering an old machine crate in plywood and insulating it with Styrofoam. The kiln has ventilation holes in the top and bottom, and inside are racks meant for holding spindles and stretchers. Two light bulbs provide heat, and a recycled computer fan circulates the warm air.

While some green oak steams and some dries, Weber begins hollowing the chair's seat with a tool called an adze, followed by a curved spokeshave called a travisher. Then he scrapes the seat with a tool called a chair devil. The bodger bores holes for the legs, then grabs his leg stock out of the kiln and cuts his tapers. Next he mounts the legs on his foot-powered lathe to turn the tenons.

Weber has several foot-powered lathes. The one shown on page 86 is patterned after a 12th century lathe from England with a 16th century bow-drive system, inspired by Denis Diderot. Weber built this lathe in 1979. He also has practical lathes, and some primitive ones. One of the lathes leaning against his shop wall consists simply of two posts buried in the ground with a head stock on top. Utilizing a long, springy branch for motion, this lathe is meant to be used outdoors.

Once the tenons are turned, Weber inserts the legs into holes on top of the kiln for further drying. Once dry, he legs up the chair, meaning he dry-fits the legs and seat together. Next, he works on the back spindles (made from hickory), arms and headpiece with scrapers, spokeshaves and chisels.

Weber dry-fits the chair, knocks it apart and then works on the legs' wedges. He uses animal-hide glue for final assembly.

Weber prefers a natural finish because he tries to keep his chairs as close to the earth as possible. He first applies a shellac sanding sealer and finishes the chair with an oil and varnish blend, which consists of a natural resin varnish, tung oil and gum turpentine.

Much of his work takes place on one of his four shave horses, each based on a different chairmaker. One is a German shave that once was used in Northern Europe and Colonial America. Another is an English, "bodger-style" shave with a swing-arm horse. The third is called a pinhorse or an Appalachia shaving horse, and the fourth is a newer model he built based on a design by John Alexander (author of "Chair from a Tree"). This shave horse uses three different types of interchangeable heads.

Worth the Journey

Once a chair is complete, its work order is taken off a crowded bulletin board. Some orders are for new, hand-crafted chairs while many are to repair broken ones.

"My father always said that if you can mend a chair, you'll never be out of work," says Weber, who takes the advice to heart.

When the day's work is done, the bodger retires to an apartment he's remodeling above his shop. Every morning he practices yoga in the general store's old skating rink. In warm weather, he tends to his rooftop garden, where he grows vegetables and herbs in a claw-foot bathtub and 5-gallon buckets.

Whether chairmaking, pounding out metal or teaching, this bohemian bodger works tirelessly to keep the early woodland crafts alive. Making the move from Mendocino to the tiny town of Paint Lick has helped him achieve just that. **PW**

Don Weber will be demonstrating at WoodWorks shows in Indianapolis; St. Paul, Minn.; Nashville, Tenn.; Columbus, Ohio; Springfield, Mass.; and Phoenix beginning this fall. Check out woodworks2003.com for specific dates.

Spindles and parts of chairs spill out of cardboard boxes throughout the shop.

Weber stores his scrapers in a small block of wood.

Bench Gouges Ideal for Roughing It

Using these sometimes-forgotten cabinetmaking tools let you hog material out of tight spaces.

Photos by Al Parrish

Many modern woodworkers consider the bench gouge a tool solely for turning or carving. But the bench gouge shown here (called a firmer gouge) is designed for furniture making. Here the author uses a gouge and a mallet to rough out a walnut breadboard tongue (traditionally called a "mitered clamping").

The task was simple, but I was not satisfied with any of the methods that came immediately to mind.

I'd agreed to make repairs on a cherry secretary. Though it was a factory reproduction "in the style of" Chippendale, it was a decent piece that had been passed down to the owner from her grandmother. It had suffered minor fire damage during transport, so most of the repairs involved cutting out charred areas and patching with sound cherry.

In this instance, the location and adjacent obstructions were going to make any direct means of isolating and removing the bulk of the damaged material difficult. There wasn't room to use a saw, drilling would have been awkward, and I was concerned that heavy chopping with a chisel could have undesirable consequences. But there was a fair amount of material to remove.

While continuing to do other work and turning this over in my mind, I had a nagging feeling that I was overlooking the most obvious solution. Suddenly, it came to me – I realized I could borrow a low-relief carving technique, commonly known as "grounding," and use a bench gouge and mallet to quickly and safely remove the bulk of the material along the cross grain. Final cleanup then could be achieved with chisels.

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.

In musing over why it had taken me so long to arrive at such an obvious solution, I realized that I had been, in effect, wearing blinders regarding the full range of possible uses for bench gouges.

Not Just for Carving

I'd been in the habit of thinking of bench gouges as specialized tools held in reserve for special occasions, such as those involving decorative treatments or some form of shaped work. While gouges are indispensable in those situations, I had overlooked their potential usefulness as roughing tools in a variety of more mundane situations.

Since then, my bench gouges have seen much more use. Which, in turn, has given me a better understanding as to why bench

gouges were such a vital part of the working kits of our predecessors. And I know they can be useful for many woodworkers today.

A bench gouge is seldom the only tool that will accomplish a given task. But surprisingly it is often the simplest and most direct, especially when access is restricted or using other tools is problematic. This can be particularly helpful in situations where the production of noise and fine sawdust are an issue. A few examples:

- As already discussed, roughing out where access is restricted or awkward.
- Roughing in a stopped dado or housing. A gouge can establish most of the width and depth directly, allowing for minimal cleanup with chisels and a router plane.
- Roughing out the tongue of a mitered clamping, or breadboard end, as shown in the photo at left. A gouge of appropriate depth can be used in a self-gauging manner, a surprisingly direct and efficient process.

Finding the Right Gouge

The variety of bench gouges that are available in catalogs, auctions and flea markets can be confusing, so I thought it might be good to outline the basic types and their uses.

The most common bench gouge has traditionally been referred to as a firmer gouge. While the specific meaning of this term is a matter of some discussion, I think the word "firmer" was meant to indicate a gouge for general woodworking. This is distinct from more specialized carving or turning gouges.

Most often, these tools have the primary cutting bevel on the outside, which is useful for the roughing type work already discussed. These either can be driven with a mallet or pushed by hand.

Some firmer gouges, though, have bevels on the inside of the blade. These are often referred to as incannel gouges or scribing gouges. More difficult to maintain and sharpen, these also can be driven, carefully, with a mallet or pushed by hand. Scribing gouges are used in situations where the specific curvature of the cutting edge is used to accurately define a feature. An example of this would be to scribe or cope a joint in sash work where two mouldings meet (hence the name, scribing gouge).

Paring gouges are similar to firmers, except that they tend to be longer – generally, 8" to 10" blades, compared with 5" to 7" blades more typical of firmers. They also tend to be more delicate at the cutting edge. These can have outside or inside bevels, though the more common configuration is the inside bevel. Intended to be pushed by hand, these can be useful for cleaning up surfaces of curved or shaped woodwork.

A special type of paring gouge is the cranked, or bent-shank, gouge. The bent shank provides extra clearance for the handle off the surface of the material and always has an inside bevel. These are particularly useful for the kind of shaped work undertaken by patternmakers.

With the exception of the cranked gouge, all these gouges come in either the tang (shank) or socket forms. For general bench work, the choice between these two forms is a matter of personal preference. Both the tang form and the socket form have ancient origins, and it might be surprising to learn that, historically, the socket form was more expensive because it required more manufacturing steps.

Yet one more variable is that, at least in the United States, gouges have often been available in three different "sweeps." Typically, they were regular, middle and flat sweeps.

The term sweep refers to the depth of the

The three types of gouges for cabinetmaking are, from top to bottom, the cranked gouge, the paring gouge and the firmer gouge. The paring gouge is in socket form, while the other two are in tang forms.

Bench gouges are available in three sweeps: (from left) flat, middle and regular. The regular sweep is the most useful for general work.

To establish a new edge (or repair a badly damaged one) hone a clean edge while holding your gouge on end on the stone.

curvature of the cutting edge in proportion to its width. The greater the curvature, the "quicker" the gouge.

Of the bench gouges, the regular sweep is the quickest and, as the name implies, is the sweep we think of when considering gouges in a generic sense. This sweep also is the most useful, though the middle and flat sweeps have their place. Older bench gouges at flea markets and auctions seem to remain overlooked and undervalued, so, with a little patience, it is still possible to acquire a variety of them at reasonable prices.

Sharpening: No Fingernail Grinds

Sharpening a gouge isn't as straightforward as sharpening a chisel, and this can become another deterrent to their use.

For general usage, the cutting edge of an outside bevel gouge needs to be a straight line when viewed from directly above. Further, the cutting edge should be at an approximate right angle to the axis of the tool. A convex-shaped cutting edge (sometimes referred to as a "fingernail edge") will tend to stick in the work because it is attempting to lift the chip before it is severed at the surface. I don't suggest this shape for general usage. A slightly concave-shaped cutting edge won't hurt anything, but nothing is gained from it, either.

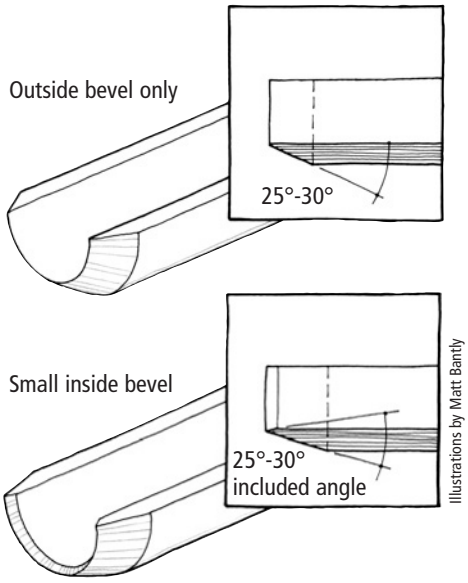
If there are any flaws with the edge, or if you are starting with an older gouge that needs reconditioning, you will need to first establish a new edge. Assuming the flaws aren't too bad, you can do this by holding the gouge upright, vertical to the flat face of your sharpening stone, and abrading the end until you have produced a straight and clean (shiny) edge, as shown in the photo at left. (If the flaws are severe enough, you may have to use a grinding wheel first.)

The most common advice regarding sharpening bench gouges is to polish the inside with your slip stone, or abrasive stick, resting on the surface. My preference, to borrow an idea from carvers, is to put a small bevel on the inside of the gouge. One consequence of this practice, though, is that you may need to slightly lengthen the outside bevel to maintain an appropriate cutting geometry. See the illustration above.

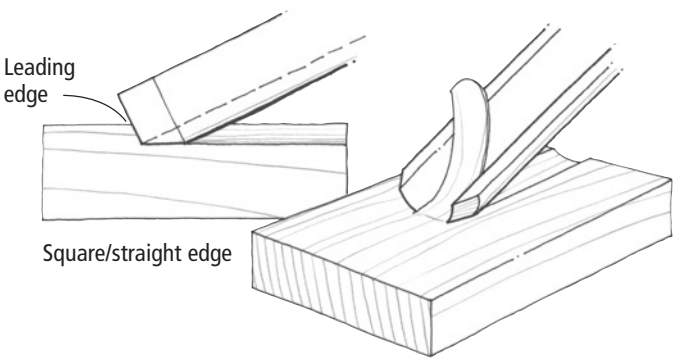
As to the main, outside bevel, there are special honing jigs that can be useful for obtaining consistency. However, I find that with some care I can maintain suitable consistency by rolling the gouge in a side-to-side stroke over the stone. Freehand honing can also be accomplished by honing along the axis of the gouge, rolling the gouge through each stroke. I find it a little more difficult to obtain consistent results this way.

If I need to grind a new bevel, I find it useful to carefully use an appropriate grinder (hand-cranked in my case) and allow the resulting hollow grind to aid the forming of the new bevel. Inside bevel gouges are more difficult to maintain.

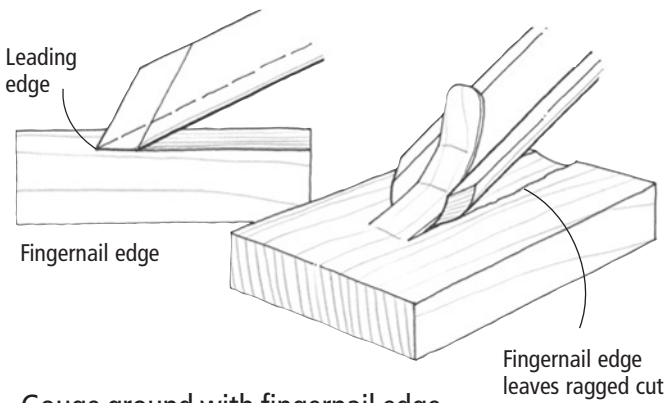
Any number of strategies have been devised for dealing with these difficulties, but I have taken the course of avoiding incannel gouges that require drastic reconditioning and relying on honing the inside bevels with slip stones as each gouge is needed. **PW**



Outside & inside bevels



Gouge ground with straight edge



Gouge ground with fingernail edge

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ADVERTISER INDEX

Aerosol Spray Finishing

For small or specialty jobs, spray-can finishing is a good choice.

Photo by Al Parrish

When finishing anything bigger than a turning, we recommend you purchase an accessory trigger unit for your aerosol cans. They are inexpensive (about $5), effective and available at most home center stores.

Aerosols make possible the packaging of various finishing products in convenient, easy-to-use containers. The packaging raises the price of these products compared to using them in a spray gun, but the convenience of aerosols is so great that it's rare to find a professional finish shop without a shelf full of them.

Many amateurs also use aerosols as an inexpensive substitute to buying a spray gun – inexpensive, at least, as long as the amount of finishing being done is not too great. Aerosols are ideal for smaller projects.

Most popular finishes are packaged in aerosols in sheens ranging from gloss to flat. These include polyurethane, shellac, water-based finish, lacquer and pre-catalyzed lacquer. (Pre-catalyzed lacquer is a fast-drying finish like lacquer, but it's considerably more durable so it's often used to finish kitchen cabinets and office furniture.) Other useful products, such as sanding sealers, toners and blush removers, also are packaged in aerosols.

The finishes in aerosols are the same as those you spray through spray guns except they are thinned much more to fit easily through the small hole in the nozzle. You normally would have to spray at least twice the number of coats to get the same film build you would achieve with a spray gun.

Local paint stores and home centers rarely stock many aerosols, but you can find a large selection at Wood Finishing Supplies (866-548-1677 or woodfinishingsupplies.com).

How to Spray Aerosols

Aerosols have the same application advantages spray guns have when compared to brushes: speed and better appearance. It's faster to spray a finish than it is to brush it, and spraying produces a more level surface than brushing, which leaves fairly pronounced brush marks.

Spraying with an aerosol is almost identical to using a spray gun. The most important rule is to arrange the object and lighting so you can always see a reflection in the area you're spraying. This way, you'll see if you're spraying properly – a fully wet coat that's not so wet it puddles or runs. With the help of reflected light, you can adjust the distance you hold the aerosol from your work and the speed you move it to achieve a good result. Practice on scrap wood or cardboard until you feel comfortable.

To help avoid puddles and runs, begin your spraying a few inches off the surface and continue spraying past the opposite edge. Keep the aerosol moving at all times, and avoid spurting by keeping your finger from partially covering the hole in the nozzle. If you're spraying a large flat surface such as a tabletop, ensure an even thickness by spraying your first pass 50 percent off the front edge and 50 percent on. Then overlap this pass entirely with the second and continue overlapping each additional pass by 50 percent.

Finally, make your last pass on the back edge 50 percent off the edge and 50 percent overlapping the next-to-last pass. This way, every part of the surface will have received a double application.

To further ensure an even thickness, perform the same routine again, this time by working perpendicular to the first passes. Every part of the surface will then have received four applications of finish.

by Bob Flexner

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

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Toning with Aerosols

Toning is under-appreciated, especially among those who have never sprayed. It involves applying color to a surface by adding a pigment or dye colorant to the finish itself and spraying it. (Brushing a toner can create uneven coloring or very noticeable brush marking). Too much pigment will muddy the wood like a thin coat of paint, but dye will add coloring and be almost totally transparent.

Toning can be used to adjust the coloring of an entire object after a sealer or finish has been applied, or it can be used to adjust the coloring of just part of an object. Examples include blending sapwood with heartwood or a light wood species with a darker species. Another example is creating highlighting in some areas, such as the centers of panels, by spraying toner on the area around them. Most higher quality factory furniture has been toned.

Removing Water Rings

One of the most useful functions of an aerosol is as a "blush" remover. A blush is the milky-white coloring that sometimes occurs when spraying in high humidity. It's also the milky whiteness of a water ring, and it's much easier to use an aerosol with the right solvent to remove the ring on-site than it is to take a table to your shop and use a spray gun.

Water rings are caused by moisture getting into a finish and creating voids that refract light and prevent it from passing through. The voids usually are near the surface, so abrading the finish with fine steel wool or rottenstone and a lubricant usually removes them. But this disrupts the sheen, causing the rubbed area to appear different.

A less disrupting method is to mist the damaged area with the very slow evaporating lacquer solvent, "butyl Cellosolve," which is contained in aerosol blush removers (available from woodfinishingsupplies.com). Remember that you're dissolving the finish, so don't spray too much or touch the sprayed area before it's thoroughly dry. **PW**

An aerosol toner (a common brand is shown at left) is an effective way to match a finish color. The photo below shows how I used a green toner on the right side to "kill" some of the red of the red-dyed mahogany. The added green makes the piece look more brown.

AEROSOL BREAKDOWN

Whatever liquid an aerosol might contain, the cans themselves are pretty much the same – a nozzle (made up of a valve and an actuator), a diptube and a gas to propel the liquid through the hole in the nozzle.

Before 1978, chlorofluorocarbons (CFCs) were used to propel the liquid, but these have been eliminated in all but a few exempt items because of their negative effect on the upper ozone layer. Most of today's aerosols contain liquefied petroleum gases (LPGs) such as propane, isobutane and n-butane.

The nozzle on most aerosols has a simple cylindrical-shaped actuator that you push down to activate a cone-shaped spray pattern. But some others can be adjusted to spray in a vertical or horizontal fan pattern like a spray gun. The fan can be adjusted from vertical to horizontal by using pliers to rotate a small rectangular disk. These aerosols lay down a more even finish than the cylinder type.

With both types, you need to shake the can before using. If the can contains any solid material, such as pigment or flatting agent, it will contain a ball that you'll hear knocking against the sides as you shake. This ball helps put the solids into suspension. If you don't hear this ball knocking around, continue shaking until you do, and then shake for another 10-20 seconds.

When finished spraying, clean the diptube and valve so the finish doesn't dry and clog them. Do this by turning the can upside down and spraying until no more liquid comes out.

Not all aerosol nozzles are the same. Some (top) can be adjusted to change the spray pattern. Others are fixed (below). If you have a choice, choose the adjustable nozzle.

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Caption the Cartoon

Illustrated by Bob Rech
bobrech@juno.com

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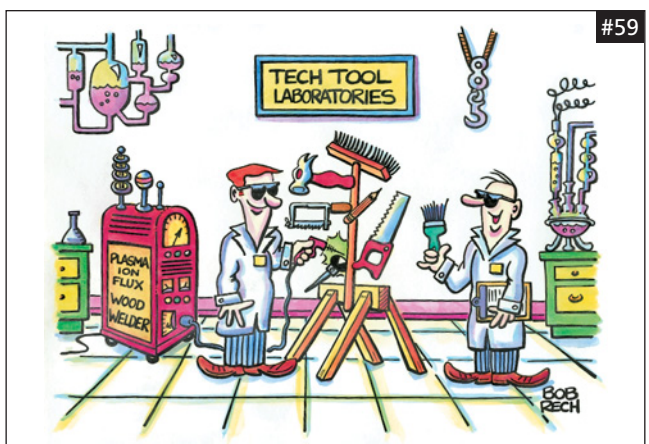
This issue's winner receives 10-12" and 10-24" PSI Clamp-n-Spread clamps. These easy-to-use clamps feature a 3⅝" throat depth, a comfort cushion pistol grip, a heavy-duty steel bar, soft-jaw pads and a convenient clamp-release button. The clamp quickly can convert to a spreader. The set is valued at more than $200! Runners-up each win a one-year subscription to *Popular Woodworking*.



"I know that no self-respecting woodworker is going to buy it, but we'll make a killing on these when Father's Day rolls around!"

Dan Stuepfert, of Hudson, Illinois, is the winner of our Cartoon Contest from the June issue and recipient of 20 PSI Clamp-n-Spread clamps. The following runners-up each receive a one-year subscription to *Popular Woodworking:*

"Let's see Harry borrow our tools now ..." **Curt Slusser, Berwick, Pennsylvania**

"Duuude! A Swiss army sawhorse!" **Mark Roth, Davenport, New York**

"Finally! The ultimate cordless." **William Riggs, Palm Harbor, Florida**

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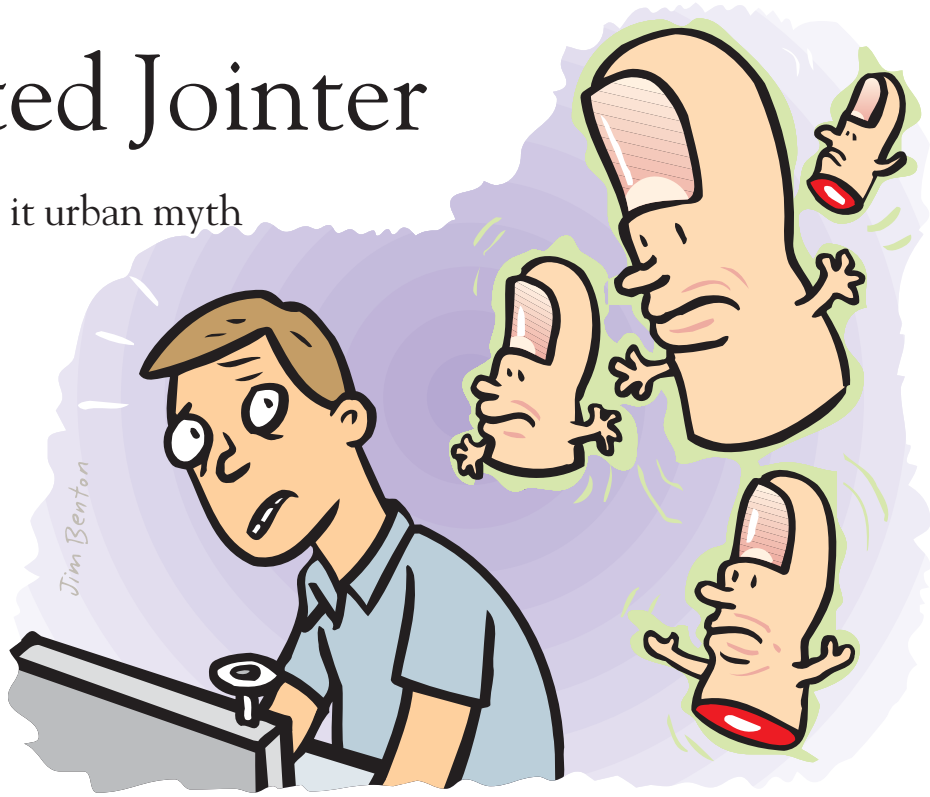

Mark is a customer who talks more than he buys at the hardwood supply company I run. But I never know when one customer will send a buyer my way, so I always allow Mark to use his daily quota of words on me. A few years ago, Mark's visit paid off.

"Say, I know where you can get yourself a free jointer," he said one day.

"Oh yeah?" I responded cautiously.

"Sixteen inch. It's sitting in a parking lot next to where the old Dundee Boat Co. used to be. They dragged it out of the building before it was torn down. It's been sitting there for more than a year. I think the owner would be glad to see it fixed up and used."

"That's nice. I'll keep it in mind," I said.

Mark leaned forward, lowered his voice and said, "It has a cylindrical head."

I whispered back, "I'll take it."

Most old jointers have square heads. Accidentally stick your finger in one of those and it will grab and pull your entire arm in before you know what happened. Cylindrical heads only remove a salami slice of your finger at a time. Meet any 50 woodworkers and check their hands. You'll see several reasons for not using tools with square heads.

We arranged to meet the owner, Frank, the following Saturday. Mark gently reminded the elderly gentleman of the condition of the jointer and what a worthy person I am. Mark explained how the jointer would have a new life, perhaps even a classy paint job, maybe with a racing stripe. We shook hands on the deal, then I followed Mark and his dad to the site of the demolished factory in my '67 Dodge flatbed.

In the far corner of the lot stood the massive, rusted machine with the pitted table and the wonderful cylindrical head.

As we loaded the truck, Mark filled me in on the jointer's venerable history.

"She was bought new by the Hornell Furniture Co.," he said. "Frank bought her when they went out of business in the '40s. They kept the jointer on the second floor but before they went out of business the building was in such bad shape it fell through to the first floor and they set her back up right there where it stayed until they went out of business. It was too big to move.

"After Frank bought it he really didn't use it much," Mark continued. "He was afraid of it. One of his employees accidentally removed his thumb with it. It was a strange accident. The company had a committee that reviewed accidents and recommended ways of preventing them. When the employee recovered, the safety committee gathered around the jointer and the employee demonstrated what he was doing when the accident happened. In the process, he cut his other thumb off. Frank just shut off the machine and stored lumber on it."

"That's really strange," I said. "I heard of an identical accident happening at the furniture company near Dansville a few years ago except it was with a table saw."

"I swear it's true, Pete. Frank told me."

"I believe it, Mark. But you have to admit it is a curious coincidence," I said as I thanked Mark and his father for their help and left.

But that story – did it actually happen? Did my jointer enter into the annals of American Folklore or is it a fact? I probably will never know. How many other tools across the country have cut off two thumbs or fingers or hands? I've heard the story a couple of times since then and even ran across it in a book written in the 1940s.

A few years after this, an older gentleman shuffled in to buy a piece of oak for a shelf. He didn't turn it this way and that or sight down the board the way inexperienced woodworkers do. He just tucked the board under his arm like a man who's been around lumber most of his life. When he opened his wallet, I noticed half his thumb was missing. He held the wallet in the other hand oddly, as if his second thumb was missing, but he mostly kept his hands in his pockets.

As we chatted I learned that he worked at the Hornell Furniture Co. when he was younger. I casually led him back to the jointer and asked if he is familiar with the fence system, which I never quite figured out. He looked it over without recognition. "Nope," he said. I didn't dare ask if he knew the jointer's story. You simply can't ask a stranger personal questions. **PW**

by Peter Sieling

Peter Sieling runs Garreson Lumber Co., a small cabinetmaking hardwood supply firm in Bath, N.Y.

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