CELEBRATING 25! YEARS

FIX FINISH SCRATCHES – THE SPIT & POLISH SOLUTION

17 JIGS & ACCESSORIES ADD ACCURACY TO YOUR TABLE SAW

FEBRUARY 2005
ISSUE #146

POPULAR WOODWORKING

Your First Dovetails

Better Methods For Quick Success

Fast Fixes For Chisels

5 Tricks Transform Dull, Rusty Tools

PLUS

- The Best 15" Planers
- Build a Boat at Home A New & Easy Way
- Frame & Panel Chest of Drawers

Gustav Stickley's Glass-front Bookcase

popwood.com
$5.99US $7.99CAN
02>
0 74470 01355 6
DISPLAY UNTIL 1-31-2005

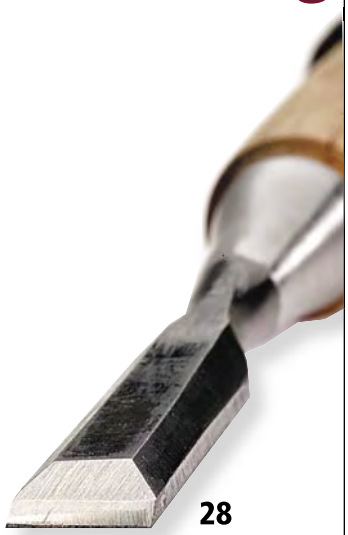
contents

POPULAR Woodworking

14

IN EVERY ISSUE

32



28

98

92

Popular Woodworking (ISSN 0884-8823,USPS 752-250) is published 7 times a year in February, April, June, August, October, November and December by F+W Publications Inc. Editorial and advertising offices are located at 4700 E. Galbraith Road, Cincinnati, Ohio 45236; tel.: 513-531-2222. Unsolicited manuscripts, photographs and artwork should include ample postage on a self-addressed, stamped envelope (SASE); otherwise they will not be returned. Subscription rates: A year's subscription (7 issues) is $28; outside of U.S. add $7/year • Canada Publications Mail Agreement No. 40025316. Canadian return address: 2744 Edna St., Windsor, ON N8Y 1V2 • Copyright 2005 by *Popular Woodworking*. Periodicals postage paid at Cincinnati, Ohio, and additional mailing offices. Postmaster: Send all address changes to *Popular Woodworking*, P.O. Box 420235, Palm Coast, FL 32142-0235 Canada GST Reg. # R122594716 • Produced and printed in the U.S.A.

ON THE COVER

Gustav Stickley's celebrated #700 bookcase is one of the high points of his brief collaboration with Harvey Ellis. Our version is the real-deal – right down to the ammonia-fumed finish.

Cover photo by Al Parrish

DEPARTMENTS

PROJECTS, TOOLS AND TECHNIQUES

POPULAR Woodworking®

February 2005, Vol. 25, No. 1
popwood.com

Editorial Offices 513-531-2690

Editor & Publisher **Steve Shanesy**
ext. 1238 • steve.shanesy@fwpubs.com

Art Director **Linda Watts**
ext. 1396 • linda.watts@fwpubs.com

Executive Editor **Christopher Schwarz**
ext. 1407 • chris.schwarz@fwpubs.com

Senior Editor **David Thiel**
ext. 1255 • david.thiel@fwpubs.com

Senior Editor **Robert W. Lang**
ext. 1327 • robert.lang@fwpubs.com

Managing Editor **Kara Gebhart Uhl**
ext. 1348 • kara.gebhart@fwpubs.com

Assistant Designer **Susan L. Smith**
ext. 1058 • susan.l.smith@fwpubs.com

Project Illustrator **John Hutchinson**

Photographer **Al Parrish**

Contributing Editors
Nick Engler, Bob Flexner, Glen Huey, Don McConnell, Troy Sexton

Magazine Group Head **David Hoguet**

Executive Vice President Magazine Advertising
Jim Gleim

CIRCULATION
Mark Fleetwood, *Group Circulation Manager*

PRODUCTION
Barbara Schmitz, *Vice President*
Vicki Whitford, *Production Supervisor*
Brian Courter, *Production Coordinator*

ADVERTISING
Don Schroder, *Advertising Director*
331 N. Arch St., Allentown, PA 18104
Tel. 610-821-4425; Fax 610-821-7884
d.schroder@verizon.net
Advertising Production Coordinator
Krista Morel, Tel. 513-531-2690 ext. 1311
krista.morel@fwpubs.com

SUBSCRIPTION SERVICES: Subscription inquiries, orders and address changes can be made at popwood.com (click on "Customer Service FAQs"). Or by mail: *Popular Woodworking*, P.O. Box 420235, Palm Coast, FL 32142-0235. Or call 877-860-9140 or 386-246-3369. Include your address with all inquiries. Allow 6 to 8 weeks for delivery.

NEWSSTAND DISTRIBUTION: Curtis Circulation Co., 730 River Rd., New Milford, NJ 07646

ATTENTION RETAILERS:
To carry *Popular Woodworking* in your store, call Steve Hudziak at 800-894-4656 or write Magazine Retail Sales, Steve Hudziak, P.O. Box 5014, Iola, WI 54945-5014.

Back issues are available. Call 800-258-0929 for pricing or visit our web site at popwood.com. Send check or money order to: *Popular Woodworking* Back Issues, F+W Publications Products, 700 E. State St., Iola, WI 54990. Please specify publication, month and year.

SAFETY NOTE

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

Not-so-big Shops, And a Silver Jubilee

Big-shop envy is a misplaced sentiment. Sure, it would seem that when it comes to your workshop, bigger is better. But I've learned that a one-person shop that's more than 500 square feet is probably too big (my own home shop is just less than 400 square feet).

In a bigger shop, you can spread out, but that means your tools are spread out and sometimes harder to find. There's more floor to sweep, dust to clean up, and more space to heat, cool and adequately light.

A small shop does have challenges. Large projects require planning and "staging." Some machines may need to be moved aside when not in use and set up again when needed.

But in a small shop, everything is comfortably within reach. You can find most everything blindfolded. Plus, a small work space forces me to be more tidy than is my habit – and that's a good thing. When thoughtfully set up, a small shop is a lot like a comfortable old sweater, roomy enough to move in, while "fit" enough to be cozy.

Our 25th Anniversary

This year, *Popular Woodworking* celebrates its 25th year of publishing. There have been many changes in format and content – even the name. It started under the banner *Pacific Woodworker*, as a tabloid-sized newspaper . A few years later the name was changed to *Popular Woodworker* for one issue before settling on *Popular Woodworking*.

I can say unequivocally that *Popular Woodworking* is today a better magazine than it has ever been. Much of the credit goes to the enthusiastic and tireless efforts of the staff.

Particularly noteworthy are David Thiel, who has contributed to all 64 issues published on my 10-year watch; and Chris Schwarz, who has played a key role for the past eight years. Linda Watts, our rock-steady designer, makes every page look great; and Kara Gebhart does wonders keeping us on schedule. Bob Lang, a recent addition, brings even more depth to our staff. Al Parrish, our photographer, and John Hutchinson, our technical illustrator, are remarkable professionals whose skills inspire and guide our work.

25! CELEBRATING YEARS

Our regular contributors have helped us improve as well. We're fortunate to have worked with Bob Flexner for so many years, as well as Glen Huey and Troy Sexton. Lonnie Bird, Bill Hylton, Nick Engler, Don McConnell, Paul Anthony and Judy Ditmer deserve a heartfelt thanks for the wisdom they have shared, too.

A special thanks also goes to *Popular Woodworking*'s parent company, F+W Publications, and its CEO, Steve Kent. The company has given us the freedom to craft the magazine we believe best serves our readers. Still others – Don Schroder, Megan Fitzpatrick, Mark Fleetwood, Lynn Kruetzkamp, Vicki Whitford, Krista Morel – all work behind the scenes and make important contributions.

I would be remiss in not thanking our advertisers. Their financial support helps make this magazine possible.

Lastly, and most importantly, the biggest thanks goes to you, our readers. Our first and last reason for publishing is to serve you, and that's what makes creating every issue a special event, even 25 years later. **PW**

Steve Shanesy
Editor & Publisher

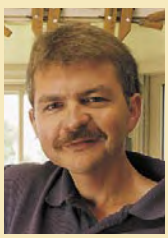
CONTRIBUTORS

TROY SEXTON

Troy Sexton's Sunbury, Ohio, woodshop is 3,600 square feet. "That's about right for one man," he says, laughing. But unlike the home woodworker, Troy has good reason to have a big shop – it's his business. Since 1984, Troy has built more than 3,000 pieces of furniture for his company, Sexton Classic American Furniture. His shop is filled with permanent setups, and he enjoys thinking about shop efficiency and flow. His favorite tool? "My bow," says Troy, an avid hunter. After rattling off 10 tools, he finally admits, laughing (he loves to laugh) that his favorite "tool" is a shop – full of tools. Troy loves building furniture for his family, including the dresser on page 40, which was a gift for his wife.

LONNIE BIRD

Many woodworkers know Lonnie Bird as an accomplished craftsman. Many more consider him a fine teacher, too. Classes at his school, Lonnie Bird's School of Fine Woodworking (in Dandridge, Tenn.), are selling out faster than ever before, he says. Classes are limited to nine students and recently he added a Woodworking Essentials prerequisite class to his advance classes with great success. Lonnie uses several mediums to teach his craft. An author of several books, "Taunton's Complete Illustrated Guide to Using Woodworking Tools" (The Taunton Press) just hit the streets. He's also a frequent magazine contributor. "Your First Hand-cut Dovetail," begins on page 60.



More Resources for The Guitar Builder

Some Updated and Easier Methods for First-time Luthiers

It was a pleasure to read Steve Shanesy's sojourn into guitar making, ("Steel-stringed Guitar," October 2004). The article was a satisfying summary of a long and complex process, which documented the joys and pitfalls of a skilled woodworker building a Martin guitar design from a Martin-supplied kit. I was further gratified to see my textbook noted as "the bible" and listed as a resource for the would-be guitar maker.

I hasten to note that the book was first published 18 years ago, and although it is still in print, it has not been updated. I think it would be a service to your readers, then, to point out that if you do obtain "Guitarmaking: Tradition and Technology," to visit my web site (cumpiano.com) before commencing – particularly the page dedicated to updates, corrections and refined methods, and then to the page which contains my newsletters, which are replete with questions and problems that users of the book bumped up against during the last two decades, with my personal suggestions and clarifications in reply.

Also let me point out that in his article Mr. Shanesy demonstrates the mould-assembly method of guitar construction, whereas my book details a different method, called "free assembly" – equally ancient – which dispenses with an elaborate mould and relies instead on a flat work board. This entails a process which, I believe, is less daunting for the aspiring luthier.

William Cumpiano
Northampton, Massachusetts

You Overlooked One Rasp That's Valuable to Woodworkers

Your article on rasps ("Return of the Rasp" November 2004) missed a very important tool – the 4-in-hand rasp.

I have some of the rasps in the article. However my 4-in-hand has its place on my assembly bench along with my 6" square, Centerpoint rulers and my Helios vernier caliper. Some things we never put away.

Tom Monahan
Tulsa, Oklahoma

We should have mentioned the 4-in-hand rasp in the article. For those unfamiliar with the tool (sometimes called a "shoe rasp"), they are typically 8" to 10" long and offer four different tooth patterns: One face of the tool has a half-round rasp and file; the other face has a flat rasp and file. I personally find these tools difficult to use – there's no place for a handle so you should use gloves. Plus, they offer only about 3 1/2" of cutting surface, which makes them unsuited for all but some occasional detail work. Their biggest virtue is the price – about $10.

— Christopher Schwarz, executive editor

Shoe Safety is Important When Using an Adze

I loved the "Building a Welsh Stick Chair" article (November 2004), but what's with the moccasins on your feet while using an adze? We hold you guys to a higher level. Please don't let pictures like that get into print. The only time I let myself work in soft shoes is if I'm finishing or sanding or scrollsawing. I don't even turn wood with them on.

continued on page 12

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:

- E-mail: popwood@fwpubs.com
- Fax: 513-891-7196
- Mail carrier:
  Letters • *Popular Woodworking*
  4700 E. Galbraith Road
  Cincinnati, OH 45236

continued from page 12

I see this all the time, take Richard Raffan, he had sandals on and the book has a disclaimer in it because of it. In my humble opinion, you are held to a higher standard, because you are representing a magazine, so make it look safe: You know goggles, face mask, etc. Anyway, sorry for the rant and I hope I'm not the only one who noticed this. Now did you actually get paid to have all that fun?

Al Schmadtke
via the Internet

Mea culpa. I should have worn steel-toed shoes during that operation. To his credit, instructor David Fleming listed them as necessary equipment. But I didn't pack them in my bag (but I remembered my block plane!).

— Christopher Schwarz, executive editor

More Resources, Ideas, Tools and Classes for Chairbuilders

I really enjoyed "Build a Welsh Stick Chair." I recently built a Windsor sack-back chair from a kit and it was the hardest project I've ever undertaken. I think it might be a lot more enjoyable to make my own parts than deal with a kit.

Which brings me to my suggestion: I think the rotary planes made by Ashem Crafts (ashemcrafts.com) in England would be great for a review. They have tools that make dowels and tapered spindles – similar to a tenon jig for making rustic chairs.

You might also want to look at courses offered by Craft Supplies of Great Britain (craft-supplies.co.uk). The location of the classes looks picturesque. I have their Exocet turning tool which might make for an interesting review for your resident turner. **PW**

Dave Kruetzkamp
via the Internet

CORRECTIONS

In the "Building a Welsh Stick Chair" article (November 2004), the publishing company for two books was incorrectly listed. "Make a Chair from a Tree" is published by Astragal Press. And "Make a Windsor Chair With Michael Dunbar" was published by Taunton Press.

In the "Portable Writing Desk" article (June 2004), the drawer front and back length is $2\frac{3}{4}$", not 2" as stated in the cutting list.

Banish Plane Tracks With Sharpening

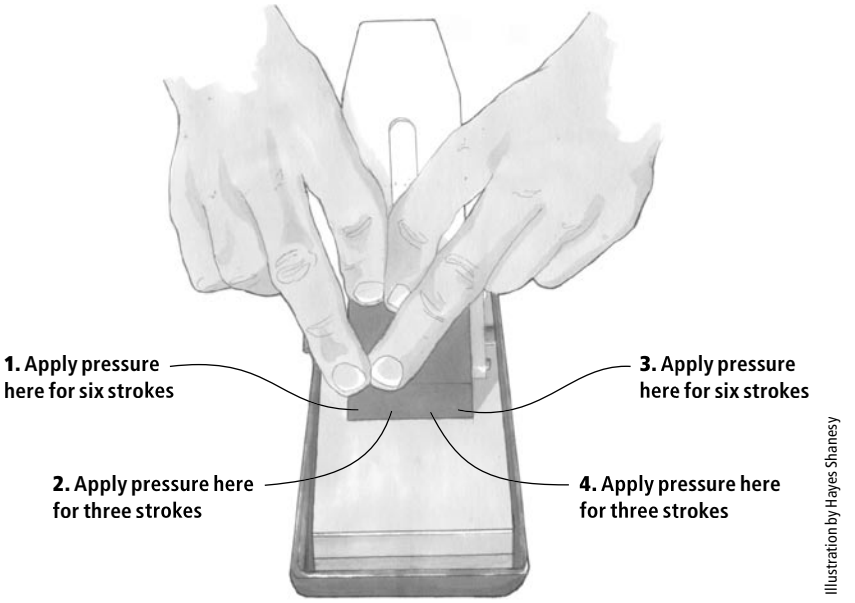


Illustration by Hayes Shanesy

Why Does My Smoothing Plane Cut Grooves in the Face of My Board?

I'm a power-tool guy who's trying to learn more about hand tools but with no luck.

I have a Stanley No. 4 smoothing plane and a cabinet scraper. I've sharpened them both on a #1,000-grit whetstone and set them up. I can get rice paper shavings from both, but when I rub my hand across my test board, I feel grooves. Can you help me figure out what I might be doing wrong?

Dave Griessmann
Cincinnati, Ohio

What you're feeling with your fingers are what are commonly called "plane tracks." They occur when the sharp corners of the plane iron cut a little step into the surface of the wood. The way to avoid or minimize plane tracks is to sharpen your plane iron so it is gently cambered (bellied) across the cutting edge.

It's actually quite easy to create this camber (it's only a few thousandths of an inch) while sharpening with a honing guide. First, I recommend you review our sharpening tutorial on our web site (on the home page, click on "Magazine Extras" to find it).

Now, to create that camber, you simply put pressure at different parts of the iron while sharpening. Apply pressure to one corner for six strokes. Then move your fingers a bit toward the middle and apply pressure for three strokes. Now position your fingers at the other corner for six strokes and nearer the middle for three more.

Do this through all your grits (I use #1,000 and then #8,000 for polishing). Check your work with a square. Hold the iron up to the light and

continued on page 16

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 the 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:

Q&A • *Popular Woodworking*
4700 E. Galbraith Road
Cincinnati, OH 45236

continued from page 14

lightly rest the square on the cutting edge. It should touch in the middle of the iron and some light should leak in at both corners.

Then it's a matter of positioning the iron so the camber is in the center of the mouth of the plane using the lateral adjustment lever (and occasionally small taps with a hammer to the iron). And your plane tracks should be just about gone. If you still get a few, don't worry. Mastering this skill takes practice. Until you get good, simply sand with #220-grit paper or scrape the tracks away. Using the methods above they should be able to be removed with just a couple strokes.

— Christopher Schwarz, executive editor

How Can I Remedy Drawers That Are Difficult to Open?

I have built a pyramid chest, which is basically a series of smaller and smaller boxes, sitting on top of each other. In each box is a drawer, sized to just fit the opening.

All the sliding surfaces are coated with rub-on polyurethane. The drawers slide on the sides of the case. If you pull a drawer perfectly straight out, it slides fine, but if there is just a little tilt or cross movement, they want to hang. What is the best way to lubricate the bottom slides as well as the sides of the drawers? I have read elsewhere to use candle wax or canning wax. What would you recommend and how would you apply it?

Dwayne Crider
via the Internet

I use paraffin or paste wax to lubricate drawer parts. However, I add it only to make the action more smooth, never to remedy a problem.

Your problem may be that your drawers are fit too tightly in the case. You should be able to open and shut the drawers easily without wax. You might want to break out the block plane or jack plane and remove a few light shavings and see what that gains you.

— Christopher Schwarz, executive editor

Which Chisels Are Suitable For Handcutting Dovetails?

Let me start off by saying that I enjoy your publication and look forward to reading new issues. I find the magazine's content the right blend of editorial, technique and information for my intermediate level of woodworking.

I am attending the Fine Furniture program at Camosun College in Victoria, Canada. This is a 10-month, full-time study focusing on the design and construction of hand-crafted furniture. During my studies, I have become quite enthused about hand-cut dovetails and have strived to prepare elegant, clean joints with delicate pins.

My current bench chisels are the Hirsch firmers that Lee Valley sells. While I am quite happy with their performance, I find they are too stout to reach into the corners of the tail sockets without bruising the joint. I read your review on chisels and I am now considering the beveled-edge bench chisels by Ashley Iles. Would these be suitable for making traditional hand-cut dovetails?

Wes Cargill
Nanaimo, British Columbia

The Ashley Iles chisels are indeed a good choice for dovetailing. I prefer the company's American-pattern chisels because they are shorter and better balanced for this finesse operation. Plus they have very small side-bevels, which is the key to cleaning out the beveled tail socket without marring your joint. (They are available from Tools for Working Wood, 800-426-4613 or toolsforworkingwood.com.)

Another good option is to purchase one or two Japanese dovetailing chisels that suit your joinery. I own a single 1/4"-wide dovetail chisel and find that it is all I really need. The Japanese dovetail chisels are unique in that they are triangular in cross-section, so there are no side bevels to mar your joint.

A third option is to modify one or two of your current bench chisels to make them suitable for dovetailing. Grind the sides down to a knife edge at the tip. This takes a few minutes on a grinder and is a simple operation. **PW**

— Christopher Schwarz, executive editor

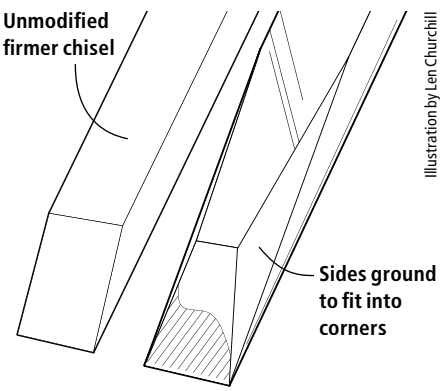
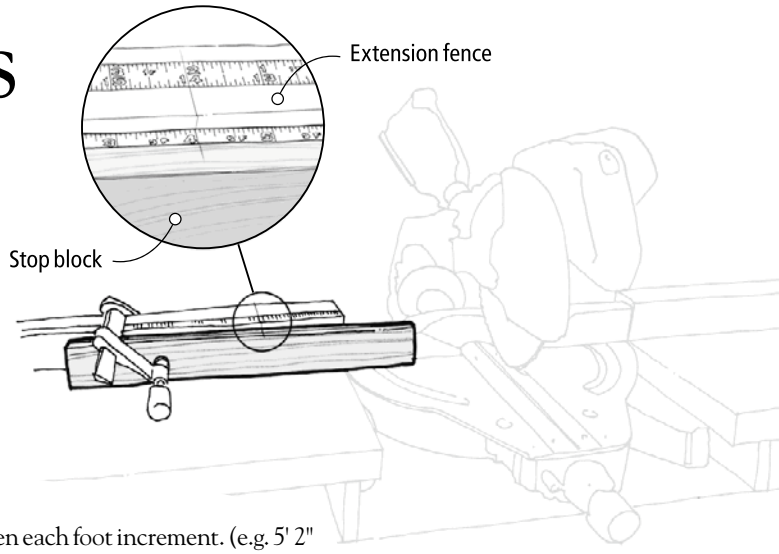


Illustration by Len Churchill

Compiled by Paul Anthony
Illustrations by Matt Bantly

A Quick Stop-block For Short Cuts



THE WINNER:

Like many auxiliary chop saw extension fences, mine includes a tape rule to allow quick setup of a stop-block. Unfortunately, the tape rule ends where the extension fence abuts the integral fence of the tool, so it won't work for cutting short pieces. To compensate, I made a long stop-block that includes a self-stick tape. By referencing a line on the fence, I can now accurately set the stop-block for sawing pieces as short as 4". (For safety, I cut pieces shorter than 4" on the table saw using a sled.)

I made my block from ¾"-thick hardwood a bit narrower than my auxiliary fence is tall. When placed 4" to the left of the blade, there is about 8" of clamping overlap onto the auxiliary fence. For the self-stick tape rule, I just cut a piece from a leftover section I had. You'll want a rule on which the top-half increments are marked as 1 through 11 reading left to right between each foot increment. (e.g. 5' 2" instead of 62".) To avoid confusion, I masked over the lower half of the rule.

To make your block, measure the distance from your blade to the left-hand end of your saw's integral fence, then add 3" or 4". For the purposes of explanation here, let's say your block is about 11" long. Stick the tape to the block with its 11" increment aligned with the right-hand end of the block, then trim off the excess tape. Position the block 4" to the left of the blade, then extend a reference line from its 4" increment onto the auxiliary fence. Voilà! You're registered. Now to make a cut, just align the increment of your chosen length with the reference line and clamp the stop-block in place.

Andy Lincoln
Dearborn, Michigan

CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a Freud PKG0026 Router Table Package including a FT2000E 3-hp router, router tabletop and variable-height stand, micro-adjustable SH-5 fence and router mounting plate. The $400 package also includes two instructional videos on basic routing techniques and creating raised-panel doors.

Runners-up each receive a check for $75. When submitting a trick (either by mail or e-mail) you must include your complete mailing address and a daytime phone number. If your trick is selected for publication, an editor will need to contact you. All entries become the property of *Popular Woodworking*. 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.

Finishing Drawers

For protection against dirt and stains, I wanted to finish the interiors of the drawers in a chest I made, so I sprayed them with lacquer along with the rest of the piece. This turned out to be a mistake that I was reminded of for some time after that. Whenever I opened the drawers, they emitted such a strong odor that it was a while before I was able to store clothes in them.

I have learned since then that it's fine to finish drawer interiors, but it should be done with shellac instead of lacquer, oil or varnish. Shellac dries almost immediately and doesn't emit any odor once it has dried. Several coats can easily be applied with a rag or brush, scuff-sanding lightly between coats with very fine sandpaper for a smooth finish.

Mike Lardner
Omaha, Nebraska

continued on page 20

continued from page 18

Open-end Thickness Gauge

There are lots of rules and calipers to accurately gauge material thickness, but rather than fumble to read the scale I came up with a quick way to determine stock thickness when planing. By using a set of inexpensive open-end wrenches you can easily (and accurately) gauge the finished thickness of your wood. Just plane and measure as the wood comes out. You will always have accurate and consistent measurements. And if you prefer to work in the metric system, that's an easy switch to a different set of wrenches.

Gus Andrews
Maple, Ontario

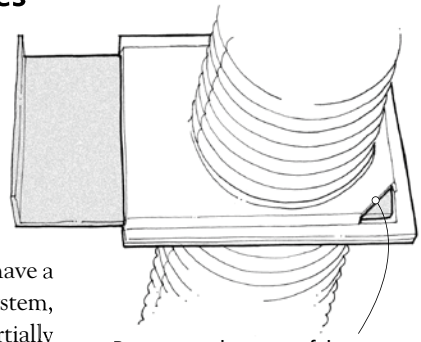
Clean-edged Masking

Almost immediately after removing the protective wrapping from a new roll of masking tape, the sides begin to collect all kinds of dust, hair, etc., which can adversely affect any attempt at a crisp and clean paint or finish line – even if it doesn't take an errant trip to the workshop floor. A quick and easy way to remove this debris is to take a short piece of the same tape right off the roll and stroke the sides with it – sticky side down, of course. The roll of tape will be again as clean as it was when you first opened it.

Dave Bolash
Easton, Pennsylvania

Closing the Gates

I use plastic blast gates in my dust collection system and have found that, after a short while, the slot that the gate slides in plugs up with dust, preventing it from closing totally. I have a half dozen gates in my system, so when all of them are partially open, the efficiency of the system is seriously undermined. I tried various fixes, including wiring the gates shut, but that proved to be a real nuisance.



Remove each corner of the gate housing opposite the slot opening

I finally fixed the problem by cutting away a bit of each corner on the gate housing opposite the slot opening. This gives the dust in the slot an exit and allows the gate to close properly. I cut the opening on the far side of the gate so that a small amount of air being drawn in assists in cleaning the slide. This simple solution has worked well for the past seven years.

Barry Black
Alberta, Canada

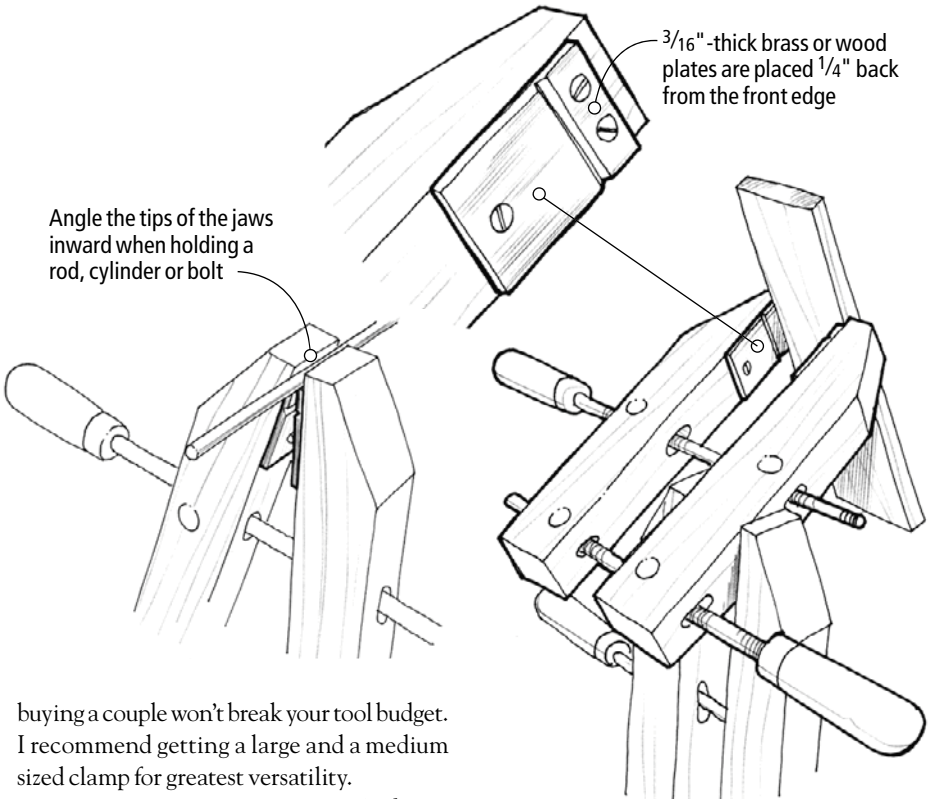
continued on page 22

continued from page 20

Improved Hand Screws

I find hand screws to be very versatile clamps. I use them alone and in concert with other hand screws and bench vises to hold work at a variety of angles. As good as they are, I found a way to greatly improve the design, especially for holding small or round pieces. The secret is to add 3/16"-thick plates to the inside faces of the jaws, recessing them about 1/4" in from the ends of the jaws. This does a few things: For one, the edges of the pads provide ledges for a workpiece to lodge against, to prevent it from sliding down further into the jaws under tool pressure. It also provides four-point contact against the diameter of a rod, cylinder, or bolt to keep it from rotating during sawing. (In this case, it's best to angle the tips of the jaws inward toward each other.) I also cut small opposing notches into the plates to hold very small-diameter rods or screws.

As a plane maker, I work with a lot of metal, so I made my plates from brass that I bought from a mail-order metal supplier. However, you could just as easily use a hardwood such as maple. Hand screws are relatively cheap, so buying a couple won't break your tool budget. I recommend getting a large and a medium sized clamp for greatest versatility.



Wayne Anderson
Elk River, Minnesota

Pocket Hole Shelf Hanger

After finishing a set of shelves, I was trying to think of a way for them to hang so the back of the shelves would sit flush with the wall, rather than lean away from the wall as a standard picture hanger would do. There are commercial router bits that cut a keyhole shape in the shelf sides to do just this, but because I don't have a keyhole cutting bit, and didn't want to wait to order one, this idea came to mind, and is easier to hang than a keyhole.

I simply used my pocket hole jig and a standard 3/8" drill bit. I didn't use the stepped drill bit that's normally used with the jig because it would have drilled a hole in the top of the shelf. I cut the hole at the top of the two sides as if I were going to screw up into the top. To hang the shelf unit I screwed a couple of pan head screws into the wall (if you don't hit a stud, a plastic molley will support the screw – and the weight of the shelves) level to one another. When the shelves are slipped over the screws, the side of the screw head sits recessed into the pocket hole.

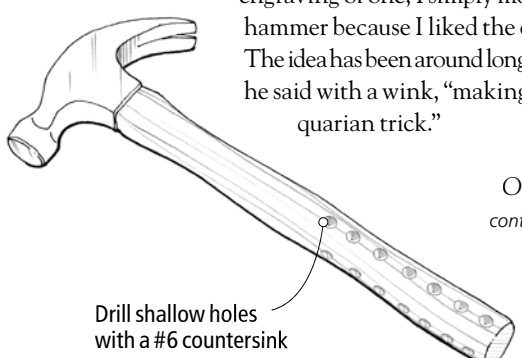
The pocket hole makes flush hanging as solid as a keyhole, it's easier to cut and easier to install. You can also use this technique for hanging plaques, shadow boxes and a variety of smaller projects.

Rhett Fulkerson
Raleigh, North Carolina

A Better Hammer Handle

My dad had been helping me work on my cottage when he showed up one weekend with an unusual looking hammer. Its handle was pock-marked with shallow holes that he had drilled with a #6 countersink. I asked him about the odd-looking tool and he explained that the holes allowed gripping the handle much more securely and with far less force, so you don't need a "death grip" to keep the tool under control. I found it comfortable indeed, and it definitely improved my grip.

Now, my dad is a very clever guy, and I was just about to compliment him on yet another great idea when he reminded me that there's little new under the sun. "Years ago," he explained, "there was a hammer company that sold handles like that. When I saw an engraving of one, I simply modified my own hammer because I liked the effect so much. The idea has been around longer than I have," he said with a wink, "making it a truly antiquarian trick."



Rob Lee
Ottawa, Canada

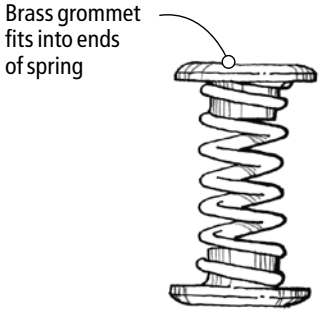
continued on page 24

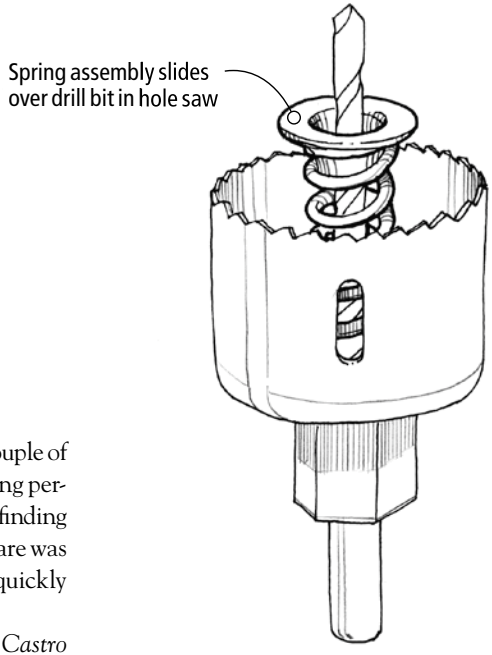
continued from page 23

Hole Saw Ejector

I recently needed to cut a bunch of 1"-dia. discs from ¾"-thick stock using a hole saw. To minimize the problem of removing the piece from the cutter afterward, I drilled halfway through from one side of the stock, then completed the cut by entering from the opposite side. Even so, the pieces stuck inside the cutter, and I found that I was ruining a lot of them when pulling them out with Channellock pliers or trying to push them out through the slot in the side of the cutter. I needed a better solution.

Thinking that an interior spring might do the trick, I plundered my hardware jar and found a stiff spring whose length just about matched the length of the drill bit inside the hole saw. This time, before drilling the second half of the piece, I slipped the spring over the drill bit. At the end of the cut, the spring provided just enough pressure to eject the piece. However, the end of the spring tended to scar the face of the piece, so I headed out to the hardware store, where I found a couple of grommets that fit the ends of the spring perfectly – problem solved. The time spent finding and matching the appropriate hardware was quickly recovered by the time saved quickly drilling perfect pieces.





Gabriel Castro
Victorville, California

continued on page 26

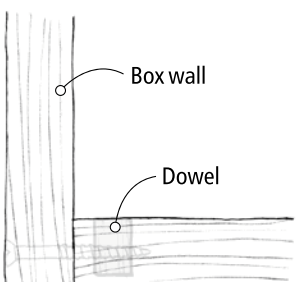
continued from page 24

Hiding Reinforcing Dowels

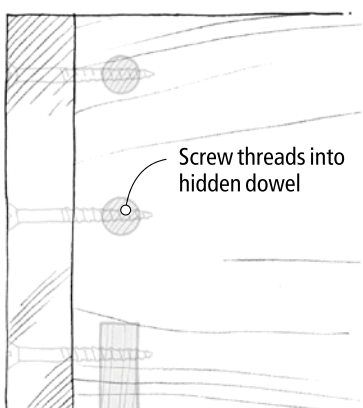
It's common practice to use dowels to reinforce screws driven into end grain, but visible dowel ends are unacceptable in some cases. For example, I wanted to make some boxes with screw-joined sides but I didn't want the dowel ends to show on the outside of the box.

To solve the problem, I took advantage of a Forstner bit's ability to make a flat-bottom hole. I was able to drill the dowel holes most of the way through the box walls from the inside of the box for most of the screws. For the lowest screws, I drilled the dowel holes upward. In this way, all screws obtained good grip in the long grain of the dowels without exposing any of the dowels on the outside surface of the box.

Bradley Blair
New York, New York



Top view



Front view

Lag Screw Levelers

Certain shop fixtures such as independent table saw extension tables and freestanding lumber racks must sit level on the floor to do their job properly. Sometimes simply shimming under these items isn't the most practical solution, especially if you move them occasionally. You could, of course, buy table leveler hardware that mounts to the bottom end of a leg, but they're often not substantial enough to hold up to heavy loads being dragged across a shop floor. Instead, I drive hefty 3/8" or 1/2" lag screws into the legs. They are heavy duty, perfectly adjustable, simple to install and cheap. What more could a woodworker possibly ask for? **PW**

Harvey Freeman
Fargo, North Dakota

High-speed Steel Chisels are Beyond Tough

Most chisels designed for carpentry jobs have little value to the fine furniture-maker (think: cold chisels).

So I wasn't expecting to be impressed when I tested a Japanese chisel designed to be used by carpenters in man-made materials and with knotty construction lumber.

These chisels are made by layering a hard steel cutting edge with a soft steel back. For those in the know, this is how the Japanese traditionally make all their chisels. What's different about this tool is that the cutting edge is an alloy similar to high-speed steel. This alloy allows the steel to be even harder than a traditional Japanese chisel, which is already very hard. The downside is the tool isn't supposed to take as fine an edge.

In my testing, however, I found these chisels to be excellent in many ways for Western-style woodworking. The tool took a keen edge without too much trouble on my waterstones. And it held onto that edge as I administered an abuse test we run all chisels through.

Essentially, we pound the snot out of the tool in a controlled manner in redheart, a nasty exotic. Then we examine the edge under a 30x loupe and use it for end-grain paring.

This chisel can really take it. It performed as well as Japanese chisels I've tested and as well as the Lie-Nielsens and Barr chisels, we've recently tested.

What I don't like about the tool is what I don't like about Japanese chisels in general. I find the handles uncomfortable. Plus the hoops on the ends add to my discomfort. However, if you like the feel of Japanese chisels, you'll like these. Also, these aren't suited for dovetailing. The side bevels are chunkier than on the Lie-Nielsens, Barrs and many Japanese chisels. But if you need a tough bench chisel at a fair price, this is it.

— Christopher Schwarz

For more information, circle #175 on Free Information Card.

SPECIFICATIONS

Alloyed Laminated Steel Carpenters' Chisels
Street price: $170 for five, $350 for 10
Handle: Japanese red oak
Sizes (set of 5): 9, 15, 24, 30 & 36mm
Extras in set of 10: 3, 6, 12, 18, 42mm
Performance: ●●●●○
Price range: $$$$
Tools for Working Wood:
800-426-4613 or toolsforworkingwood.com

Hitachi Two-base Router Set

For all you Star Trek fans out there, Hitachi has a couple of new routers built and designed using Romulan technology ... OK, not really. But that's what they look like. And while they're decent routers, the technology is unfortunately still standard earth fare.

Available in either single speed (KM12SC, as tested) or variable speed (KM12VC) models, these routers are the newest in the growing line of single motor, two-base kits offering versatile routing options at lower costs.

The nickel-plated 11-amp motor offers soft start (no jerky start) and a very pleasant noise level (for a router). Hitachi calls out an 80 dB rating, but we registered an 84 dB in our shop – still, a comfortable level.

Power was good during reasonable cuts in white oak (1/2" roundovers and 1/2" x 1/2" dado cuts). The motor design includes a flat top to make it easier to change your bits, but the company opted to require two wrenches to change a bit rather than the more common (and more user-friendly) spindle lock/one-wrench arrangement. Both 1/2" and 1/4" collets are included in the kits.

The two bases (fixed and plunge) are standard, with the motor held in place with a good cam-lever clamp. On the fixed-base model, height adjustment is accomplished by engaging the locking clamp halfway and rotating the motor. It's simple and efficient.

The plunge base operated smoothly and had a reasonable spring tension for normal use.

Hitachi also added removable template mounting plates in each base and seven template guides and a template guide-centering adjuster. What is missing is through-the-table height adjustment for use in router tables, integral dust collection and a more convenient fine height-adjustment in plunge mode.

In the balance, Hitachi has provided two nice router kits priced below the competition. Though lacking in some extra features that might have made these kits the hands-down selection, the two router kits do offer generally good performance and features at aggressively competitive prices. Therefore, it might be worth it to take a look.

— David Thiel

For more information, circle #176 on Free Information Card.

SPECIFICATIONS

Hitachi KM12SC Two-base Router
Street price: $189 (variable-speed model)
Motor: 11 amp, 24,000 rpm
Weight: 7.3 lbs
Performance: ●●●○○
Price range: $
Hitachi: 800-829-4752 or hitachipowertools.com

continued on page 30

continued from page 28

Bosch Power Box CD/Radio

There are many indispensable tools in a woodshop. One that is always present, but usually not considered a tool, is a radio. If your shop radio only has an AM dial it's time to trade up – and Bosch has a good option.

The Power Box is not just a shop radio. It's equipped with four GFCI power outlets to run other tools, and an integrated Bosch battery charger (for 12-24 volt Bosch batteries). A battery can also power the player when not near an electrical outlet. Plus, a 12-volt DC outlet is included for charging cell phones.

It also has an AM/FM digital radio, CD player with anti-skip technology and an auxiliary jack for MP3 players. An integrated antenna removes worries of someday sticking a coat hanger in the hole to get reception.

The whole thing is surrounded by an aluminum roll cage designed to protect the radio from a 10' drop. The Power Box also is sealed against dust – a shop must. And the sound is really quite good, with some kickin' bass!

— DT

For more information, circle #177 on Free Information Card.

SPECIFICATIONS

Bosch PB-10CD Power Box
Street price: $170 ($150 without CD)
Present stations: 20 FM, 10 AM
Battery charger: 12, 14.4, 18 and 24 volt
Performance: ●●●●●
Price range: $$$$
Bosch: 877-267-2499 or boschtools.com

Norton's Newest Stone a Good Combination of Grits

Most people will tell you that sharpening is like sanding – you must progress through several grits for good results. After a year of experimenting, I've found that when honing the tiny secondary bevel on chisels and plane irons, you can go straight from a #1,000-grit stone to a superfine #8,000-grit polishing stone and still get a superb edge. (I do find that a #4,000-grit stone helpful when preparing the backs of chisels or plane irons, however.)

Now Norton Abrasives has developed a new combination waterstone that allows you to do this operation with a single stone. One face of the stone is #1,000 grit; the other is #8,000 grit. I'm fond of the Norton stones and find them to be a less-expensive alternative to the premium Shapton waterstones, which are still my favorite system.

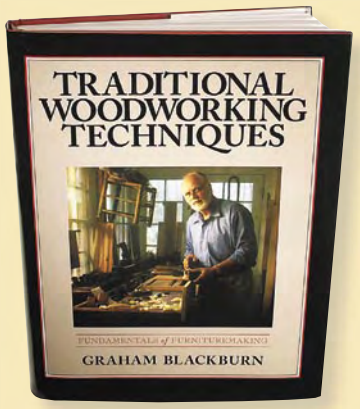
In general, Norton stones cut fast and seem to wear considerably longer than my set of man-made Japanese waterstones.

With this single stone and some method to flatten it (a diamond stone; or plate glass and wet/dry sandpaper), you'll be able to handle almost all of your honing needs. **PW** — CS

SPECIFICATIONS

Norton #1,000/#8,000 Waterstone
Street price: $60 to $65
Size: 1" x 3" x 8"
Performance: ●●●●○
Price range: $$$
Lie-Nielsen Toolworks: 800-327-2520 or lie-nielsen.com
Tools for Working Wood: 800-426-4613 or toolsforworkingwood.com

For more information, circle #178 on Free Information Card.



GRAHAM BLACKBURN'S NEW BOOK EXPLORES CLASSIC TECHNIQUES

When I was a wee lad of nine or 10 years old I built my first workbench with the help of some inadequate hand tools and an extraordinary book: Graham Blackburn's "Illustrated Furniture Making."

Unlike other books about hand tools, Blackburn's was focused on how to use hand tools, not on collecting them. That great book is out of print, and there is still surprisingly little written on that topic that's available. So Blackburn took the contents of that book and added new material plus information drawn from his articles in this magazine, *Fine Woodworking* and *Woodwork* to create the newly published "Traditional Woodworking Techniques" (Blackburn Books).

This handsome hardbound book has 352 pages that show you how to perform many woodworking operations using hand tools, from rabbets to dados to dovetails. There are entire chapters on carving, moulding, mortise-and-tenon joints, drawer-making and miters, plus nine projects that reinforce the skill lessons. The book ($65) is an essential part of any hand-tool user's library. To order, call 845-679-4990 or visit blackburnbooks.com.

— CS

ABOUT OUR 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, or e-mail me at 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

A Chairmaker's Laboratory

With each new invention, Brian Boggs seeks to build a better chair.

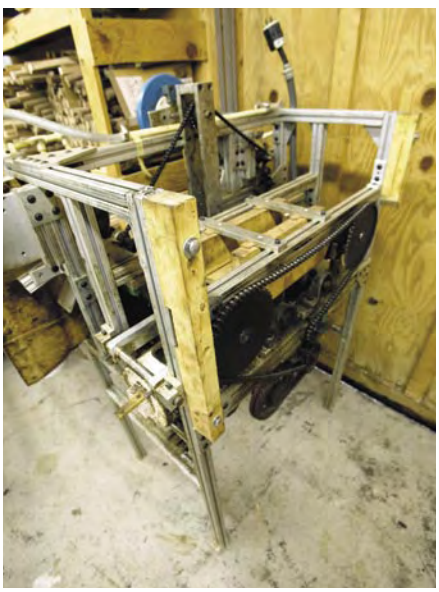
Photos by Al Parrish

Chairmaker Brian Boggs has been making Appalachian-style ladderback chairs for more than 22 years.

Initially, chairmaker Brian Boggs's woodshop in Berea, Ky., holds no surprises. Strips of hickory bark are drying in the ceiling's rafters. A man sitting on a shaving horse works on a back slat with a drawknife. Jigs and templates hang from the walls, as do half-finished ladderback chairs.

But as you walk through the various rooms, each with a specific purpose, you begin to notice jigs, fixtures and even machines that you've never seen before. And then your eye catches sight of this, well, thing – a complex configuration of oily steel, wood, rubber, bolts, drive belts and gears.

Boggs proudly calls this his hickory bark stripper. While it doesn't actually strip the bark from the log, strips of hickory bark 25' to 30' long are fed through the machine where they pass through four 8" rotary knives, slide down angled tables and slither through pipes as they are split, processed and sliced until out pop perfect strips of hickory bark, ready to be hung from the ceiling for future woven seats. The machine took Boggs 12 years to develop.



It took Boggs 12 years to invent and build this machine, which processes strips of hickory bark.

Suddenly, it occurs to you. You aren't in a chairmaker's shop. Rather, you're in a chairmaker's laboratory. And all those jigs, fixtures and machines, you realize, are the scientist's chairmaking inventions.

The results of 45-year-old Boggs's constant ingenuity are ever-evolving, Appalachian-style ladderback chairs with a contemporary flair that have earned him national acclaim. Boggs continually strives to improve the way he builds his chairs (he talks about R&D – research and development – as much as he talks about hickory bark stripping) and he's constantly reevaluating his designs to make them more pleasing to the eye and more comfortable to sit in.

Surprisingly, Boggs isn't an engineer-turned-woodworker. No one in his family was a woodworker either. How he got to this stage was just a matter of reinventing himself.

The Philosophy of Chairmaking

Boggs grew up on various horse farms his father ran in Kentucky. He spent his childhood working horses, attending rodeos and dreaming of someday painting for a living.

by Kara Gebhart Uhl

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

After high school Boggs read James Krenov's "A Cabinetmaker's Notebook" (Linden Publishing) and "The Fine Art of Cabinetmaking" (Sterling Publishing). After finishing the books, he decided to attend Berea College and study woodworking. But at the time, the college wasn't teaching hand-tool skills, which is what he wanted to learn. So he doubled-majored in philosophy (he had taken a philosophy class his freshman year and really liked it) and French (an easy second major, he says). Not satisfied, he dropped out and began carving spoons and working for woodworker Kelly Mehler.

Having discovered what it would cost to set up his own woodworking shop, he was about to drop the idea of woodworking altogether when he stumbled upon John Alexander's book "Make a Chair From a Tree" (Astragal). He was intrigued by the fact that he could make a chair with hardly any tools, and Alexander's primitive methods appealed to him.

"I saw a lot of connections with what he (Alexander) was doing and the spirit of what Krenov was doing," Boggs says. So he started building chairs using Alexander's methods, which were affordable, and incorporating what he liked about Krenov. It seemed bad timing to start a business – his wife was in school and they were expecting their first child. But his idea, it turns out, was a good one.

At the time Boggs was renting a house from the late master woodturner Rude (Rudy) Osolnik. Osolnik's son, Joe, saw the first chair Boggs built and immediately ordered it for his gallery. Since that time, Boggs has never been without chair orders.

Joe continued to order chairs for his gallery. Joe, Rudy and some other folks put together a craft festival and invited Boggs and his work to the show. More orders resulted from that. Then, in 1988, Boggs was invited to teach at the Southern California Woodworking Conference in Clermont, Calif. Chair orders came pouring in. Renowned chairmaker Sam Maloof ordered four of them.

Boggs continued to teach across the country. (He still teaches chair-building workshops at various locations. For details, visit brianboggschairs.com.) He also began writing articles for woodworking magazines.

During this time Boggs was building ladderback chairs working out of his house. He and his family decided to rent a different house from Rudy, but still there wasn't enough space. So he rented a church outside of town with plenty of room but one wire from a neighboring building that provided electricity. Even though he worked with mostly hand tools, the electricity simply was inadequate. Plus, the church proved to be too cold in the winter (wood heat). So he added garage space to his house and, for six years, worked from that. This shop was featured in "The Workshop Book" by Scott Landis (Taunton Press).

Boggs started hiring help and eventually outgrew his garage shop. Nine years ago he found a lot, and then designed and built the shop he's in today.

A Chairmaker's Shop

There are several rooms in Boggs's shop. The back room is called the green room. It's not temperature controlled. One of the first things you notice is the 36" 1941 Yates American band saw with custom-made solid-steel wheels. The band saw uses a rail system to carry green logs through the blade. Boggs uses the band saw for quartering logs. His hickory bark stripper also occupies this room, as well as coils of hickory bark hanging from the rafters.

The kiln and steam-bending room houses the steamer, which Boggs made. In it is a three-phase, 10,000-watt electric boiler gravity fed from a pot that contains a toilet bowl kit to keep the water level. The steamer can steam 12 chair legs at a time. Boggs steams his curved chair parts one hour per inch of thickness. Typically he'll dry chair legs to about 15 percent moisture content, and then bend them in a form with compression straps. The legs are then placed in one of the holding forms that line the wall for a day or two.

The shop also has a machine room. But unlike most woodshops, there is no table saw. Boggs considers it unnecessary for his work

The machine room has no table saw – Boggs says it's unnecessary. You can see the router table Boggs designed in the center of the room.

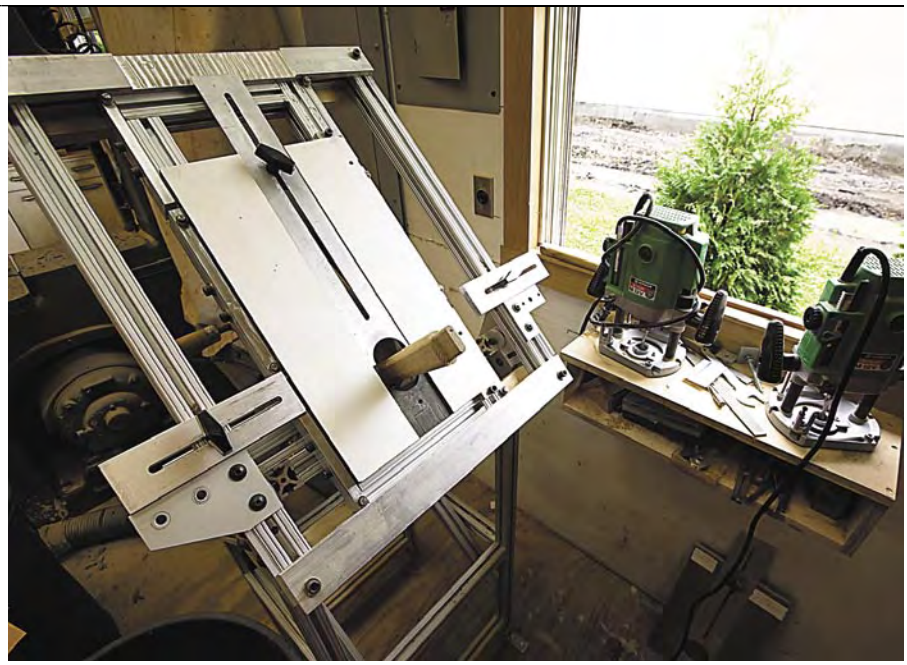
Aaron Rust (left) and Aaron Beale (right) bend chair legs straight from the steamer. The legs are bent in a form with compression straps and are then placed in holding forms that line the opposite wall.

and would rather keep carts loaded with material in the middle of the room than a rarely used saw. Another Yates American band saw (this one 30") immediately grabs your attention. Boggs equates this one to a souped-up race car. Incredibly accurate, this machine can cut stock with less than .002" variance in thickness. Boggs says this is possible thanks to a quality resaw blade and wheels that are very carefully dressed for nearly no runout. Also important are careful setup, a good featherboard, even feed rate, a tall, sturdy and accurate fence, proper body position, and steady breathing, Boggs says.

Also notable in this room is the system Boggs invented for cutting tenons (shown right), which uses a QuickTenon jig. Wood can be clamped at countless angles and orientations for a variety of joints, including double tenons. Thanks to registered stops, there's no initial setup time. The routers use a bushing system to make the cuts. A shimming system allows quick router changes.

Boggs also invented a system for cutting mortises using his Powermatic overarm pin router, which also is in the machine room. The indexing is so precise that Boggs claims he can cut 12 mortises for a rocking chair all within .001" tolerance of each other.

Boggs says that he can guarantee the same degree of comfort in all his chairs because of his many templates and jigs. He gave up using wood to build jigs years ago. Today, everything is made from aluminum and steel, and is milled to strict specifications, making his shop look a bit like it was built from a grown-up erector set.



This is Boggs's tenon-cutting system, which functions as a two-dimensional router table with X/Y axes.

Everything in his machine room has been tuned-up, souped-up or made better thanks to Boggs's constant tinkering. He made a new toolrest marked for production runs for his Oliver lathe. He also designed and built his router table, which features room for a dust collector and a drawer. The aluminum extrusion makes it easy for Boggs to add an extension table when slotting rocking chairs with his router.

Next to the machine room, separated by a thick insulated wall, is the assembly room. Here is where the "quiet work" is done – the work that requires a shaving horse and hand tools. Here is where Boggs and his two employees, Aaron Rust and Aaron Beale, listen to music and talk as they work. Here is where the chairs are assembled.

Boggs's shop also features a gallery with hardwood floors, big windows, a vaulted ceiling and an open pass-through to the assembly room. The gallery showcases his work – three-slat ladderback side and arm chairs, six-slat ladderback arm rockers and a footstool.

There are separate rooms for finishing and office work. Lumber is stored upstairs.

Almost-finished chairs hang from the wall in the assembly room as Beale assembles a chair and Rust works on the shaving horse.

Creating New Tools and Joints

Boggs's inventions aren't limited to templates and jigs. His ingenuity has overlapped into the world of tools and joints as well. Lie-Nielsen Toolworks sells one of Boggs's inventions – The Boggs Spokeshave. The tool, which has received favorable reviews, features a heavy 12-ounce bronze body, an 1/8"-thick A2 blade and hickory handles. Lie-Nielsen plans to offer two more of Boggs's shave styles (one concave) this spring and the company is reviewing Boggs's fourth spokeshave design now.

Boggs's joint design, which he calls the universal joint (shown on page 36), features double offset tenons and housed shoulders. The joint, which Boggs says resists torque and rack, has more than 10 square inches of glue surface, including four parallel glue planes that stabilize the joint. The joint requires custom-made jigs (which Boggs designed)

continued on page 36

continued from page 34

and two routers to make. The joint allows for a more open design and forms a much more organic intersection.

This joint, which Boggs already is incorporating in his chair designs, is just one example of the continuing evolution of his ladderback chairs. "I made some ugly chairs," Boggs says laughing, talking about his early years. Antique or "country" chairs have a certain awkwardness that's charming, he says. His early pieces had some of that charm (and some did not, he says again laughing) but he continued to tinker with the design. For years he tried to design a more contemporary style ladderback chair but finally realized that as long as he continues to weave his seats from hickory bark, they're only going to be able to look so contemporary.

"Hickory bark always has a country vibe," he says. "It really limits what you can do." But Boggs appreciates the bark's strength (it's stronger than leather) and the fact that it makes his chairs distinctly regional. However, if a customer wants an entire chair built from hickory, he must be prepared to pay 50 percent more. Hickory wood is difficult to steam, and is littered with defects and color variations, making chair construction difficult.

Although Boggs enjoys inventing, right now he says he's a woodworker who's not woodworking much. The balance is off. But it's been necessary – he says he can't build the chairs he wants to build until he has the right tools and equipment. And for the most part, those tools and equipment don't exist. But the time he's spent doing research and development has paid off – his chairs are better than ever.

Boggs invented this sturdy joint, which he calls a universal joint.

Here you can see examples of Boggs's work in the gallery.

As far as future growth is concerned, Boggs doesn't want to become as big as Thomas A. Moser has become. He likes being extremely close to his work. He acknowledges the fact that growth (currently he runs a three-man shop) has allowed him the time to invent – the time for his research and development. Eventually he wants to try running a five-man (or woman) shop, and see where it goes. But his motto is this: If it's not fun, it's done.

As much as Boggs enjoys his job, he's constantly wary of burn-out. He's adamant about working a 40-hour week and rarely works on weekends. He's careful that his employees stick to a 40-hour work week, too. He uses the example of woodturner Bob Stocksdale. "Stocksdale never worked more than an eight-hour day and that's why he was always so fired up about spinning a bowl," Boggs says.

The Almost-perfect Chair

Sitting in one of Boggs's six-slat ladderback arm rockers, you have to wonder how another invention – whether it be a jig, a tool or a joint – could possibly improve the chair. As you gently rock back and forth, Boggs shows you how the wood's growth rings wind around the chair just like they did in the tree. This, he says, orients the chair's parts so they receive the least amount of stress.

He explains how each of the six back slats have a different curve for perfect lumbar support. He asks you to hold your hands up, as if you were reading a book. As you perform this act your elbows slide into the angled part of the armrests and you realize this cut was intentional. The heavy cut taken underneath the end of each armrest was intentional, too. This, Boggs says, gives your fingertips something to play with.

Over the past 22 years Boggs has reworked the beauty of the Appalachian-style chair into one that fits the human form more comfortably. And although from the time he sold his very first chair he's never been without a chair order, Boggs still sees room for improvement. Sometimes, the constant redesign and problem solving can be overwhelming and even downright scary, he says. But Boggs equates the work to a favorite carnival ride – it can be the scariest ride you've ever been on but as soon as you get off you pay your money and get right back on again.

Boggs can't resist jumping back on, perhaps because he knows this: As he continually reinvents his company – whether it be adding more employees, inventing a new way to cut a new joint or putting a new tool on the market – he continually improves his work and, ultimately, himself. And that's really all a scientist can ask for, or ever need. **PW**

SOURCES

Brian Boggs's new DVD, "Hickory Bark from Tree to Chair" is available through his web site at brianboggschairs.com or through Lie-Nielsen (800-327-2520 or lie-nielsen.com). Boggs offers chair-building workshops across the country throughout the year. For information on times and locations visit his web site. E-mail questions to brian@brianboggschairs.com.

FRAME & PANEL Dresser

Traditional techniques eliminate wood-movement concerns, reduce construction time and save money.

Nice looking dresser, huh? Looks complicated, right? Believe it or not, two router-table setups allow you to build the case quickly using less-expensive wood and plywood for the interior, making the assembly more stable.

You could build this dresser with solid-wood slab sides, but that's just going to cause problems with wood movement. Frame-and-panel construction uses loose panels that allow for wood expansion and contraction because of changes in relative humidity.

To make the frame-and-panel ends you use what's called a rail-and-stile router bit set that joins the stiles (the long, vertical pieces) and the rails (the shorter, horizontal, intermediary pieces) in the frames and also cuts a groove to accept the panel.

To save time, I used the same rail-and-stile setup to make the horizontal and vertical frame-and-panel dividers for this piece.

Even better, because it's a drawer case, no one will see the interior so I was able to use flat plywood for the panels and poplar for many of the rails and stiles. I ended up saving money, weight and time. And I defy anyone to call this dresser anything less than fine furniture.

Frame and Panel is the Heart and Soul

The entire carcase of the dresser is essentially a bunch of frame-and-panel assemblies that are nailed together. It's sort of like taking leftover frame-and-panel doors and building furniture out of them.

The trick to frame-and-panel joinery is the cope-and-stick joint, which is created with a rail-and-stile router bit set. OK, that's a lot of words, but the process is actually quite simple and based on the easy-to-make tongue-and-groove joint. I've added a short piece detailing the bits that make this joint possi-

by Troy Sexton

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

Photo by Al Parrish

ble (see "Using Stile & Rail Bits" below). If you're already familiar with rail-and-stile bits, just keep reading and we'll move on to the dresser construction.

As you prepare to lay out your pieces for the frames, note that because the interior is hidden I've called out maple and poplar pieces for the interior frames. Make sure the maple pieces end up at the front of the dresser. A single poplar stile at the front of the case will look pretty funny.

I raised the solid-wood end panels on my table saw, beveling the blade to 10° and setting the rip fence to leave a shoulder on the panel at the top of the blade and a thin-enough edge to fit into the grooves in the stiles and rails. Be sure to run a test piece first to check the panel's fit.

You'll find it easier to sand the panels before gluing up the frame-and-panel assemblies. Spend the time now while it's convenient to work up through #180-grit sandpaper on all the visible pieces. Avoid sanding the areas where rail-and-stile pieces will mate to form the joints. This will just leave a sloppy-looking joint.

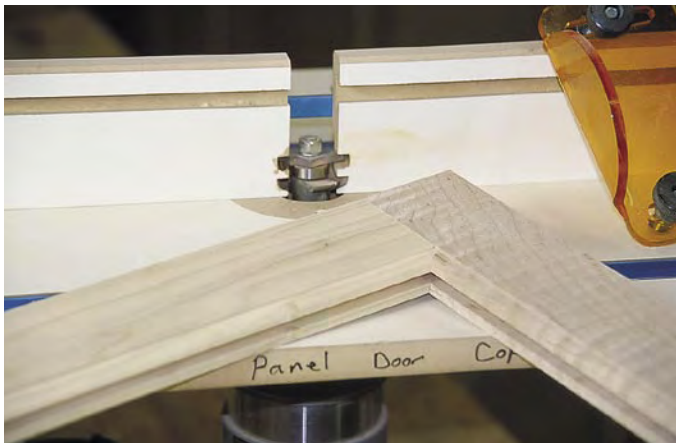
Also, when gluing up the frames, remember that no glue is required in the grooves for the panels. This defeats the purpose of a loose panel.

Dados, Grooves and Rabbets

To add stability and accuracy to the dresser carcase, each of the points where the panel assemblies join has a carefully sized dado or groove to accept the assembly.

All the "grooves" (whether technically dados or grooves, depending on grain orientation) are $^3/_4$"-wide x $^1/_8$"-deep. Start by setting your dado set to the proper width using one of your actual frame-and-panel assemblies to check the fit.

You want a snug fit, but if you have to hit it with a hammer, it's too tight. You also don't want the



The trick to frame-and-panel construction are rail-and-stile router (or shaper) bits (see below for how to use them). Shown here is a test-fit door, with the cutter for the stile tenon in the router table.

USING STILE & RAIL BITS

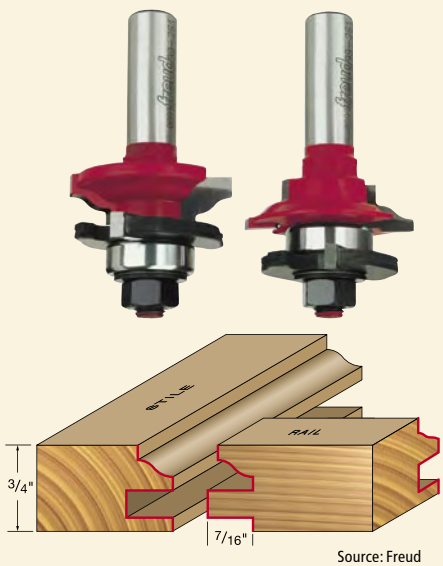
To use stile-and-rail bits you should also have a router table and a router rated at 2hp that takes $^1/_2$" router bit shanks. The bits themselves are sold in pairs, called a matched stile-and-rail set; then you'll have the option of using a panel-raising bit, or you could cut the beveled panels on your table saw.

There are a few rules to follow to ensure your frame-making goes well. First, make an accurate cutting list. Stiles, the vertical (and usually longer) pieces of the frame, are the length of the door or assembly. Rails need extra length to account for each end nesting, or coping, into the moulded profile of the stile, usually $^3/_8$" or $^7/_{16}$" for each end. Extra width and length for the panel is needed because it fits in the groove of the frame. The amount is $^1/_{16}$" less than the depth of the groove.

Set up the router table for the moulding profile and groove with the bit height to cut a $^1/_{16}$"-deep fillet on the face. Then set the router table fence so it's in line with the ball bearing guide on the bit. For safety, set the fence opening as close to the bit as possible.

Make a test cut on some scrap material prepared to the same thickness as the good parts. Run them with firm pressure down and against the fence.

Next, trade the router bit for the rail- or



Source: Freud

cope-cutting bit. Before making a test cut, it's important to prepare a "cope block." This can be a simple 12" square of plywood. The cope block provides bearing surface against the fence and supports the rail while the end is passed across the router bit.

Height adjustment is critical and several attempts may be necessary to get it right – when faces of the stiles and rails align perfectly. As in the previous setup, align the fence with the bearing on the bit. When running the rail ends with the cope block, direct pressure on the block (but not the rail) toward the fence. Hold the rail firmly to the front edge of the bock. Push the block from the back to make the cut.

If you haven't made this cut before, be aware that the bit tends to pull the rail into the cutter at the start and end of the cut, so keep the rail snug to the block.

When done, install the panel-raising bit. If using a variable-speed router, reduce the speed to 12,000 rpm to compensate for the large diameter of the bit. Set the fence and bit height according to the set instructions. Make test cuts before running your good panels.

If you're making beveled panels on the table saw, set the blade angle to the appropriate angle and set the blade height and fence. Run the panels against the fence carefully, running all four edges.

With all the parts ready, dry assemble to check the fit, then proceed to glue-up. But remember, the panel must be allowed to float in the frames. Just glue the stile-and-rail joints. Clamp the joints with enough pressure to close gaps, but don't over-clamp and distort the door. Also check the assembly for square and adjust as necessary. *– Steve Shanesy*

To add strength (and to align everything) 1/8"-deep dados are cut across the frames. The dados are primarily in the stiles, but in the ends they also just touch into the panels. Grooves are run in both the horizontal and vertical dividers.

With the dados run, the rip fence is reset to cut a 9/16"-wide x 3/8" rabbet on the back edge of both of the end frame and panel assemblies.

fit too loose. Don't rely on the nails to hold things together. Each of these spaces will have drawers fit into them and it won't take much slop to end up with a case full of whopperjawed drawers that will look poorly built.

With the width set, adjust the dado height. Now you have some layout and marking to do. Use the illustrations on page 45 to locate the dados on the individual pieces.

You'll find paired pieces throughout the case, and these should be marked and cut at the same time to maintain accuracy. Start cutting the dados with the two outside ends.

You'll see that two of the dados in the ends are in the same location as in the center dividers – at least they are from the inside. But you need to adjust for the extra 1/4" length of the divider that lets into the 1/8"-deep grooves in the top and center horizontal pieces.

There are also dados for the vertical dividers. See the illustration on page 45 for their exact locations.

I used a shiplapped solid back on the case. It was slipped into 9/16"-wide x 3/8"-deep rabbets cut on the back edge of the two end assemblies. Use the same dado setup, but adjust the width and depth to cut the rabbets.

Carcase Assembly

With all the frame-and-panel assemblies grooved, you're almost ready to assemble the case. But before you start, it's a good idea to make sure each of the pieces fits in the appropriate groove. You don't want to do too much fitting once the glue is added.

About the glue: When gluing up a cabinet with large solid-wood panels, gluing the entire width of the frame-and-panel assembly can lead to problems when the wood inevitably moves to adjust to humidity changes. Frame-and-panel construction avoids much of that problem, but you still want to avoid gluing cross grain when assembling the carcase.

Because there are so many pieces to this case, you need to assemble it in a particular order. Start with one end panel with its good side down on the floor (throw a furniture pad under it to protect the face). Place the four long horizontal panels in the grooves (without glue). If the fit is good, they should stay upright without support. If not, clamp L-shaped braces to hold them steady.

Apply glue to the top ends of

When all the dados and grooves are complete, you're ready to assemble the carcase. Glue is important, but I find a good 16-gauge finish nail goes a long way to holding everything together. Notice that the lower horizontal dividers have one center rail, while the two upper dividers have two. These correspond to the vertical dividers.

the horizontal panels and place the opposite end in place. Put some nails through the end panel into the horizontal dividers. It's too bad they don't make an air nailer that fires cut nails. But, conveniently enough, the driving rod in a standard pneumatic nailer has a rectangular shape that almost looks authentic.

This is a good time to make sure you have a helper handy. You can do the next steps yourself, but it's just a lot easier with a friend.

You want to flip the carcase end-for-end, so the unattached end is now on top. Remove the loose end, add glue and then replace the end and nail it in place.

This is a good time to check the carcase for square, measuring across the case from corner-to-corner. It's also not a bad idea to clamp a couple L-shaped supports in place to help hold the case square while you attach the rest of the pieces.

Next add the two smaller horizontal dividers to the "down" end of the cabinet. Put the glue in the lower dados, set the dividers in place, then glue and place the vertical divider in place. Nail through the vertical divider into the short horizontal dividers and also through the two long horizontal dividers to hold the vertical divider in place.

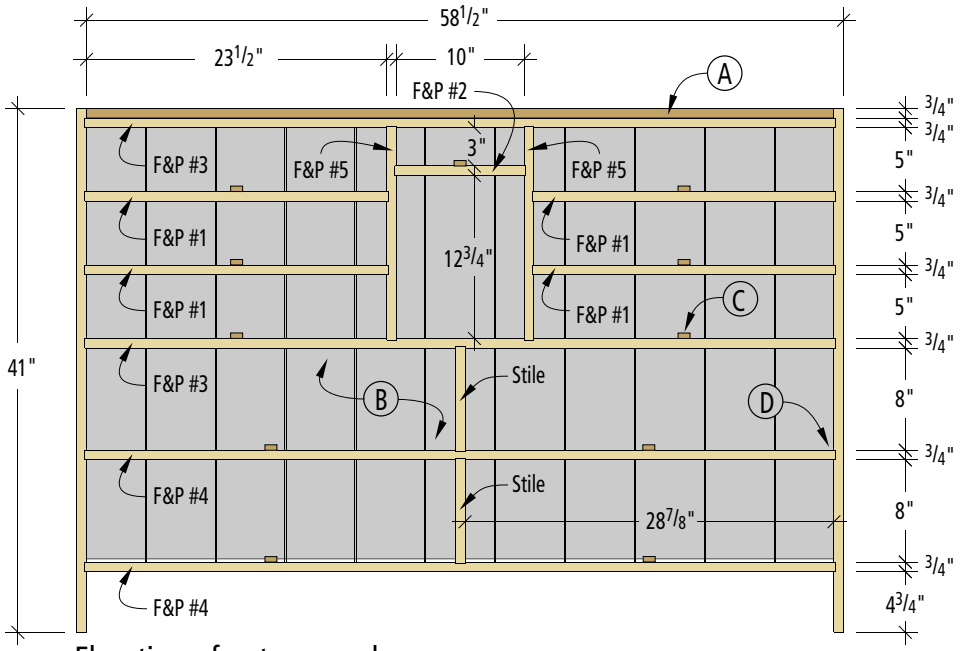
You have an option here: You can either repeat this last step on the other side by holding the piece up in place to attach it, or you can

To further divide the upper section, two more horizontal dividers and one vertical divider are added on each end of the cabinet.

FRAME & PANEL DRESSER

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
End Panels						
❑	4	Stiles	3/4	2 5/8	41	Maple
❑	2	Rails	3/4	2 5/8	14 1/2	Maple
❑	2	Rails	3/4	5 3/4	14 1/2	Maple
❑	2	Panels	5/8	14 3/8	33 3/8	Maple
Frame Panels						
❑	8	Stiles	3/4	2 1/2	58 3/4	Maple/Poplar
❑	8	Stiles	3/4	2 1/2	23 3/4	Maple/Poplar
❑	2	Stiles	3/4	2 1/2	10 1/4	Maple/Poplar
❑	4	Stiles	3/4	2 1/2	16 3/4	Maple/Poplar
❑	28	Rails	3/4	2 1/2	14 1/2	Poplar
❑	4	Panels	1/4	14 3/16	26 3/16	Plywood
❑	4	Panels	1/4	14 3/16	19	Plywood
❑	4	Panels	1/4	14 3/16	19 7/16	Plywood
❑	2	Panels	1/4	14 3/16	12 7/16	Plywood
❑	2	Panels	1/4	14 3/16	8 15/16	Plywood
❑	1	Panel	1/4	14 3/16	5 15/16	Plywood
Case Pieces						
❑	1	Top	3/4	20 1/4	62 1/2	Maple
❑	2	Front stiles	3/4	2 1/2	8 1/4	Maple
❑	11	Drawer guides	7/16	15/16	17	Poplar
❑	1	Front base	3/4	5	61 1/2	Maple
❑	2	Side bases	3/4	5	19 3/4	Maple
❑	12	Back pieces	1/2	5	36 1/4	Maple/Poplar
❑	1	Cove moulding	3/4	13/16	61 1/2	Maple
❑	2	Cove mouldings	3/4	13/16	19 3/4	Maple

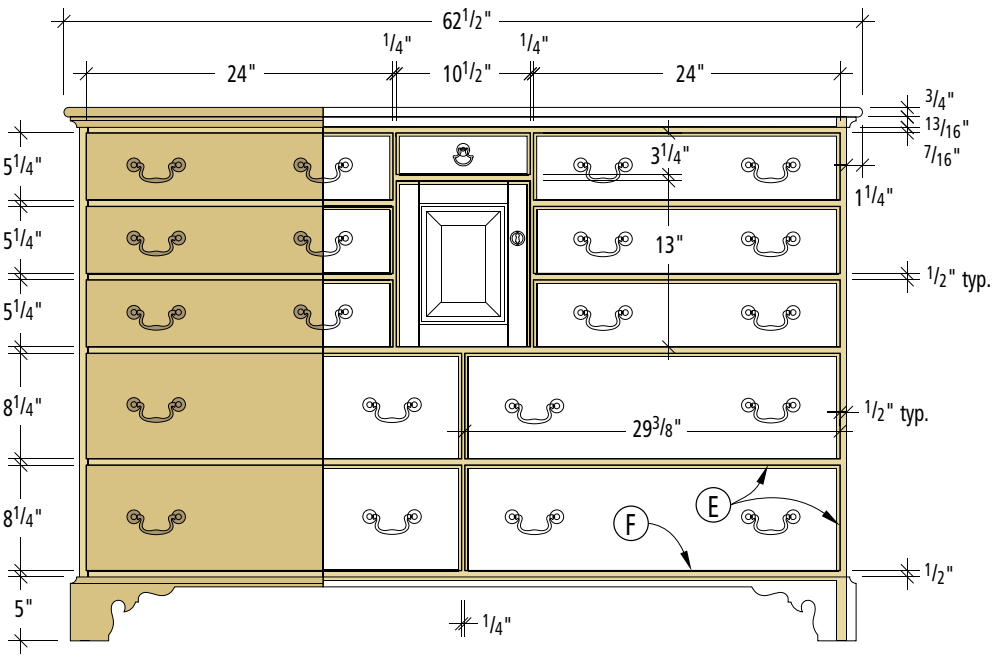
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
Drawers						
❑	8	Drawer sides	1/2	7 7/8	18 3/8	Poplar
❑	4	Drawer fronts	1/2	7 7/8	28 3/4	Poplar
❑	4	Drawer backs	1/2	7 1/8	28 3/4	Poplar
❑	12	Drawer sides	1/2	4 7/8	18 3/8	Poplar
❑	6	Drawer fronts	1/2	4 7/8	23 7/16	Poplar
❑	6	Drawer backs	1/2	4 1/8	23 7/16	Poplar
❑	2	Drawer sides	1/2	2 7/8	18 3/8	Poplar
❑	1	Drawer front	1/2	2 7/8	9 15/16	Poplar
❑	1	Drawer back	1/2	2 1/8	9 15/16	Poplar
❑	4	Drawer veneers	1/4	8 1/4	29 3/8	Maple
❑	6	Drawer veneers	1/4	5 1/4	24	Maple
❑	1	Drawer veneer	1/4	3 1/4	10 1/2	Maple
❑	4	Drawer bottoms	5/8	18 1/8	28 1/4	Plywood
❑	6	Drawer bottoms	5/8	18 1/8	22 15/16	Plywood
❑	1	Drawer bottom	5/8	18 1/8	9 7/16	Plywood
Door						
❑	2	Door stiles	3/4	2	13	Maple
❑	2	Door rails	3/4	2	7 1/8	Maple
❑	1	Door panel	5/8	7 1/16	9 3/4	Maple



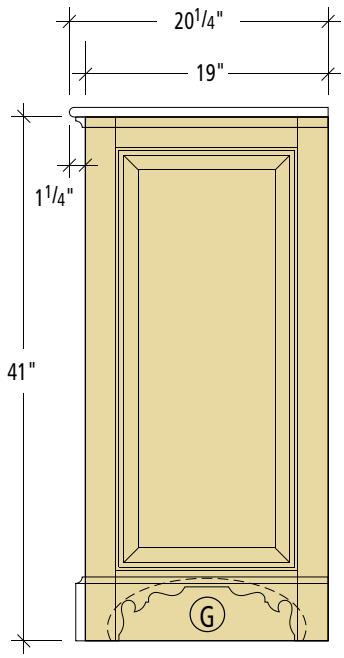
Elevation – front removed

Construction Notes:

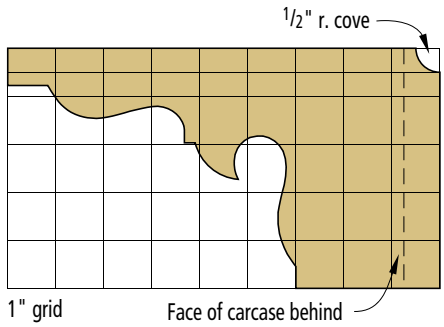
- (A) 3/4"t. x 3"w. filler strips front and back
- (B) 1/2"t. shiplapped board back
- (C) 7/16"t. x 15/16"w. drawer guide strips
- (D) 3/4"w. x 1/8" dados typical
- (E) Veneer drawer face overlaps panel edge 1/4" on top and sides
- (F) Bottom of drawer face flush with bottom of opening
- (G) Rough cut bottom of side panel before applying base



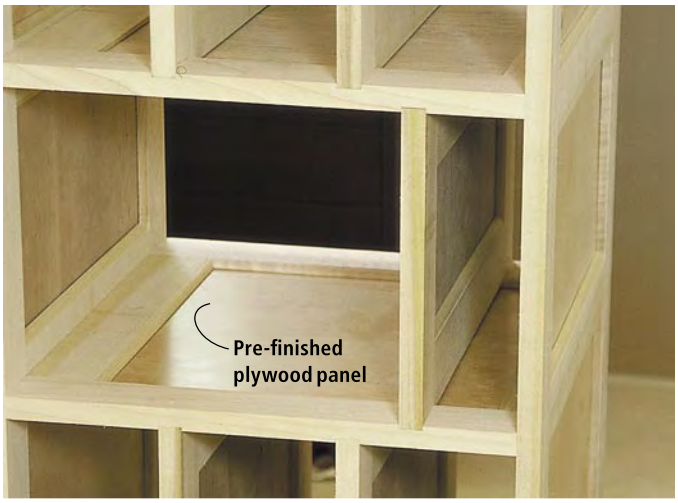
Elevation



Profile



Base board pattern



One more horizontal divider completes the door space and adds a drawer. Note that I used pre-finished plywood panels. This saves time.

To hold the front dividers in place I toenailed a couple of nails with my air nailer. If you've ever toenailed a regular nail, you'll quickly recognize how much easier this procedure can be with air power.

The top is a single glued-up panel, with a radius on the top and bottom edge. To smooth the transition between the top and carcase I added a simple cove moulding, as you can see here.

To help guide the drawers, I added a 3/4"-tall strip in the upper and lower dados, behind the front dividers.

roll the carcase again and work with gravity rather than against it. Whichever way you choose, don't forget to add a couple of nails through the end panels into the short horizontal panels.

There's one more horizontal panel to put in place between the two vertical panels. Glue and nail it in place now.

Rather than trying to fit full-depth panels in exactly the same center position to divide the two lower spaces, I slid only a front stile into the grooves. I then added two poplar strips to serve as drawer guides directly behind the stiles.

Simple Top and Cove

The top is actually the simplest piece of the project. It's a solid-wood slab, glued up from as few boards as you can manage. Even though it's simple to make, it's also one of the most visible parts of the piece, so select and arrange the boards carefully to present an attractive and nearly seamless expanse of wood.

I used my router to add a 3/8" roundover on the top and bottom edges of the top on both ends and the front edge.

Before attaching the top, you'll need to add a 3/4"-thick x 3" spacer at the front and back of the cabinet to support the top. These can be simply screwed to the top frame with flat-head screws.

The top is then screwed to the case using figure-eight metal fasteners that are countersunk into the top edge of the two end and the two center vertical panels.

To complete the look of the top, I ran a strip of 3/4" x 13/16" maple with a 1/2" cove detail under the top, mitering the moulding at the corners. The moulding is then nailed into both the filler strip sides.

Shiplapped Back

The back is made up of shiplapped boards (interlocking rabbets cut on the long edges of the boards). These can be uniform widths, or random depending on the material you have available. The two end boards are rabbeted on only one side, fitting into the rabbets on the back edge of the end panels.

The back boards are nailed into the lower and upper horizontal assemblies. Each board should be nailed with two nails near the center of the board to allow for wood movement.

Because the back will not be seen through the case except behind the door area, poplar is an acceptable choice for the boards to either side of that space. I used maple behind the door space, but

you could choose to use poplar throughout.

Even though this is a drawer cabinet, I use pre-finished plywood panels and I finish the rest of the interior. So go ahead and fit the back pieces, but leave them loose until after the piece is finished.

A Curvy Base

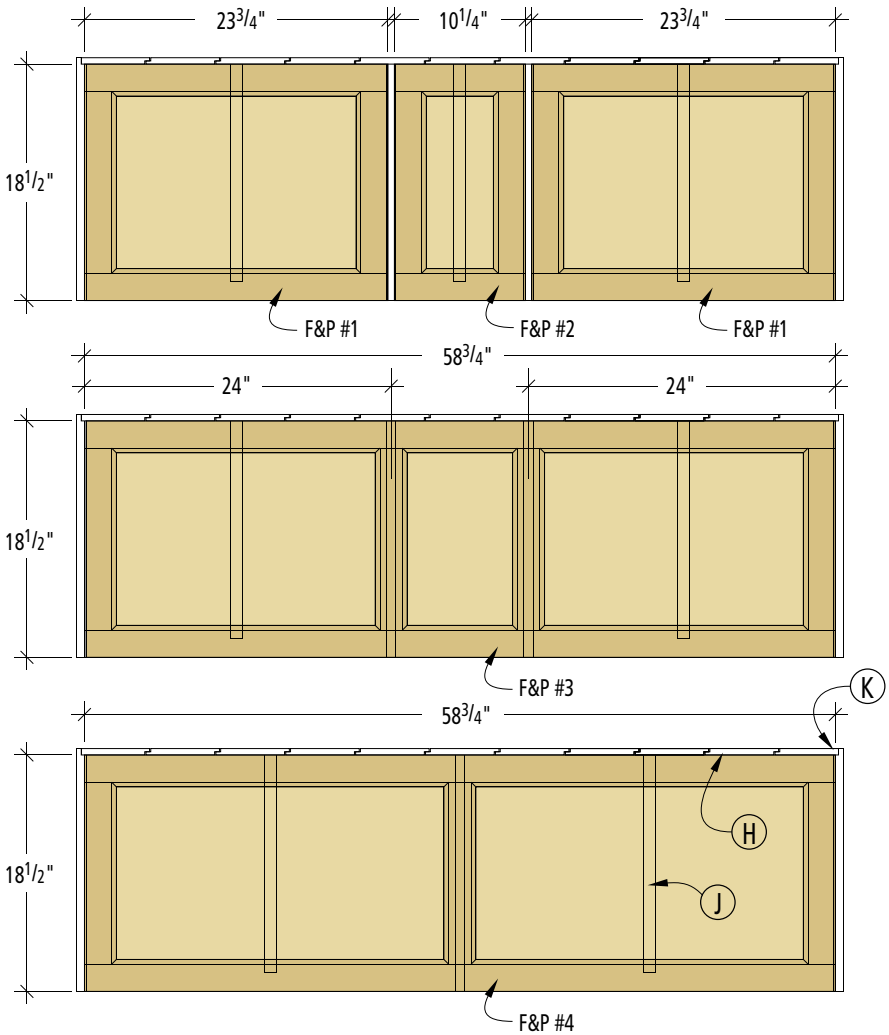
I always enjoy the bases on these pieces. While so many other parts of the cabinet are straight lines, the base is sculpted and shapely, giving the piece elegance. The fun part is how simple it is.

The base is simply three pieces of wood, mitered at the front corners and nailed in place. I ran a 1/2" cove detail on the tops of the base boards.

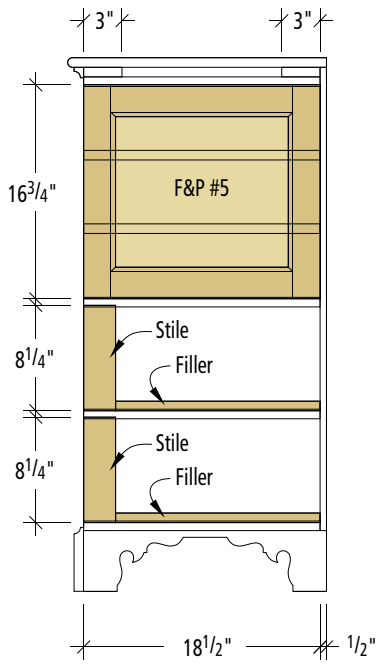
For the sculpting, copy and transfer the scaled pattern on page 45 onto the base boards. Then cut out the shapes with either a band saw or jigsaw, and sand the edges smooth.

Because the end assemblies run through to the floor, you need to cut away the lower rail behind the base to create the feet. First, hold the base return pieces in place on the sides and then mark the shape on the lower rail. Don't try and fol-

With the case assembled, it's time to add some details. The "feet" are a simple skirt board that's cut to shape, mitered and attached.



Interior frame & panel dividers



Profile with guides & fillers

Construction Notes:

- (H) 1/2" t. shiplapped board back
- (J) 7/16" t. x 15/16" w. drawer guide strips
- (K) 9/16" w. x 3/8" d. rabbet

low the shape when cutting the rail, just cut away enough to leave the base open.

Fasten the base pieces using brads. Use glue sparingly in consideration of wood movement.

Drawers and a Door

Let's take care of the simple part first. The single door on this piece is made the same way as the end panels, using stile-and-rail cutters on the router table and the table saw to raise the panel.

The door is sized to overlap the space by 1/4" on three sides. Once assembled and sized, a 1/4" x 1/4" rabbet is cut on the back of the door to allow it to recess into the space, forming a lipped door that will match the drawers. Because of the door and drawer alignment, the bottom of the door ends up flush to the bottom of the door space, but the 1/4" rabbet keeps the door looking OK when opened.

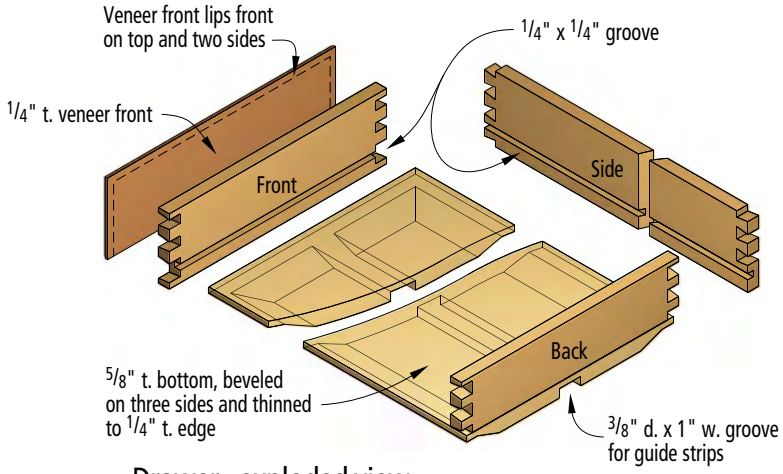
I used my router to add a 1/4" radius to the outside edges of the door and the drawer fronts.

The hinges to attach the door are designed for use with a lipped door and require no mortising.

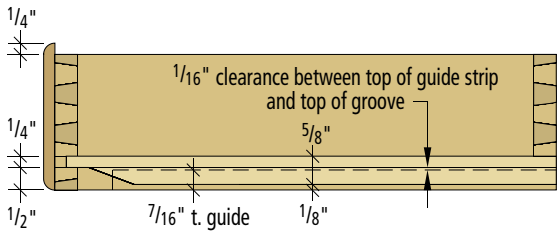
The drawers are a little more complicated and, of course, there's a bunch of them. You can hand-cut your dovetails, or use any number of router jigs to make your dovetails.

All the fronts are lipped as with the door, but I've made them a little easier than you might imagine. The drawers are simple poplar boxes with through dovetails at the four corners. I then added a 1/4" "veneer" to the drawer front to make the lipped front. This also allows for careful grain selection to get attractive drawer fronts .

To make things easier and more evenly spaced, the veneers are sized to be held flush to the bottom of the drawer box. This actually makes the drawer fronts lipped on only the two sides and the top. Don't forget the radius detail on the edges.



Drawer - exploded view



Drawer - profile

The drawer bottoms are captured in 1/4" grooves in the sides and front, while the backs are cut to a width to allow the bottom to run past the back.

The drawer bottoms themselves are 5/8"- thick hardwood that requires a bevel on three sides of the bottoms to thin them to fit the 1/4" grooves.

To guide the drawers I used wooden center guides rather than let the drawers guide on the case sides. If you look closely you'll notice that each of the side and divider panels has a recess from the frame. This would make for bumpy drawers.

Instead, I ran a 1"-wide x 3/8"-deep groove down the center of each drawer bottom. I then made strips 15/16" wide x 1/4" tall and screwed them in place in the center of the drawer openings. A little wax in the groove and they slide wonderfully.

Finishing and Hardware

My finishing process is fairly simple, involving a coat of aniline dye stain, followed by a few coats of spray lacquer.

I use water-based aniline dye, which raises the grain some when applied. To reduce this problem, I sand the piece to #220-grit, then lightly wipe down the entire piece with a damp cloth. This raises the grain just as the dye will, but I can lightly sand down the raised grain after everything dries. Then the dye can be applied with much less grain-raising.

I'm set up to easily spray a lacquer finish in my shop. That may not be your case and you may want to consider a shellac or wipe-on lacquer finish instead.

The drawer and door hardware is fairly self-explanatory, and I've listed the parts and prices in the Supplies box at right.

See? I told you it wasn't complicated. Of course, not everyone has to know that. **PW**

SUPPLIES

Traditional hardware available from:

Ball and Ball
800-257-3711 or
ballandball.com

Horton Brass
800-754-9127 or
horton-brasses.com

Whitechapel Ltd.
307-739-9478 or
whitechapel-ltd.com

Finishing supplies available from:

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

1 • Moser's dark wine cherry aniline dye, water-based, #W14204, $17.99

WOODWORKING ESSENTIALS

BY NICK ENGLER

CHAPTER 4

Customize Your Table Saw

There are dozens of table saw accessories you can mount on your machine to make it safer, more accurate or extend its capacity. Some can be purchased, others can be made by you. By carefully choosing these options, you can soup up your old table saw or customize a new one.

The most common additions are a reliable rip fence, a cut-off system (either an improved miter gauge, miter sled or sliding table) and roller stands or outfeed supports. But there are lots of other accessories, many very affordable, that I'll share with you in this chapter. You can pick and choose what will work best for you on your table saw.

Photo by Al Parrish

A Better Rip Fence

Perhaps the most beneficial customization is a replacement fence. Many very good rip fences are now available from table saw manufacturers – many as standard equipment. This is a great improvement from more than 10 years ago, but the better fences aren't always included in the base model of the saw, but rather they're offered as an upgrade.

There are also a number of good-quality, aftermarket rip fences that can

SMOOTH TIP:

Keep Things Sliding

No matter how many cool accessories you add to your table saw, if you have difficulties moving the wood past the blade, it's no good. Make sure the table surface is clean and lubricated to provide effortless material movement. There are a number of good dry (that's the important part) lubricants on the market. You can also use paste wax or paraffin wax (canning wax from the grocery store) to treat the top. This doesn't have to be a daily chore, but put your lubricant to work whenever you start a new project.

TIPS & TRICKS

PRO TIP:

Cutting Irregular Pieces

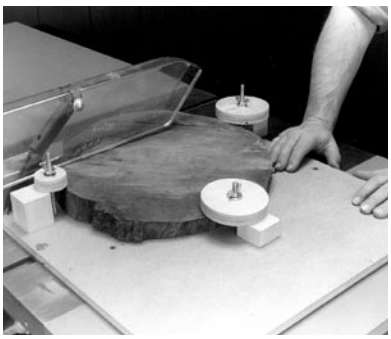
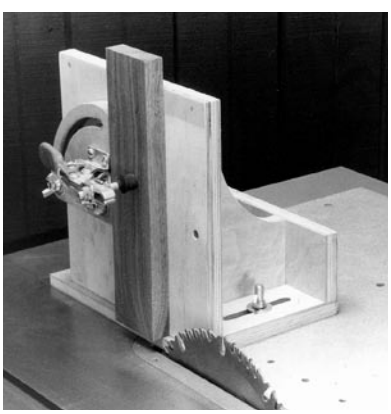


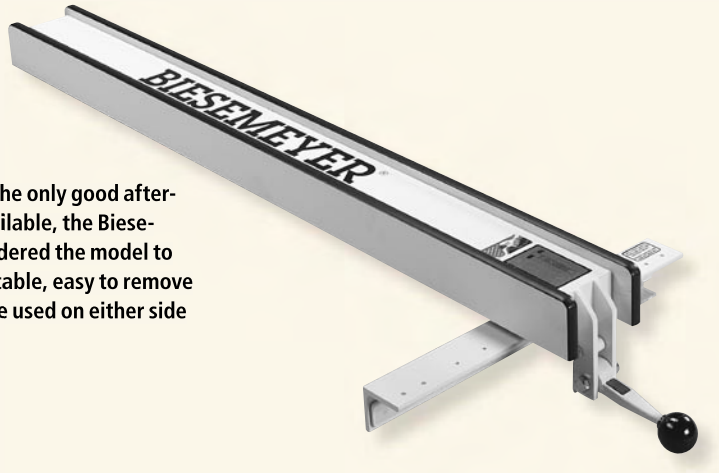
Table saw sleds can be used for much more than just crosscuts and miters. At times there are situations where an irregular piece of wood needs trimming. By adding hold-down clamps to a crosscut sled, you can easily trim the wane from a rough piece of wood. You can even square off a cross-section of a log with relative ease, accuracy and safety.

GREAT TRICK:

Sled Add-ons



While you can make a separate tenoning fixture for your table saw (I'll show you how in Chapter 5 of this series), your miter sled can also serve as a platform to attach a number of very useful jigs – such as a tenoning fixture as shown above. The fixture is a basic plywood structure to support (and brace) the wood. It's adjustable from left to right (for the width of the tenon) and the supporting brace can even be pivoted for angled tenons.



While certainly not the only good aftermarket rip fence available, the Biesemeyer is often considered the model to surpass. Accurate, stable, easy to remove and replace, it can be used on either side of the blade.

be added to your new or existing table saw. A good upgrade, or replacement fence, will increase repeatable accuracy and can also increase the usable space on your table saw. Various brands of fences employ different mechanisms for perfect alignment, and most come with precise scales and hairline indicators. When you choose a replacement fence, consider these important features:

■ **How long are the fence rails?** Most replacement fences extend the ripping capacity – the maximum distance between the blade and fence. To do so, they use longer front and rear support rails (usually 35" to 50" in length) and a larger table extension, increasing the size of the saw. If you're cramped for space in your shop you may not have room for this accessory. But the capacity gained is worth serious consideration.

■ **Will the fence dismount easily?** For many operations, you must remove the fence from the saw. This task is easier with some brands than others. Some aftermarket fences have a rear lock that slows removal and replacement. Others connect to the front rail and need to be released or slid off the rail to remove. These mountings can improve accuracy, but they can be a trade-off.

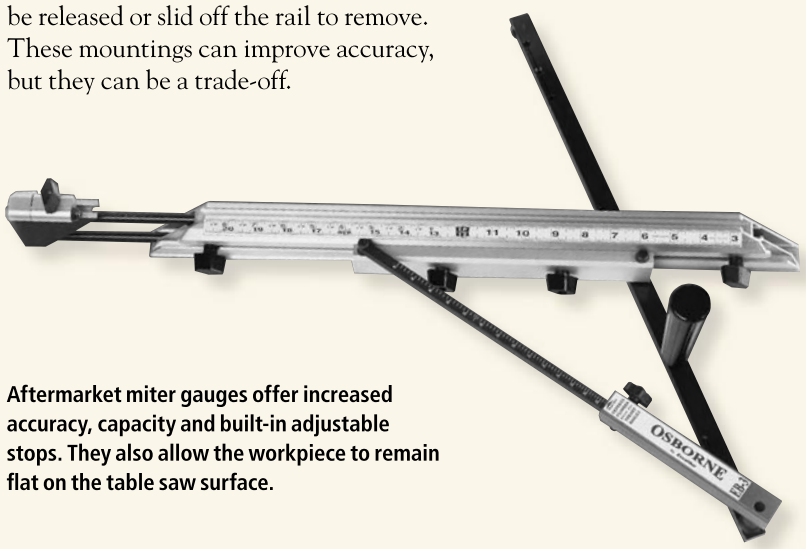
■ **Can the fence be used easily on both sides of the blade?** Many factory and replacement fences can be used on the right and left sides of the blade. But on some, the fence face must be removed and reversed when changing sides.

■ **Can you easily mount jigs on the fence?** Many table saw operations require you to mount shop-made jigs on the fence. It's easier to drill bolt holes in some replacement fences than others. You may also find a fence that can't be drilled at all – for this, you need to clamp a jig to it. Some fences actually include T-slots in the fence to make attaching accessories easier.

Aftermarket rip fences can cost hundreds of dollars – potentially one-third the price of your saw – so when possible, getting a good rip fence on a new table saw is preferable. If you're upgrading, choose carefully.

Miter Gauges

Factory miter gauges often are as inadequate as factory fences, but deciding



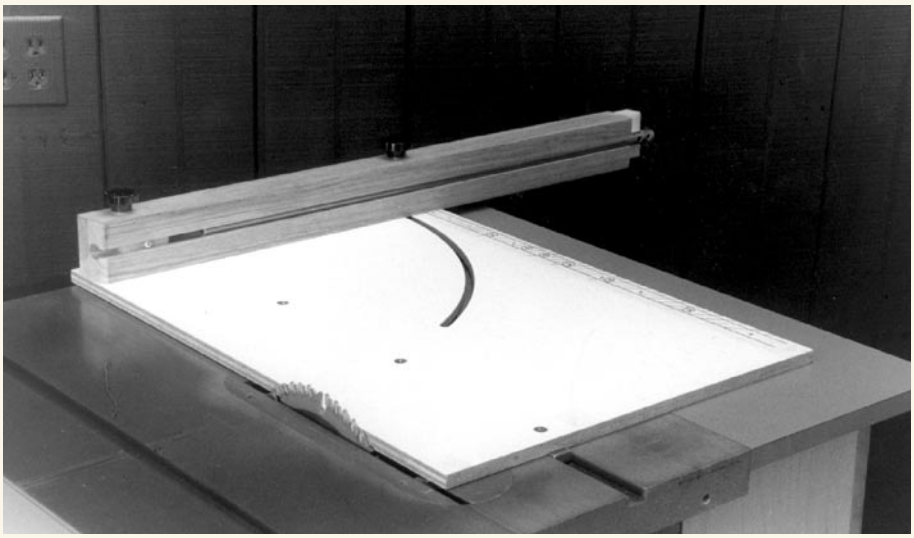
Aftermarket miter gauges offer increased accuracy, capacity and built-in adjustable stops. They also allow the workpiece to remain flat on the table saw surface.

what to replace them with is more complex. How much cut-off work do you perform on the table saw, and how large are the boards that you must cut accurately? If you crosscut lots of large boards, you need a crosscut (or miter) sled instead of a replacement miter gauge. For small work and an occasional large board, a good miter gauge will serve you well.

Here are a few features to look for in a quality aftermarket miter gauge:

- The miter bar should be adjustable to allow you to custom fit it to the miter slots in your saw top. No matter how accurate the miter gauge, if the bar fits sloppily in the slot your work will suffer.
- Some type of adjustable stop should be included on the fence. It should be able to be located easily anywhere on the crosscut fence. It should be stable, but if possible, a stop that can flip out of the way of the cut without changing the setting is also advantageous.
- Make sure you look for a fence that is adequate to the task. A miter gauge should allow you to set a stop for the length of a table leg, so at least 30" capacity is recommended.

When you use a miter gauge, whether a factory gauge or a replacement, there is friction between the wood and the saw table as you push the work across the surface. The larger the board, the greater the friction – and the greater the tendency for the board to twist or creep as you make your crosscut.



This shop-made crosscut sled has one miter bar and the sled runs right up against the blade. It also adds a mitering feature by adding a sliding track that allows the fence to pivot and lock. A commercial version, the Dubby, is also available at 800-533-6709 or in-lineindustries.com.

A crosscut sled works like a miter gauge, but it also supports the wood and eliminates the friction. Crosscuts – particularly cuts in large boards – are smoother and more accurate with a sled.

While you can't easily make your own miter gauge, a shop-made crosscut sled is definitely an option. There are two distinct styles of shop-made sleds, one that slides on the left of the blade and another that slides on both sides of the blade, with a kerf cut in the sled to allow blade passage. Both have benefits.

The left-sliding sled (shown above) supports the workpiece for square and mitered cuts, but it does not support the waste piece during or after the cut. The "fall-off" piece can truly fall off and without proper caution can become a hazard. This can also cause tear-out at the end of the cut. One solution is to add a second fixed table of the same height as the sled to the right of the blade.

Another option is to use a larger wooden sled that rides in both miter slots, allowing you to support the workpiece on both sides of the blade. It also will always be set for a square, 90° cut, but will not easily accommodate mitered cuts.

A two-sided miter sled allows equal support on either side of the blade and also functions as a partial blade guard. While stops can also be added into this design (as shown) it doesn't easily allow for adjustable miter cuts.

Sliding Tables

Like a crosscut sled, a sliding table supports the work so you can crosscut large stock accurately and easily. But unlike a miter sled the supporting surface is flush with the saw table. And instead of sliding back and forth in the miter gauge slots, this accessory rolls back and forth on bearings and rails.

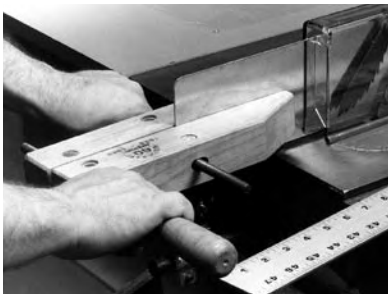
A sliding table usually replaces the left table wing on your saw and will require you to relocate, or shorten the fence rails. This will also limit how far you can position the fence to the left of the blade, so be mindful of this complication.

Most sliding tables not only allow moving larger panels past the blade effortlessly, but they also have stops mounted on the crosscut fence that can accommodate up to a 62" crosscut. The

TIPS & TRICKS

SAFETY TIP:

Bend and Split



For a splitter to work correctly it needs to be perfectly aligned with the blade. Most factory-provided splitters are made from a light-gauge steel that can be easily bent. If your splitter should lose alignment, it's easy to readjust using a hand screw clamp to apply pressure to the splitter bending it back into alignment. Of course, you need to remove the clamp when making a cut.

SAFETY TIP:

Nothing Like the Real Thing

While outfeed tables and roller stands can make things much easier when cutting large material, sometimes there's nothing like a helping hand ... when helping correctly. Remember, both operators must be clear of the danger zone. You must each understand what is expected of you during the operation and what you will do if something goes wrong. Hand signals are best. Also, remember that the guy pushing the board is in charge. Don't try and direct the board through the blade. That's his job!

Photo by Al Parrish

This sliding table makes crosscutting panels and longer boards simple and accurate. Although they require a bit more space in your shop and are expensive, they can be a valuable addition.

fence can also be repositioned to the front of the table for front-supported crosscuts, or angled for miter cuts.

While very advantageous, sliding tables are expensive and are usually recommended for cabinet saws. If you're working with a contractor saw, you'll likely be adequately served by adding a simple miter sled to your setup.

Blade Guards/Splitters

This is another area where manufacturers have provided what is necessary on the saw, but pricing has kept guard systems at the bare minimum and they're often cumbersome to use. So we recommend upgrading your safety systems on your saw. An aftermarket splitter and guard provide more safety and are easier to use, but they can cost hundreds of dollars. Despite the price, they're a good investment.

Aftermarket overarm blade guards that replace the guards shipped with the saw offer improved convenience and safety, but the convenience usually means you must use both an overarm guard and a splitter for complete safety.

An overarm guard (and there are a half dozen available) usually employs a clear shatterproof basket that covers the blade area and makes it difficult to bring your hand in contact with the blade. Suspended and height adjustable, these guards can be made to operate in most cutting procedures. When a piece

Overarm guards are designed to keep your hands away from the blade, but also provide easy and clearly visible saw operation. Able to quickly swing out of the way as needed, this guard also has built-in dust collection.

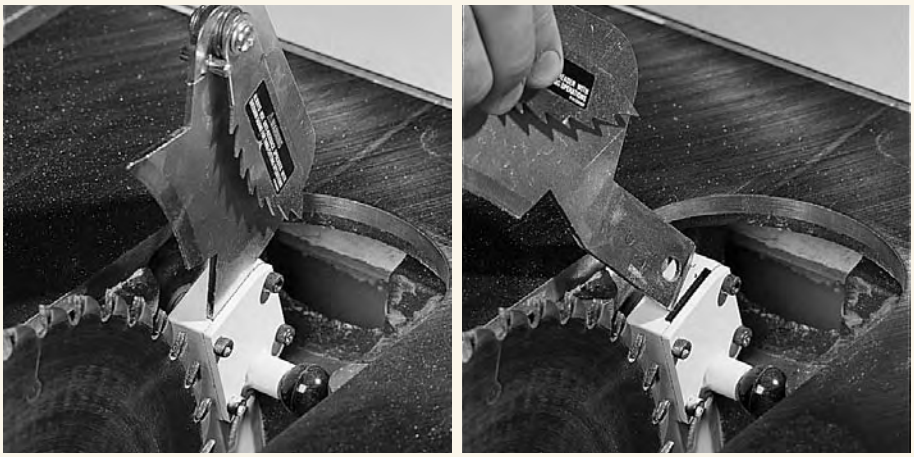
needs to be run vertically on the saw, the guard is designed to swing out of the way (temporarily), and swing easily back into place without extensive resetting. Some even include built-in dust collection.

The splitter plays an important safety role. By introducing a thin steel or high-impact plastic plate into the blade kerf after a cut, the splitter keeps the divided piece of wood from pinching the blade, should the pieces be inclined to twist because of internal tension in the wood.

Another part of a splitter is a set of toothed pawls that are spring-loaded and move out of the way as a board passes them. But the teeth will catch on the board keeping it from moving back towards the operator in a kickback.

Typically an integral part of a manufacturer-supplied guard, the splitter and pawls can cause headaches. You must remove them for specialized saw operations such as using a dado stack. Once removed, they can be difficult to reattach. Plus, they can become easily misaligned.

Aftermarket splitter/pawl assemblies that can be quickly detached and reinstalled without using tools are now available. These accessories are just good sense and should always be used in conjunction with an overarm guard system.



An aftermarket splitter/pawl assembly is shown in position (left) and being easily removed (right), without the use of tools. The splitter keeps a cut board from pinching the blade, while the pawls reduce kickback. The two parts work together to ensure your safety.

Roller Stands and Outfeed Tables

While it might be advantageous to build permanent outfeed tables and side tables to support larger work on your saw, it's not always practical.

There are two distinct types of temporary work support that make handling larger pieces on the table saw manageable – roller stands and outfeed tables.

Roller stands are available for sale in a dizzying array of designs. They all are adjustable in height to align with your saw's table and offer some type of low-friction support head. This can be a set of oversized ball bearings, one or more large rolling bars, or as simple as a tilting, slick plastic surface. All work, but you may prefer one style over another.

You can also make your own roller stands from kits, or from odds and ends in your shop, if that's your preference.

Outfeed tables are more permanent in design and are exactly what they sound like. The tables are usually about 24" wide and about 48" long, and are designed to be about ⅛" lower than the height of the saw's table. These are usually shop-made items and the top surface could be made from melamine or laminate to provide less friction against a moving workpiece.

It's usually handy to make two of these tables (shop space permitting). One serves as an outfeed table behind the saw to catch longer pieces, while the other is used at the left side of the saw to support longer pieces. If necessary, you can get by with one table, locating it for your immediate support needs.

Roller stands serve as a simple helping hand when working with wide or long material. The Lee Valley stand shown here uses swiveling casters to support and move the material. It's adjustable for height in both gross or fine increments using separate mechanisms.

TIPS & TRICKS

HANDY TIP:

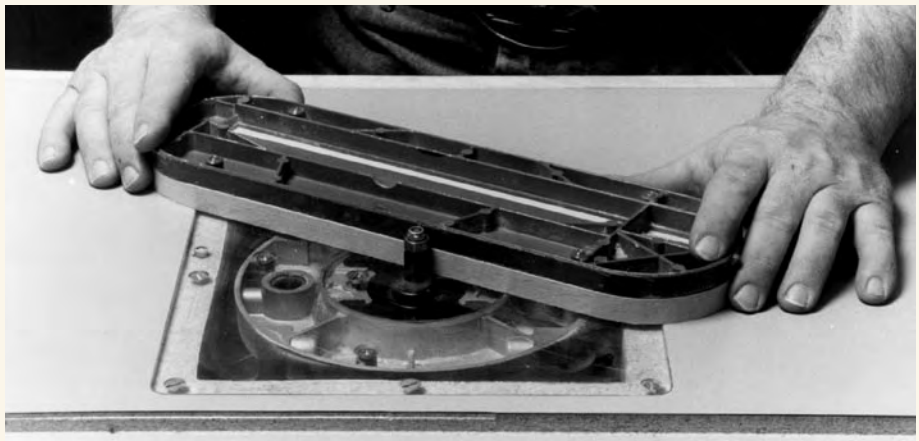
Fence Straddler

Push sticks and push blocks are valuable accessories. But sometimes you want even more control than usual. I recommend making at least one fence straddler. When making a narrow rip cut, the stock can be lifted off the table saw as it passes by the rear of the blade. It can also be pinched between the blade and the fence, and then flung like a spear. A fence straddler allows you to both hold the stock on the table and feed it past the blade. Because the U-shape of the jig straddles the fence it adds great stability and the handle on top keeps your hand even further from harm's way.

BASIC TIP:

Everything Handy

This may seem a little simple, but no other single tip will save you as much time and frustration. Five accessories to always keep at the saw: pencil, tape measure, safety glasses, bench brush and calipers or a steel rule. No matter how much attention you're paying in your shop, half the time you end up leaving one of these items somewhere else and have to go chasing it before you can make your cut. This can lead to inaccuracies, poor safety habits and frustration. Find a drawer or even store these items in the hollow front rail of your rip fence, but keep them at the saw.



To make a zero-clearance table insert, plane a piece of hardwood to the thickness of your regular blade insert. Trace the shape of the insert on the planed stock and saw it with a band saw, cutting about 1/16" wide of the line. Fasten the metal blade insert to the wooden blank with double-faced carpet tape and rout the final shape with a flush-trim bit. Adjust the height of the bit so the pilot bearing follows the shape of the metal insert while the cutters trim the wood.

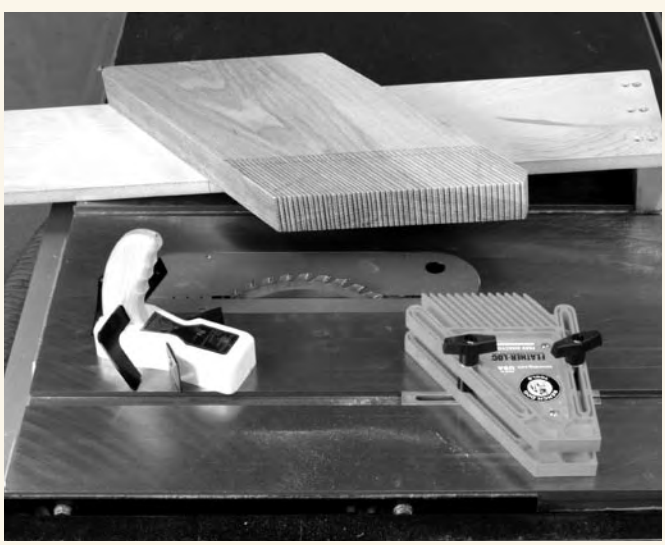
Zero Clearance Inserts

All table saws come equipped with a throat plate insert. These usually have a 3/8"-wide slot running the length of the opening to accommodate most saw operations, including bevel cuts. While they work, the slot, which is three times the width of the blade, can allow waste to drop between the blade and the insert where they will likely be splintered.

Don't throw the insert away: Hang onto it and make your own zero-clearance table saw inserts. In fact, make a few of them. Not only will they keep fall-off pieces from being thrown back at you, but when cutting joints, you have more bearing surface for your work to ride on. Another benefit is by providing better support on the underside of the cut, zero-clearance inserts reduce splintering, especially in plywood.

The photo above shows how to make a simple zero-clearance insert. Once made, run your saw blade down to it's lowest point and fit the plate into the throat opening. Hold the plate in place (either by placing the rip fence over the edge of the plate, or by clamping a board across the edge of the plate) then turn on the saw and slowly run the blade up through the plate.

If you would like to make a throat



Three types of featherboards are shown here. At the top is a shop-made one that can be clamped across the saw table. The "feathers" are created by making repeated cuts on the band saw. The lower left one has a strong magnet that locks it to the saw table and uses flexible plastic paddles. The third rides in the miter slot and uses plastic feathers to apply pressure.

plate that can be adjusted for height to fit perfectly flush with the saw table, make your blank thinner and then add short wood screws to the plate, located to rest on the tabs inside the throat opening. By adjusting the screws, you adjust the plate.

Featherboards

You can increase accuracy and safety with featherboards, which press stock against the fence or table during a cut.

Featherboards work just like the pawls on a splitter assembly, but they're tension-loaded, not spring loaded. As wood is pushed past the fingers, they bend out of the way, but will not allow the material to be pulled back through. This keeps your work tight against a saw table, saw fence, or both at the same time.

You can purchase plastic featherboards or make your own. Evenly spaced kerfs ripped in the end of a piece provide the tension. For less tension, make the cuts longer. For more tension, shorten them up. A straight-grained hardwood is best for featherboards.

Once made, the featherboards are clamped in place. They should be positioned to avoid forcing the piece against the blade. To avoid clamp placement problems, you can also make simple hold-downs to fasten the featherboards in your miter slot.

Push Sticks

Push sticks – one of the most important table saw accessories – are often overlooked. When it comes to safety, you can never have enough push sticks handy.

I've known woodworkers to use very simple and very elaborate push sticks. In my opinion both are great, as long as they're being used. And don't worry about nicking your stick with the saw blade. It's much easier to make a new push stick than grow a new finger.

There are dozens of manufactured push stick designs. Some are shipped with new table saws and many other designs are sold in catalogs and retail locations. All are fine, but consider making your own instead. Use either a solid hardwood or high-density plywood. Either copy a shape from a store-bought design that you like, or design your own. Just make sure you use them.

Other Accessories

- **Powertwist Belt**

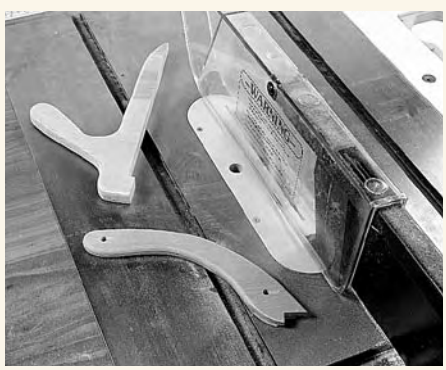
If you have a contractor saw, this is a great upgrade. This belt, commonly called a "link belt," makes your saw run smoother and with less slipping. It costs about $7 a foot (you'll probably need 4'), but it's worth it (available from Woodcraft, 800-225-1153 or woodcraft.com).

- **Mobile Base**

Many woodworkers are challenged by space and one way to ease that is with the use of mobile bases. Even your table saw can be made mobile, though usually cabinet saws are set in place and not moved. If you add a mobile base to your contractor-style table saw, make sure it can be locked solidly in position with no movement. The last thing you want is your saw shifting during a cut.

- **Dust collection**

Table saws are much more friendly about creating dust (at least in volume) compared to planers and jointers, but the dust they do create is fine and still dangerous. Most cabinet saws offer an effective dust port in the base. Contractor saws require some special effort. The open back makes dust collection less efficient, but it's still worth the effort. **PW**



Two useful and functional push-stick designs are shown here. The lower design applies very specific hold-down pressure at the notched tip of the stick. The upper stick is actually more of a push shoe. The entire surface ahead of the notch rides on the material, providing pressure not only behind the wood, but along the length of the wood as well.

Low-cost Splitter

One of the most recent and affordable options for making your table saw safer is this polycarbonate plastic splitter from Micro Jig (407-696-6695 or microjig.com). About $20, this splitter installs on any zero-clearance throat plate (which you should have anyway) in about 30 minutes.

The splitter mounts right behind your blade holding the two recently cut pieces of wood apart and greatly reducing the chance of kickback. When you need to make a dado or through-cut, it can be removed quickly and then can be easily dropped back into place after the cut.

Micro Jig makes splitters that will work with standard 1/8"-wide saw blades and also thin-kerf blades. Each package comes with two splitters. Each face of the two splitters exerts a different amount of pressure (in .003" increments) against your stock and the rip fence. This allows the splitter to function as a featherboard, adding accuracy to your rips. Each kit includes the drilling guide (that doubles as storage for the splitters when not in use on your saw), drill bit and instructions.

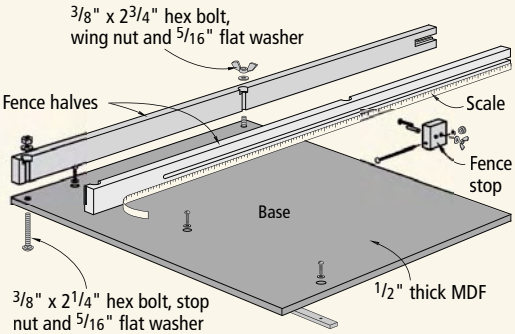
The splitter slips into three holes drilled in your zero-clearance throat plate, directly behind the blade.

The drilling guide doubles as storage for the splitters when not in use and attaches to the underside of the throat plate.

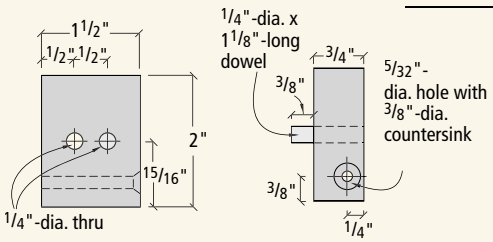
Saw Sled

This multipurpose saw sled offers the sliding table itself, with a fence long enough for most crosscut applications and a micro-adjustable fence stop for duplication and accuracy. The sled can use a purchased aftermarket miter bar, or you can make your own from a piece of hardwood. I added a microadjustment mechanism to the stop using a #10-32 flat-head machine screw threaded into the stop, with a jamb nut and knurled nut on the other end to turn the screw easily.

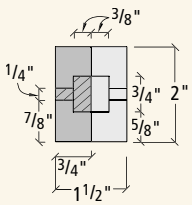
Photo by Al Parrish



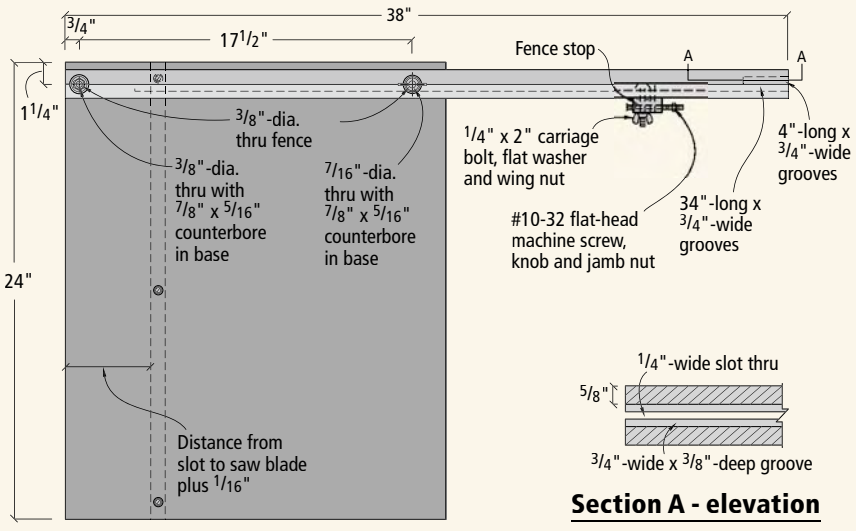
Sled - exploded view



Stop detail - elevation & profile



Fence detail



Sled - plan

Section A - elevation

Illustration by Mary Jane Favorite

The WoodRat

WHAT CAN IT DO?

- Through Dovetails
- Half-blind Dovetails
- Sliding Dovetails
- Finger Joints
- Mortises and Tenons
- Profiling
- Raised Panels
- Dados and Grooves
- Dowels

Genius or just another jig? We have the answer right here.

So that there's no confusion here, I think dovetails are a great joint for strength and beauty. But I'll also do anything I can to avoid making dovetails, or at least do whatever I can to make them easier.

Enter the WoodRat. It was brought to my attention that this multi-use machine was popular in Britain and had been for sale in the United States for some time, but is slow to gain acceptance. I decided it was time for a closer look.

The siren song of simple dovetails drew me in, but the versatility of this machine sold me. Not only are dovetails less complicated to make, but the WoodRat allows you to adjust their spacing infinitely and even allows for thin pins that look very close to hand cut.

by David Thiel

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

On top of that, the machine will also create more than half a dozen other joints without having to buy dozens of accessories.

Is it too good to be true? There are some catches. The WoodRat isn't cheap and it has a pretty steep learning curve. You'll also have to use it regularly to keep the knowledge fresh. The user's manual is 141 pages long, but I recommend watching (and rewatching) the instructional DVD to really understand the tool.

The tool's originator, Martin Godfrey, is also the DVD's host. Unlike many instructional DVD's Godfrey makes this one entertaining and the production values are pretty decent.

The Jig Itself

In its heart the WoodRat is a joint maker and can also be used as a router table. So it's not really fair to compare it to a dovetail jig, but that's what most woodworkers will do, and so will we.

Location: Many of us have a special shelf where our dovetail jig lives when not in use. Pull it off the shelf and after 10 or 15 minutes you're ready to start setting up the jig. The WoodRat is designed to be mounted permanently to your wall. It does take up some wall space but it's always ready to use. If you don't have wall space, it can be mounted to a frame and easily attached to your bench when needed.

The manufacturer touts the space-saving benefit of the WoodRat, and initially that doesn't seem to wash. But when you consider the size of a router table and the necessary space for a dovetail jig, the assertion isn't wrong.

When using a standard dovetail jig you're presented most commonly with templates that determine the spacing and type of dovetail created. Many woodworking purists avoid jigs because of the lack of flexibility in the spacing. The WoodRat uses no templates, so you can space the tails in any arrangement you like. That in itself is a pretty strong argument for the machine.

Add to that the special high-speed steel dovetail bits available for the WoodRat and you gain a very thin tail profile (as thin as 3/16") that's simply not possible with standard dovetail bits. This increases the nearly hand-cut effect of the jig and again earns points for the WoodRat.

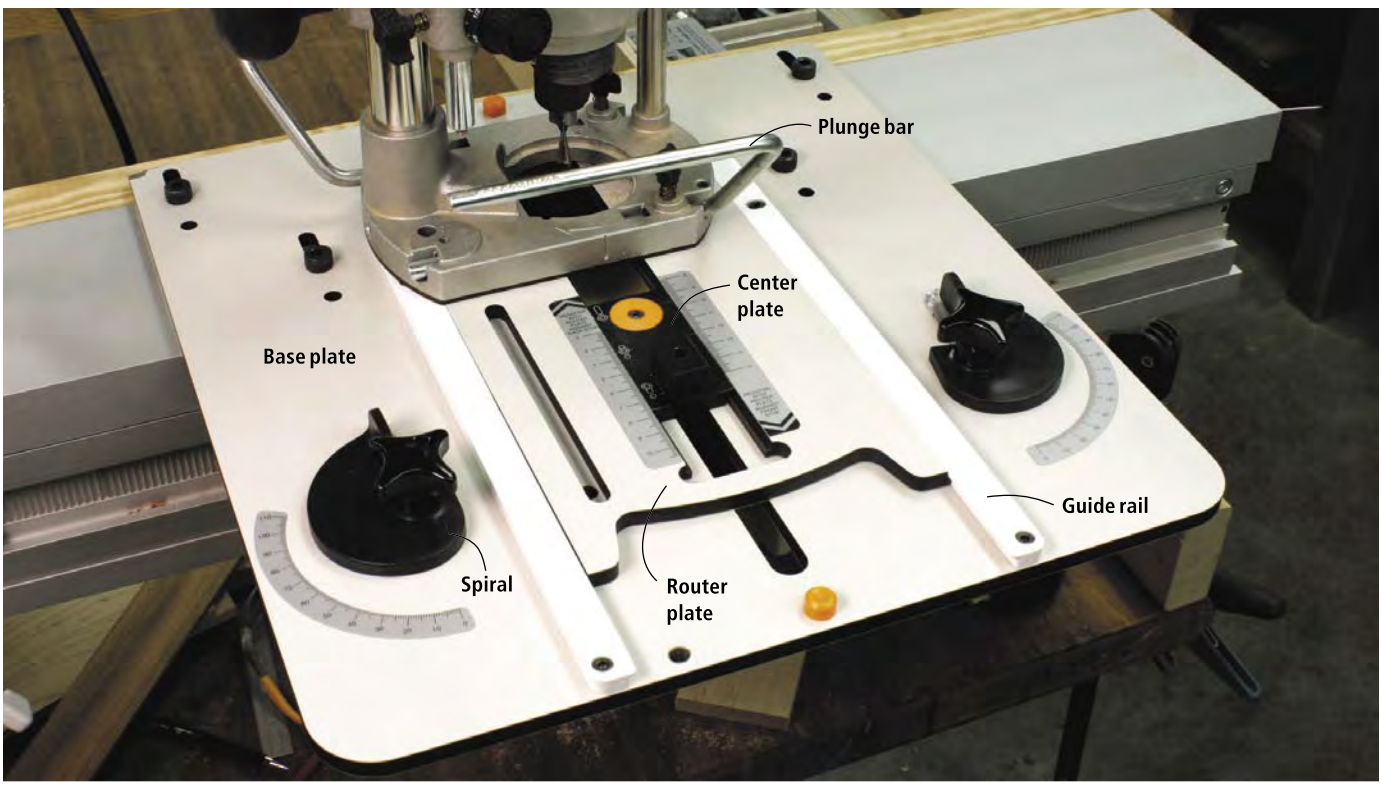
Once understood and set, the WoodRat is very handy at making dovetails, both half-blind and through (though you still have to square out the corners of the half-blinds). Let's take a closer look.

How it Works

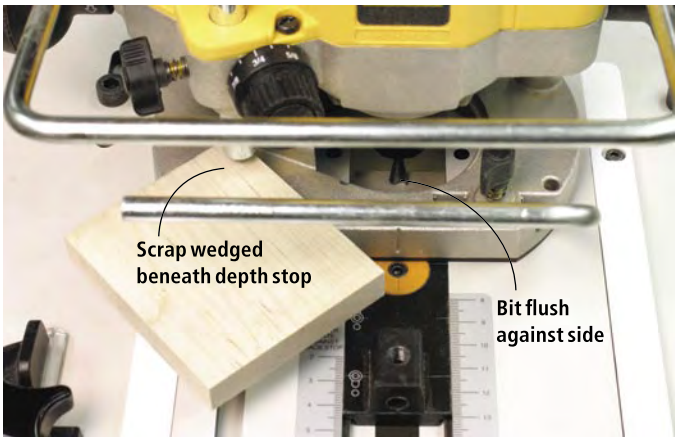
The photo below shows a plunge router mounted to the router plate. Similar to many aftermarket router table inserts, the router plate is drilled to match the mounting holes on your router.

The router plate is attached to the base plate by the two guide rails. The guide rails capture the router plate in milled rabbets and are used for straight cuts, including cutting tails for dovetails and finger joints.

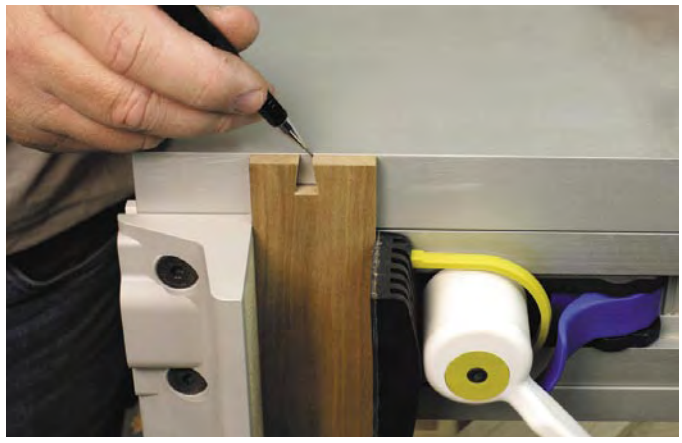
With the guide rails removed, the spirals and center plate come into play for cutting the dovetail pins. The center plate serves as a carefully located pivot point (determined by the type of dovetail bit used). The spirals are eccentric stops that limit the left and right pivot of the router plate, again adjusted to match individual dovetail bits.



The router plate is guided by the guide rails across the base plate, giving one axis of movement for the router. The plunge mechanism of the router itself (assisted by the plunge bar) provides a second movement axis. With the guide rails removed, the router plate pivots on the center plate making angled cuts. The left and right swing is limited by the spirals set to the appropriate angle.



To set up the WoodRat for dovetails, the bit is set flush to the actual board. The bit depth is then set using a scrap the same thickness as the drawer front. The router's depth stop is used to set the depth. It's simple and logical.



With the bit positioned, a test board is cut and then moved to the left clamping position. The shape of the detail is then transferred to the machine face.

With the router in place, the material to be shaped is mounted in a vertical cam-clamp at the front of the machine. There are actually two of these clamps – one positioned under the router and the other positioned off to the left to serve as your guide.

The photo (above right) shows a test piece with the dovetail through-cut. This piece is locked in the left clamp and the shape is transferred to the aluminum face of the machine.

You'll notice a crank in the main photo (page 57). This is the handle that moves the entire face of the machine left-to-right, repositioning the wood. After laying out your dovetail spacing on a sample board, it's placed in the left clamp and the pencil marks are used as guides to orient the face (and the workpiece and the sample board) and make your cuts.

By using the sample board "template" any variation of spacing is possible. The sliding face is guided by a wire pulley system that has no backlash, and the channel is tight enough that it's unnecessary to lock the sliding face in position during the cuts – no movement and no problems.

With the tails completed, you change to a straight bit, remove the guide rails, set the spirals and then mount your finished tail board in the left clamp. The actual finished board is your template to cut the pins on the pin board, so the match is exact.

Now, there is some fine-tuning required to get the height and fit perfect, but once it's set running all the pins is a breeze.

These same basic steps are used to create all the different joints. One other aspect that I like when creating any of the joints is the ability to see the piece that is being shaped, as it's being shaped. In a router table the cut is usually buried from view.

There are many more things that need to be said about the capabilities of the WoodRat – too many to enumerate here. If you'd like to get familiar with the tool before buying, a demonstration DVD is available for $3 that will acquaint you with the 'Rat's capabilities, as well as entertain. It's money well spent.

As I mentioned earlier, the WoodRat's not cheap. The WR5 model shown here runs $645. That's before the router and the clever plunge bar ($40, and I recommend one). Add bits to that (a four-piece high-speed steel dovetail set is $79), and you're looking at just shy of $800. Ouch.

Bottom Line

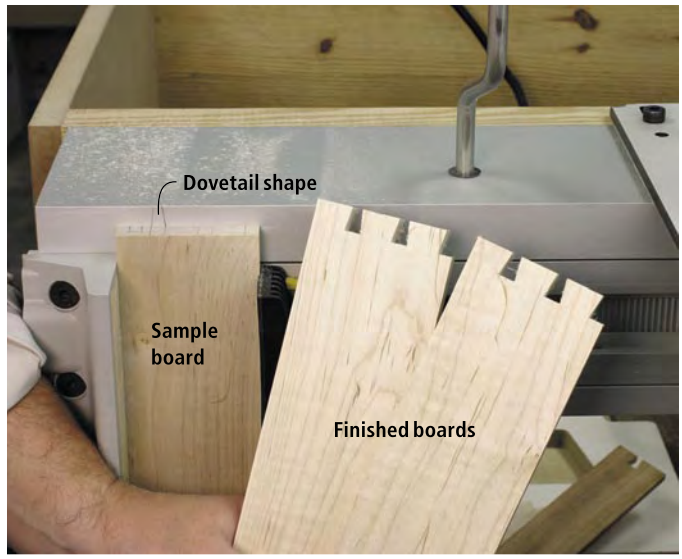
If you're willing to invest the time to become comfortable with this machine, it'll be your best friend and the money spent will be returned in spades.

Case in point: One of our contributing editors, Troy Sexton, has been using a WoodRat for years. As a professional woodworker he has the 'Rat set up to just cut dovetails and never uses it for other applications. And he's very happy with his investment.

Get the demonstration DVD and decide for yourself if the WoodRat is the right tool for your woodworking needs. **PW**

SOURCE

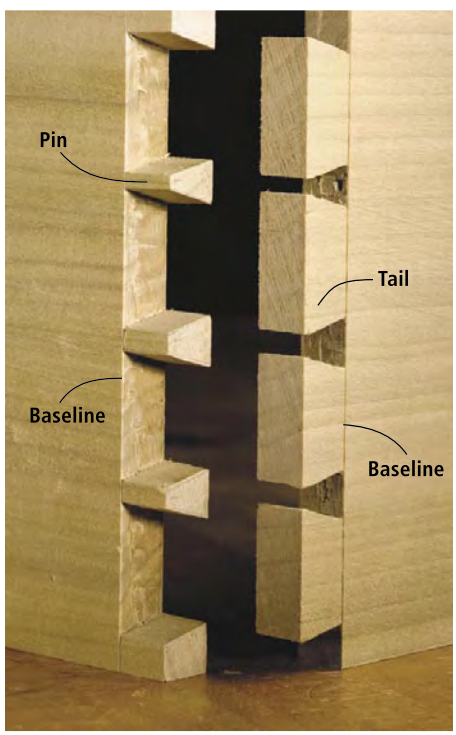
The Craftsman Gallery
866-966-3728 or
thecraftsmangallery.com



A sample board with the required dovetail spacing is mounted in the left clamp and used as a reference against the dovetail shape to position the sliding bar and make the cuts for the finished boards.

The right techniques and tools (plus a few tricks) will give you a good start on mastering this fine traditional joint.

Your First HAND-CUT DOVETAILS



The essential parts of a through-dovetail joint.

Dovetails have long been recognized as the premier joint for casework and drawers – and for good reason. They're the strongest way to join the corners of a box, and they look great.

However, dovetails also have a reputation as a difficult joint to master. But cutting dovetails by hand only looks difficult. It's actually just a process of sawing and chiseling to a line. It's that easy. (And with a bit of practice, everyone can saw and chisel to a line.) In fact, when I teach dovetailing, I start people out not by cutting dovetails, but just sawing to a line. Once you've mastered sawing to a line, you're on your way to creating this time-honored joint.

No doubt you've seen the multitude of jigs available for routing dovetails. But there are several good reasons for skipping the jigs and learning to cut dovetails with hand tools. Undoubtedly the main reason is the pleasure that comes when crafting the joint with a saw, chisel and mallet. Cutting dovetails is fun. Another reason is the personal satisfaction of meeting the challenge head-on. And once

by Lonnie Bird

Lonnie is the author of "The Complete Illustrated Guide to Using Woodworking Tools" (The Taunton Press) and teaches woodworking. You can learn more about his classes online at lonniebird.com.

Photos by Al Parrish

Lonnie Bird's essential toolkit for dovetailing includes (from top): A mallet, a marking gauge, chisel (note the shortened handle), an adjustable square, a dovetail marker, more chisels and a knife.

you develop the skills, you'll find that you can cut a variety of dovetail joints that can't be produced with a jig. Keep reading, and I'll show you step-by-step how to lay out and cut woodworking's most beautiful joint.

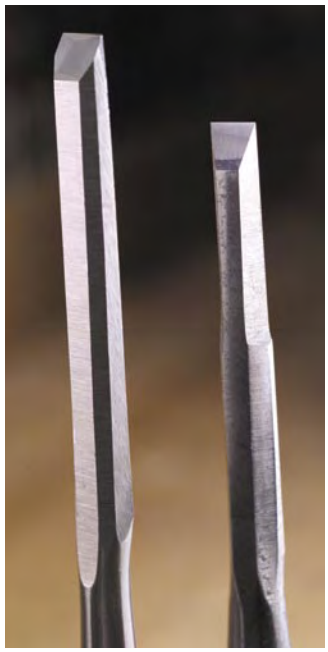
A Few Terms

Before diving in, it's helpful to understand some of the terms associated with dovetails. All dovetails have two mating parts: tails and pins. Tails are usually wider than pins and are tapered on the face. Pins are narrow and tapered on the ends. It's the tapered, mechanical interlock, combined with the long-grain gluing surfaces, that give dovetail joints their tremendous strength.

Through dovetails are the most common type; the joint is aptly named because each member of the joint goes "through" the adjacent member. Consequently, through dovetails can be viewed from either face.

Half-blind dovetails can only be viewed from one face; on the adjacent face the joint is hidden. On a typical drawer, through dovetails are used to join the side pieces to the back and half-blind dovetails join the sides to the drawer front.

All dovetails have baselines; the baseline indicates the height of the tail or pin.



Many modern chisels have sides that are too square for getting into the triangular sockets between the joint's tails (left). I recommend grinding the sides down almost to the back (right).

Tools

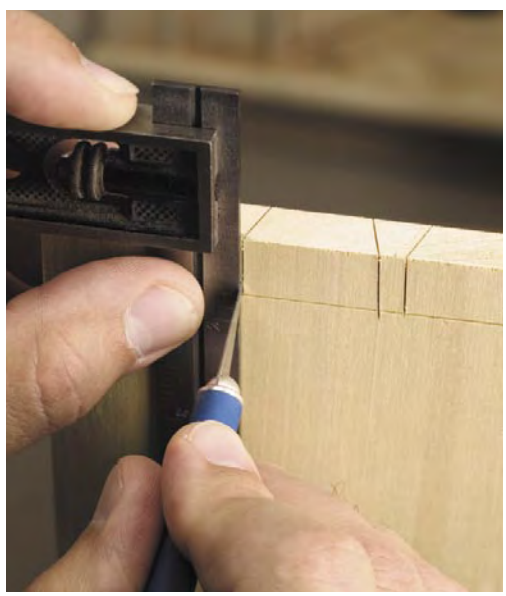
The tools for dovetailing are not expensive but it's important to have the right ones. It's also important to have them well-tuned.

Before cutting a dovetail you'll need to do a bit of measuring and marking, commonly referred to as layout. Good layout is essential. Remember: Dovetailing is the simple act of sawing and chiseling to a line; if the line is inaccurate the joint won't fit together.

One of the most important tasks is marking baselines. The baseline is created with a marking gauge – a simple tool that consists of a head, beam and cutter. The head slides along the beam and locks in place with a thumbscrew. Some gauges use a steel pin for the cutter while others use a tiny wheel. Either type of cutter will work so long as it's sharp. A dull marking gauge will tear the fibers, making it difficult or impossible to craft a clean dovetail joint. In contrast, a sharp gauge will cleanly sever the tough end-grain fibers to create an incised layout line. As you chisel out the waste between the tails and pins, the edge of the chisel will drop precisely into the baseline to give you that great fit that you're striving for.

Other layout tools you'll need include a layout knife, a square and a dovetail marker. An X-acto knife works well; it's razor sharp

Mark the baseline on the faces of both the pin board and the tail board with a marking gauge. Also mark the baseline on the long edges of the tail board.



Use your dovetail square to mark the shape of the pins on the end grain. Then mark the face of the pins using your adjustable square.

and the narrow point will easily scribe between the tails and pins. The type of square is unimportant as long as it is 90°; I prefer the Starrett combination squares for their precision and versatility. To mark the angle of the tails and pins, I use a Veritas dovetail marker. Its simple extruded aluminum design functions well, it's inexpensive and I can rework the soft aluminum to an angle of my choosing, typically 14°. A 14° pitch provides the good looks and mechanical interlock that I'm always after.

Of course, you'll also need a dovetail saw, a few chisels and a mallet. There are two types of dovetail saws available today: Western style and Japanese. Traditional Western-style dovetail saws cut on the push stroke and feature a thick back to stiffen the blade and prevent it from buckling. However, Japanese saws cut on the pull stroke, which places the blade in tension during the cut so it doesn't have the tendency to buckle. Consequently, Japanese saws have a thinner blade and cut a finer kerf. Also, the unique tooth design of the Japanese saws cause them to cut more aggressively than Western saws. Which is best? When I teach dovetailing I encourage people to experiment with each. Although most choose the Japanese saws, others feel they get more control and a truer cut with the Western saw. Regardless of which style that you prefer, it's important to use a high-quality dovetailing saw.

The best chisel for chopping waste from between the tail and pins is a short one. A short chisel provides the control you need when driving the chisel with a mallet; long chisels are designed for paring. For many years I've used the long-discontinued Stanley #750 socket chisels. The short 9" length and perfect balance of these old tools are just what's needed for dovetailing. Stanley #750s are still available from old tool dealers, and Lie-Nielsen Toolworks has just recently begun manufacturing its own improved version of these venerable chisels. Of course, if you already own a set of inexpensive chisels, you can also do what many of my students do—cut the excess length from the handle. Although it may sound odd, reducing the handle length greatly improves the balance of a long, top-heavy chisel. And the improvement will be reflected in the quality of your dovetails.

An important step to fine-tune chisels for dovetailing is to further bevel the sides of the blade up by the cutting edge. On most new chisels, the sides are too square, and the excess steel crushes the fibers of the tails and pins as you chisel the waste. Grinding the sides close to a knife-edge will eliminate the problem. Of course, you should also hone the chisels to razor sharpness.

Having the right mallet is important, too. I've found that a round, 12-ounce mallet works best. Heavier mallets are tiring to use and the extra weight just isn't needed. Also, the head of a square mallet must always be aligned to the chisel before striking. Not so with a round mallet.

Once you've gathered your tools and tuned them up, you're ready to begin.

Use your thumb as a guide to start the kerf of your saw in the edge closest to you. After a couple strokes, begin to lower the angle of the blade.

To make the waste between your pins easier to remove, cut several extra kerfs in the waste. Take care not to cross the baseline of the joint.

Layout

The first step in the layout process is to mark the baselines. Note that the baseline is marked on both faces of both halves of the joint. It's also necessary to mark the baseline on the edges of the tail board. First, set the gauge to the thickness of the stock. As you mark the baseline, focus on keeping the head of the marking gauge firmly against the end of the stock. To avoid tearing the grain, make several light passes with the gauge as opposed to one heavy cut.

Next mark the half pins on each corner of the pin board, and then divide the board into the number of desired tails. Each point of the divider becomes the center of a pin. After marking the slope of the pins on the end of the stock, mark the face with a square, as shown at left.

Sawing

As I stated earlier, dovetailing is essentially sawing and chiseling to a line. Once you've mastered that technique you can cut great-looking dovetails.

Start by positioning the saw on the near corner of the stock and pull the saw to establish a small kerf. During this initial cut, it's helpful to use your thumb to guide the saw. As you pull the saw toward you, lower the blade into the stock to establish the top line.

Now use long, smooth strokes to follow the line on the face of the stock. Stop when you've reached the baseline. Once you've sawn all the pins, make several extra saw-kerfs into the waste area between the pins. These cuts will make it a lot easier to chisel the waste between the pins.

Next, select a narrow chisel, 3/8" or 1/2", and make certain that it is razor sharp. A narrow chisel has less cutting resistance than a wider chisel and you'll have better control of the tool.

To remove the waste between the pins, it's best to cut halfway through the stock from each face. But remove the bulk of the wood

first by positioning the chisel about 1/16" away from the baseline. Drive the chisel halfway through the stock, flip the stock over and repeat.

Now position the edge of the chisel in the baseline (note how easily it drops into the incised line) and repeat the process. It's good practice to undercut the baseline very slightly. The undercut surface ensures a tight fit and doesn't weaken the joint. (Remember that the strength comes from the interlocking tails and pins as well as the long-grain gluing surfaces.)

Now examine the end grain surface very closely. You should see a fine line along the edge of the stock that was created by the marking gauge. If you don't see this line, you've chiseled too far – or not far enough.

Lay Out the Tails

The tail-board layout is created from the pin board. First position the tail board face down on the bench. Next, place the pin board over the tail board, align the face with the baseline of the tail board, and then clamp it in place. Remember, too, that the wide part of each pin should be facing the inside of the joint.

Mark the tails with your layout knife. Position the blade of the knife against the pin and use the pin to guide the cut. To complete the layout, mark the end of each tail with a knife and square.

Sawing the tails is similar to sawing the pins except you'll have to tilt the blade on the vertical axis. I think it's bad practice to angle the tail board in the vise; it's best to learn to angle the saw instead. Otherwise, when sawing the tails of a wide board for large casework, one corner of the board will be positioned high up in the air which will make sawing difficult. Instead, clamp the tail board in the vise (make sure it's level) and saw all the cuts one direction, as shown at right. Then

Here is how I remove the waste between the pins. First position the chisel 1/16" from the baseline and cut halfway through the thickness of the board.

Then flip the board over and do the same on the opposite side.

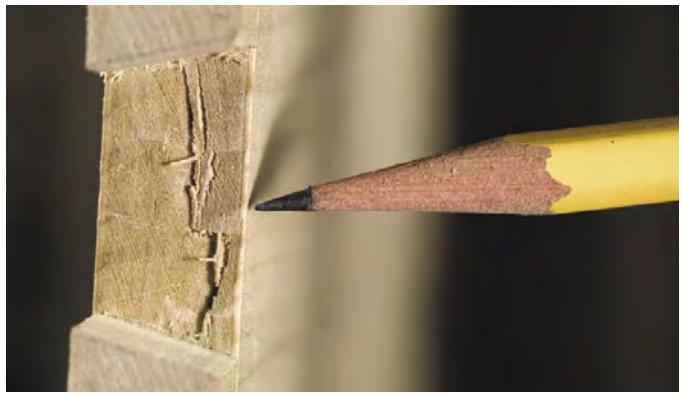
Third, to chisel out the rest of the waste, place your chisel into the baseline and undercut the joint just a bit by angling the chisel as shown.

Cut halfway through the waste on one side. Flip the board over and repeat.

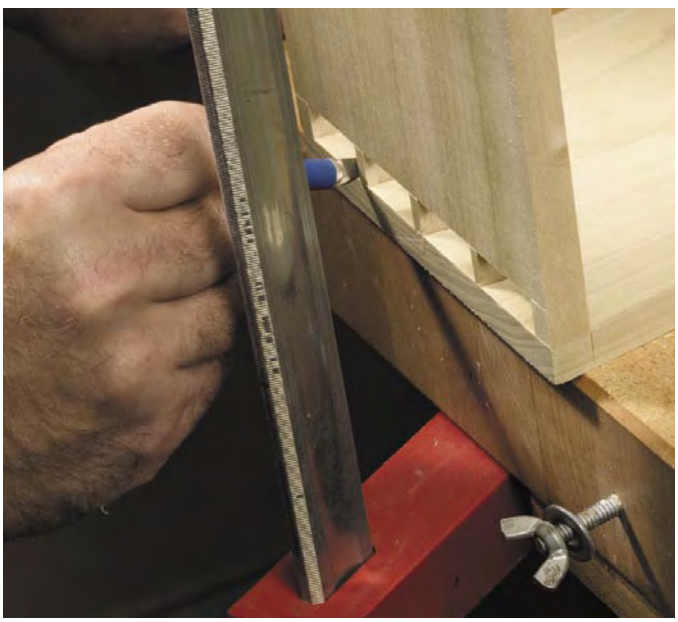
saw all the cuts that are angled the opposite direction.

I use the same technique for chiseling the waste as I use on the pins; make a few extra saw kerfs and chisel half way from each face. Remember to undercut this end-grain surface slightly. However, be careful to not undercut the surfaces at each corner. Otherwise you'll see a distracting void in the assembled joint.

To assemble the joint, first position the pin board upright in the vise. Now gently press the tail board into the pin board using pressure from your thumbs. When assembling dovetails on wide casework, I'll use gentle taps from a dead-blow mallet. You can hear and feel where a portion of the joint may be too tight. Simply pare a shaving from any such areas, slide the joint together, and step back and admire your work. With patience you'll find that dovetailing is one of woodworking's most pleasurable tasks. **PW**



Here you can see what's left of the baseline after removing the waste. This fine line is the evidence that you've chiseled to the correct point.



Clamp your pin board to the mating tail board and transfer the shape of the joint to the tail board using your marking knife.

Clamp your tail board vertically in your vise and saw the shape of the tails. Make a few extra kerfs in the waste and chisel it out much like you did with the pins, as shown at left.

When you remove the waste between the tails, slightly undercut the end grain between the tails – except on the ends, where it will show.

In wide casework especially, you may need a few taps of a dead-blow mallet.

Photo by Al Parrish

HARVEY ELLIS BOOKCASE

A faithful reproduction of the epitome of Arts & Crafts design.

Gustav Stickley once wrote that the best way to learn furniture design was to build a proven design. He wrote that the student "learns from the start the fundamental principles of design and proportion and so comes naturally to understand what is meant by thorough workmanship." This bookcase is one of the finest examples of proportion and detail that make the Craftsman style more than just a simple piece of furniture.

In 1903 Harvey Ellis designed this glass-door bookcase while working as a designer for Stickley. The first time I saw an original example of this piece of furniture I was struck by how perfectly proportioned it was and how well all of the details combine.

These details also present some challenges in building. While this is a relatively simple piece, the joinery must be precisely executed. Before I began, I spent some time tuning up our table saw and jointer, made sure my squares and measuring tools were in order, and sharpened my chisels and planes.

True to the Original

Original Craftsman furniture was occasionally made in mahogany or figured maple, but the vast majority was made from quartersawn white oak. This method of sawing yields more stable material than plain sawn oak, and the distinctive rays can be absolutely stunning. White oak is much more of a furniture wood than red oak, giving a smoother and more refined appearance.

In addition to using this wood, I also decided to use the same method of finishing that was originally used, fuming the finished piece with ammonia, and using shellac followed by wax.

Tannic acid in the wood reacts with the fumes from the ammonia, yielding a distinctive coloration in the rays and flecks, as well as in the rest of the wood. Staining, glazing and dyeing can come close to the color of an original Stickley piece, but fuming can match it exactly.

I had to glue stock together to obtain the widths required. Because the final color was dependant on a chemical reaction, and the tannic acid content of white oak will vary from tree to tree and board to board, I was careful to match boards for color as well as for figure. I also cut most of the parts for the door from the same piece of wood so that the color would be as close as possible.

Mortising With a Template

I began the joinery work with the through mortise-and-tenon joints at the bottom of the case sides. I

by Robert W. Lang

Plans for this and other Stickley projects are featured in Bob's book "Shop Drawings for Craftsman Furniture" (Cambium Books). You can purchase the book by calling 800-238-7724 or visiting cambiumbooks.com. Comments or questions? Contact Bob at 513-531-2690 ext. 1327 or robert.lang@fwpubs.com.

made a template from 1/2"-thick plywood, which helped me locate the mortises and the arched cut-outs. I cut the mortises in the template with a 1/2"-diameter bit in my plunge router, guided by the router's fence, and squared the ends with a chisel and a rasp.

I could have used this same method on the actual cabinet sides, but by using the template I only had to do the layout work once, and if I slipped with the plunge router, the damage would be to a piece of plywood, not my finished end panel.

With the template clamped to the bottom of the end panel, I drilled most of the mortise with a 3/8" Forstner bit, and then used a router with a flush trim bit to trim the sides of the mortises flush to the template. I used the smallest diameter flush trim bit I had to minimize the amount of material left in the corners. With the template still clamped to the panel, I used the edges of the mortise in the template to guide the chisel in the corners. A riffler and a flat rasp completed the work on the mortises.

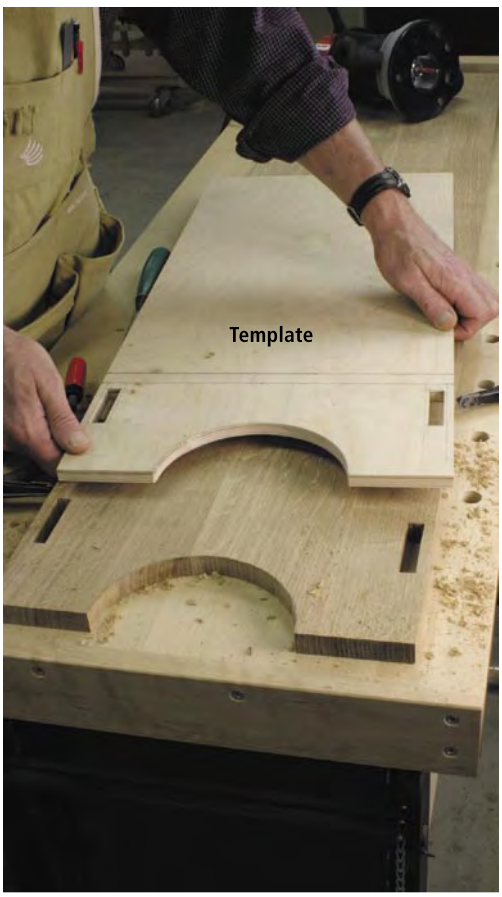
The long mortises on the ends of the rails are cut with this tenoning jig that rides along the table saw fence.

Dados and Rabbets

On the inside of the end panels there is a dado to hold the bottom and a rabbet from the top down to the dado to house the back. I made both of these cuts with a router and a 3/4"-diameter straight bit. I used a shop-made T-square jig for the dado, and used the router's edge guide to make the rabbet, stopping at the dado for the bottom. I also ran a 3/4"-wide by 1/4"-deep rabbet along the back edge of the cabinet bottom.

With the work on the side panels complete, I turned to the tenons on the ends of the two arched rails that sit below the bottom and penetrate the sides.

I always like to "sneak up" on the fit of tenons, especially when



The template locates the through mortises precisely, as well as the arched cut-out and the location of the dado for the bottom of the case.

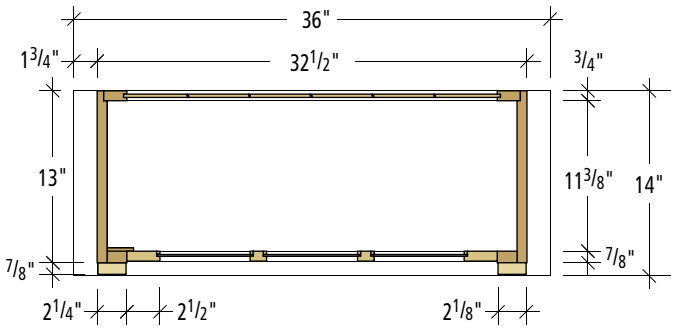
HARVEY ELLIS BOOKCASE

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
CARCASE							
❑	1	Top	3/4	14	36	Oak	
❑	2	Sides	3/4	13	57 1/4	Oak	
❑	1	Bottom	3/4	13	31 1/2	Oak	
❑	1	Bottom edge trim	1/2	3/4	32	Oak	
❑	2	Arched rails	3/4	5	33 1/4	Oak	31" between tenons-tenons extend 3/8" past sides
❑	2	Face frame stiles	7/8	1 1/2	50 1/2	Oak	
❑	1	Face frame rail	7/8	1 1/8	29	Oak	28" between tenons
❑	2	Applied pilasters	1/4	1	50 1/2	Oak	
❑	2	Capitals	7/8	2 1/8	1 1/8	Oak	
❑	2	Shelves	3/4	11 1/8	30 7/8	Oak	
DOORS							
❑	2	Stiles	3/4	2 1/2	49 3/8	Oak	Door opening is 28" x 49 3/8"
❑	1	Top rail	3/4	2 1/2	24 1/2	Oak	23" between tenons
❑	1	Bottom rail	3/4	3 1/2	24 1/2	Oak	23" between tenons
❑	2	Intermediate stiles	3/4	1 1/4	44 3/8	Oak	43 3/8" between tenons
❑	1	Intermediate rail	3/4	1 1/4	24	Oak	23" between tenons
❑	3	Top lights	1/8	7 5/16	7 5/16	Glass	
❑	3	Lower lights	1/8	7 5/16	35 13/16	Glass	
❑	18	Glass stops	1/4	1/4	7 5/16	Oak	
❑	6	Glass stops	1/4	1/4	35 13/16	Oak	
BACK							
❑	2	Stiles	3/4	1 1/2	50 7/8	Oak	
❑	2	Rails	3/4	1 1/2	29 1/2	Oak	28 1/2" between tenons
❑	1	Mid rail	3/4	2	29 1/2	Oak	28 1/2" between tenons
❑	12	Back panel slats	1/4	4 7/8	23 7/16	Oak	Shiplapped

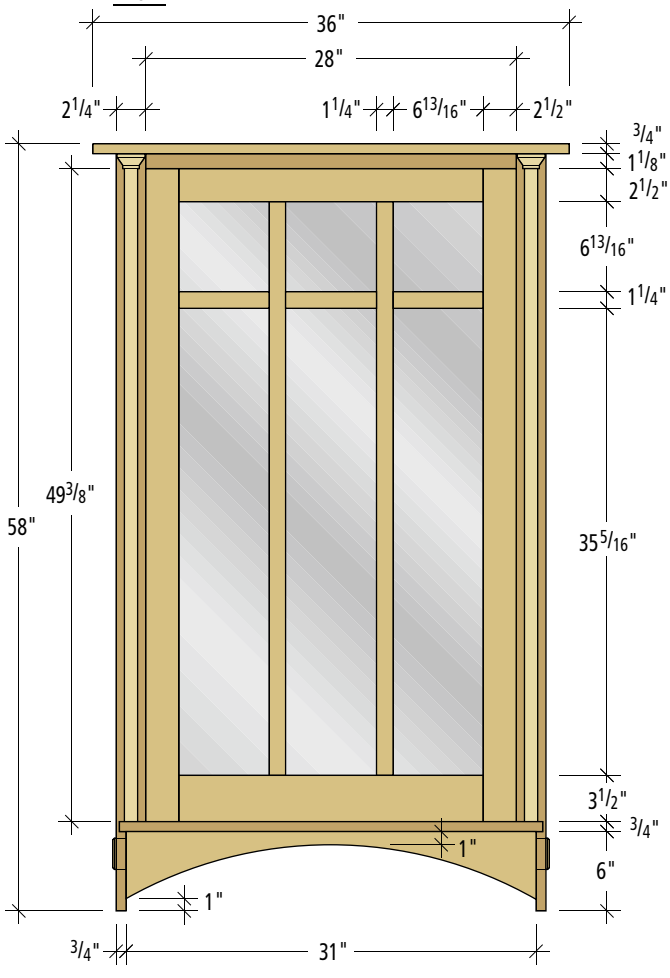
they are exposed. The tricky part with through tenons is that the final cut that yields a good fit must also be smooth enough to give a good finish. I made the initial cuts on the table saw, using a jig that rides on the fence as shown.

With the bottom in place in its dado, I held the rails in place, and marked the locations of the top and bottom of the tenons directly from the mortises in the end panels. I made these cuts on the band saw, then I cleaned up all the saw marks with a shoulder plane. As I got close to a good fit, I switched to a card scraper. Once I had the tenons fitting nicely, I took a piece of 3/32"-thick scrap, and placed it on the outside of the cabinet with its edge against the tenon. I then marked a pencil line around the tenons. This established a starting point for the rounded ends of the exposed tenons. I used my block plane and a rasp to bevel and round over the ends of the tenons, shown below.

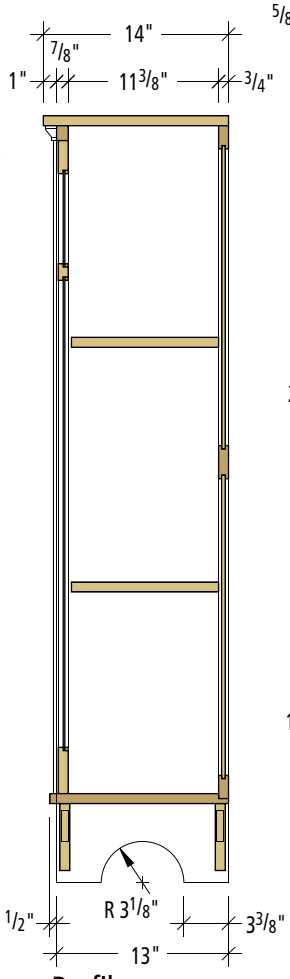
After the tenons are trimmed to fit with a shoulder plane and scraper, the exposed ends are rounded with a block plane.



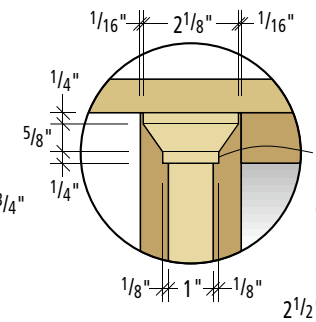
Plan



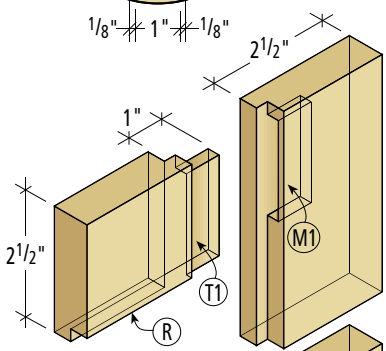
Elevation



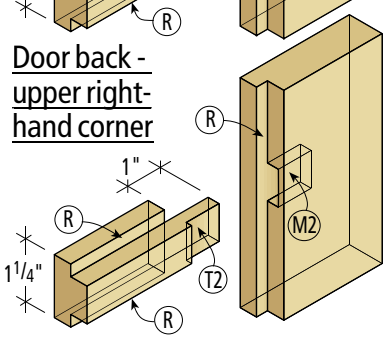
Profile



Face frame detail



Door back - upper right-hand corner



Door back - at intermediate rail

- (R) 1/4" w. x 3/8" d. glazing rabbet
- (T1) 2" w. x 1/4" t. x 3/4" l. tenon
- (M1) 2" l. x 1/4" w. x 3/4" d. mortise
- (T2) 3/4" w. x 1/4" t. x 3/4" l. tenon
- (M2) 3/4" l. x 1/4" w. x 3/4" d. mortise

After the tenons were complete, I marked the midpoint of the arch, and drove a finishing nail 1/8" below that point. I also made a mark 3/8" in from each end at the bottom edge of the rail. I then bent a 1/8"-thick strip of wood across these three points, and marked the curve with a pencil. The curves in the end panels had been marked from the template, and all of these cuts were made with my jigsaw.

The next task was to join the two stiles and top rail that make up the face frame of the carcase. I cut tenons on the end of the rail with a stack dado set in the table saw, and made the mortises at the top of the two stiles with a hollow chisel mortiser. I glued the rail between the stiles, and set this subassembly aside while I worked on the back panel.

Panelled Back

Backs in original Craftsman pieces varied depending on when they were made, and could be V-grooved or shiplapped planks, or frame-and-panel assemblies. I chose to make a back panel, as this would help keep the cabinet from racking.

The stiles and rails for the back are all 3/4"-thick material, with a 1/4"-wide by 3/8"-deep groove centered in one edge. Mortise-and-tenon joints hold the panel together, and the 1/4"-thick shiplapped panels float in the grooves in the stiles and rails. You also could use 1/4"-thick plywood for the back panels, or make the entire back from one piece of 3/4"- thick plywood.

To assemble the back, I first glued one end of each of the three rails into one of the stiles. After letting the glue dry overnight, I slipped the shiplapped panels into place, then applied glue to the tenons on the rails, and clamped on the remaining stile.

With the rails already glued to one stile, the shiplapped boards for the back panel are slipped into the groove in the rail. When they were all in place, I glued on the remaining stile.

Assembling the Case

With one of the end panels flat on the end of my assembly table, I inserted the tenons for the bottom rails part way in their mortises, and then applied glue to the tenons. This keeps the glue from squeezing out on the outside of the joint. I tapped the rails home with a dead-blow mallet, and then eased the bottom in to its dado, as shown at right. With these parts together, I put glue on the tenons of the rails, and edge of the bottom before clamping down the remaining side panel.

To control glue squeeze-out on the exposed tenons, I get the tenon started in the mortise, then apply glue directly to the tenon.

I then laid the cabinet on its back, and glued and clamped the face frame in place. After letting the glue dry for an hour, I glued the trim piece on the front edge of the bottom. The seam between the face frame and the end panel is covered by a 1/4"-thick strip that runs from the top edge of the bottom to the bottom of the top face-frame rail.

These small additional pieces add interest to the design by creating steps in an otherwise flat surface. They also hide the joints and display quartersawn figure on the front of the cabinet.

I made a template out of 1/2"-thick baltic birch plywood that located the holes for the pegs that support the two adjustable shelves. After drilling the holes, the carcase was complete, except for the two blocks that cap the trim on the top front of the cabinet. I laid out the blocks on each end of a piece of wood about a foot long to give me room to hold them while cutting them on the band saw (shown bottom right).

This extra material also provided a way to hold the blocks in my bench vise while cleaning them up with a rasp. After all the surfaces were smooth, I glued them in place.

SUPPLIES

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

1 • 1 3/8" mortise cabinet lock
#00N25.35, $10.80

1 • 1/2" extruded brass escutcheon
#00A03.01, $2.30

Rockler
800-279-4441 or rockler.com

2 • Antique brass ball tip hinges
3" long x 2" wide
#56962, $27.99 pair

8 • Desktop fasteners
#21650, $4.49/package of 10

Craftsman Plans
craftsmanplans.com

1 • Large format shop drawings, includes full size details and cut list, #GST700, $16.95

Prices as of publication date.

With the two bottom rails in place, I spread glue on the top edges of the rails and in the dado before tipping the bottom in to place.

After spreading glue on the end of the bottom, and the cheeks of the tenons, the remaining cabinet side is carefully put in place.

Because of the mechanical fit of the rails and bottom, it only take a couple clamps to secure the bottom of the case assembly.

The trapezoid shaped block is laid out on each end of a long piece of wood to make cutting and handling easier.

All of the cuts to form the capital block were made on the band saw, as shown here. The final cut will be made after the block is smooth.

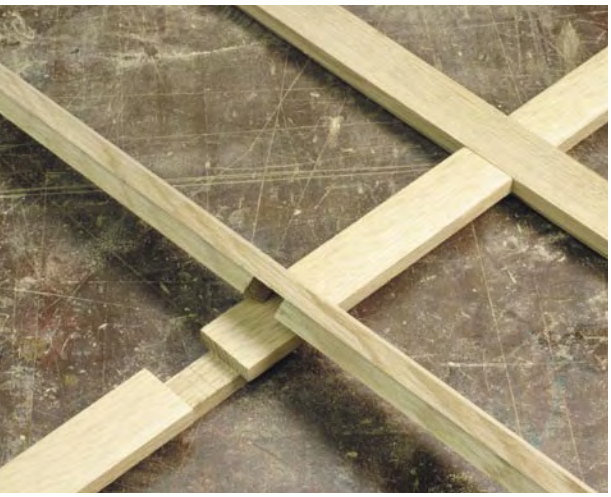
Door

With the back panel completed, and the case parts assembled, It was time to work on the door. The glass sits in a 1/4"-wide by 3/8"-deep rabbet and is held in place with 1/4"-square strips of wood.This glass stop is nailed in place after the cabinet is finished. The outer stiles and rails are held together with mortise-and-tenon joints. The intermediate stiles and rail also have tenons on their ends. The door tenons all have a step in them to accommodate the rabbet for the door's glass. The 1/4"-wide mortises are in line with the inside of the rabbet.

At the upper portion of the bookcase door, the intermediate rail joins the two narrow stiles with a half-lap joint as shown on page 72. I made the joints for the outer stiles and rails, and then clamped the door together to lay out the joints for the intermediate stiles and rails. I cut these joints, as well as the all tenons for all the door parts, with a stack dado set in the table saw.

I assembled the door in stages, to avoid putting together a lot of parts at once. I assembled the half-lap joints first. The top and bottom rails were then put on the ends of the smaller stiles and clamped. While this assembly was drying, I cut the mortise for the lock, and

Leaving the block attached gives me plenty of material to clamp in the vise while I smooth out the saw marks with a rasp, followed by a file, and then #150-grit sandpaper.



Half-lap joints hold the intermediate stiles and rails of the doors together.

The half-lap joints, as well as all of the tenons for the door were cut with the dado head on the table saw as you can see here. The block clamped to the saw's fence locates the cuts without trapping the parts between the dado cutter and the fence.

carved the recess to inlay the brass escutcheon for the keyhole.

I secured one of the long stiles in my bench vise (as shown below), and put glue in the mortises before placing the tenons of the rail assembly. Next I put some glue on the top edges of the tenons on the rails. Then I tapped the second rail in place before I began clamping.

Fumed Finish

Fuming white oak with ammonia is an exercise in faith; the color doesn't look right until the piece is finished with shellac and dark wax. There is also a distinct risk that some parts won't come out the same color as others, or, perhaps worse, that there will be some sapwood present that won't take on any color at all.

I assemble the door in stages. Here I'm placing a subassembly of the intermediate stiles and rail to one of the door stiles. The remaining stile will be placed on top and clamped.

Twenty-six percent ammonia is used in blue print machines, and is a much stronger solution than household ammonia, which is about five percent. Such a strong chemical requires great care in handling, as the fumes can quickly damage eyes, skin and lungs. Make sure to where gloves, goggles and a respirator when handling it. I also took steps to minimize the time that the ammonia was exposed to the environment in our shop.

Before fuming the entire piece, I did some tests on scraps. As I worked on this project, I saved the cutoff pieces from the end panels and top. I put these, along with other scraps in a plastic container with an airtight lid. I put some ammonia in a small plastic bowl in the larger container, sealed the lid, and let this sit for 24 hours. Satisfied that the final result would be close to matching, I built a frame from inexpensive 1 by 3 pine and covered it with 4-mil-thick plastic sheet, as shown at right.

I tucked the plastic under the wood frame at the floor, and secured it to the frame with spring clamps to get an airtight seal. I left one end open so that I could place the assembled cabinet and all of the parts inside. Once everything to be fumed was inside, I clamped most of the opening closed, leaving just enough room at the bottom to reach in and pour the ammonia in to a plastic container. After this, I sealed the rest of the end and waited a day.

When it came time to remove the cabinet from the tent, I put on my goggles, gloves and respirator, opened the bottom of the end, and put a lid on the plastic container inside. I then put a fan in the opening, and exhausted the fumes outside. After letting the fan run for an hour, I opened the tent completely.

Most of the pieces came out close in color, but there were a few parts that were a bit lighter, and a couple edges that didn't take at all. Overall though, I was happy with the results, and prepared to deal with the inconsistencies.

The first step after fuming was to smooth all of the surfaces with a nylon abrasive (Scotchbrite) pad, and give everything two coats of garnet shellac, in a two-pound cut. I then mixed some aniline dye (Liberon Fumed Oak light) with some alcohol. With a 1"-wide sash brush, I applied the dye to the lighter areas, brushing on slight amounts until the color was close. I followed this with two more coats of shellac.

The shellac changes the dirty-looking brownish gray of the fumed oak to warm brown. The photos at right show the progression of the color from raw wood, fuming and shellac. The color from the shellac, however, is just a bit too orange, and needs to be waxed to achieve the desired rich brown I was looking for. I smoothed all the surfaces with #320 -grit sandpaper, followed by a Scotchbrite pad.

The final step in finishing was to apply dark paste wax, which fills the open pores of the oak, and tones down the color from the garnet shellac, leaving the piece a rich warm brown.

With the finish complete, I installed the glass in the door,

holding it in place with 1/4" x 1/4" glass stop. I mitered the corners, and attached the stop to the inside of the openings with 23 gauge pins.

All that remained was to install the lock and escutcheon in the door, hang the door and attach the top with figure-8 fasteners. I placed three fasteners in the front and back rails, and one in the center of each of the end panels.

Harvey Ellis's association with Gustav Stickley lasted only a few months before Ellis died in January 1904. Ellis's influence on Arts and Crafts design however was tremendous. The details he produced for Stickley have served as hallmarks of the period.

Ellis related the arrangement of spaces in good design to the notes in a musical chord. This bookcase combines the practical and architectural elements that he is known for in perfect harmony, and serves as a fitting tribute to his genius. **PW**

After sanding all of the parts, I placed them in an airtight fuming tent, located by the back door of the shop.

After "fuming" for 24 hours the tent was aired out and the plastic removed. Here you can see the construction of the tent frame, and the change in color.

The quartersawn white oak in its natural color.

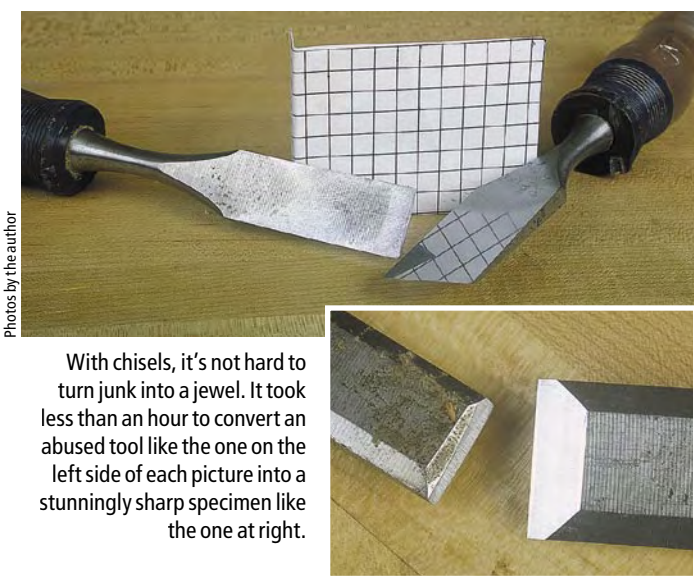
After exposure to ammonia fumes for 24 hours, the oak has turned a grayish brown color.

Garnet shellac adds some color, and highlights the distinctive grain. Dark wax will complete the finish.

Resurrecting Chisels

Old chisels can be brought back to life using these simple steps.

If ever there was a type of used hand tool that was a good candidate for restoration, it's a chisel. Lots of good deals on old chisels can be found at flea markets, garage sales and auctions. And while many old tools – such as kinked hand saws or badly warped planes – may be hopelessly damaged, it's usually not hard to bring a chisel back to a working life.



Photos by the author

With chisels, it's not hard to turn junk into a jewel. It took less than an hour to convert an abused tool like the one on the left side of each picture into a stunningly sharp specimen like the one at right.

The process of restoring a chisel back into working order involves four basic steps:

1) Flattening and polishing the back
2) Grinding the edge square to the sides
3) Grinding the bevel
4) Honing the bevel

These steps ensure that the cutting edge will consist of two polished intersecting surfaces, which is the essence of any sharp, durable edge. And a flat back is important because it serves as a directional reference in many paring and chopping operations.

In this article, I will take you through these processes step by step, including the nuances that can make all the difference in getting a frighteningly keen edge. Although the following approach – arrived at after years of teaching sharpening and testing products – is certainly not the only way to sharpen, I think you'll find that it yields great results. For most chisels, it's the blade that needs work, not the handle. Most wooden handles can be sanded and refinished. If you need to replace yours, I recommend you read "Making Your Own Chisel Handles" from the February 2002 issue of this magazine.

by Paul Anthony

Paul Anthony is a woodworking author and teacher living in Riegelsville, Pennsylvania.

Photo by Al Parrish

Working with Waterstones

Thirty years ago, I was sharpening with oilstones, like everyone else I knew. But after Japanese waterstones hit the market, a friend brought his over for me to try, and I was sold in about three minutes. Unlike oilstones, waterstones cut quickly because the surface particles on these soft-bond stones break free in use, exposing new, sharp particles for continued aggressive cutting. However, the cost of this is that the stones must be dressed, or flattened, frequently during use because dips or humps in the surface would compromise the flatness or straightness of the tool being sharpened. You can easily dress a stone by rubbing it on #220-grit silicon carbide paper glued to a sheet of plate glass with spray adhesive. A more convenient, but expensive, alternative is to use a coarse diamond plate like I do.

Waterstones are available in a variety of grits: typically #220, #800, #1,000, #1,200, #4,000, #6,000 and #8,000. Grits #4,000 and up are considered finish stones, which impart the final polish to the metal. Expect to pay about $20 per stone except for #6,000- and #8,000-grit stones, which can cost twice as much. For restoring a blade, I use grits #220, #800, #1,200 and #8,000.

Dress a waterstone flat by rubbing it on a diamond plate or sheet of #220-grit silicon carbide paper on glass until the entire face of the stone is clean. The small dark area of metal particles near the end of this stone shows that it needs just a bit more dressing.

If you're on a budget, I recommend as a starter set a Norton #220-grit stone (discussed in a moment), an #800-grit stone and a #4,000-grit stone. The last stone will give you a perfectly serviceable edge, although not what you could expect from an #8,000-grit stone. Combination stones are also available at a discount, with one grit per side.

With the exception of the finish stones, all waterstones should be submerged in water for 10 minutes prior to use. I leave mine in a constant bath except in a freezing shop. To secure a stone during use, I place it on a thin, rubber, non-skid mat, which works better than any other stone holder I've tried in my career.

Tending to the Back

The first step – flattening the back – often requires removing a fair amount of metal. Performed by rubbing the chisel against a stone, this step is also necessary on new chisels to remove the manufacturer's grinding marks. For this, you really need an aggressive cutting method that doesn't distort the flatness of the back. After trying everything from coarse silicon carbide paper and diamond stones to ceramic stones and silicon carbide waterstones, by far the best product I've discovered for the job is the #220-grit waterstone made by Norton. This $25 soft-bond stone wears down faster than any other stone I've used and requires frequent dressing, but the labor saved is well worth the cost of buying a new stone occasionally.

So begin flattening the back on the #220-grit stone. Apply strong pressure with your fingers spread out across the endmost 1½" or so of the chisel. Be careful not to lift up or you'll round over the area near the cutting edge. To help prevent lifting, keep your hands away from the handle. It also helps your leverage if your work surface is just about wrist height.

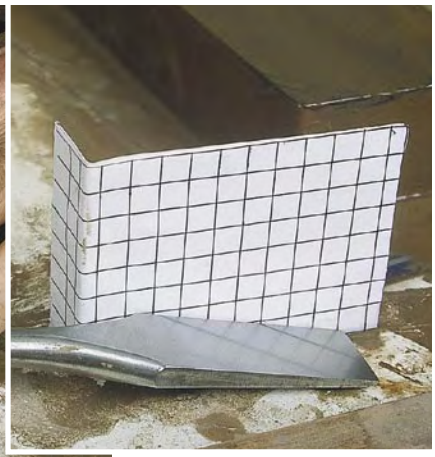
It's very important to rub the tool over the entire surface, turning the stone end-for-end occasionally in order to work both edges.The purpose is to avoid creating a hollow in the stone that will distort the back of the chisel. As a slurry of dislodged stone particles develops, check the chisel for a consistent scratch pattern that will indicate you're done with this grit. For the most aggressive cutting, wash the slurry from the stone, making sure to re-dress the surface if necessary to flatten it.

Once you've created a consistent scratch pattern across the endmost 1½" or so of the chisel, continue to rub it for a bit on the slurry, which serves as an intermediate grit between the #220-stone and the next finer grit you'll use. Wipe the metal clean and dry, then scrutinize it under strong light and magnification to make sure the surface is worked evenly, with no neglected areas or deep individual scratches. Don't worry if the back is rounded along the cutting edge from previous abuse; you can grind that away later.

A SHARPENER'S BEST TEACHERS

Sharpening is a tiny art. It's impossible for the naked eye to detect progress on the scale that really matters. For that you'll need two very important helpers: light and magnification. To best learn sharpening, inspect your work closely after every step, viewing it under a strong light with an 8x or 10x magnifying loupe. (A $6 slide viewing loupe from the photo store works fine.) You'll be amazed what your naked eye doesn't see. And if a cutting edge looks good under strong magnification, you can bet it will cut well. *– PA*

When flattening the back, orient a chisel diagonally to the stone, then aggressively rub the full length of the stone, moving slightly to the left or right after every few strokes to avoid creating a furrow in the chisel, especially from the edge of a coarse #220-grit stone like this.



Rub the back aggressively on the #1,200-grit stone, letting the gray slurry of metal and stone particles build up. The slurry serves as a finer grit that will begin to polish the back, as seen in the inset.

Next, with a freshly dressed #800-grit waterstone, maneuver the chisel aggressively in the same fashion, again working the entire surface of the stone. After a slurry builds up, wipe the chisel dry and then check for a consistent scratch pattern under bright light and magnification. You may be able to correct a neglected area with further work on the #800-grit waterstone, but it may be more efficient to reprise your work on the #220-grit waterstone. To make any waterstone cut more aggressively, wash off the slurry or spritz some more water on it. Make sure to re-dress the stone whenever necessary to flatten it.

When you're done on the #800-grit stone, repeat the processes on a freshly dressed #1,200-grit stone. With this stone, you really want to finish up by working the metal aggressively into the finer-grit slurry because next you jump up to a considerably finer grit on your finish stone. When you're done with the #1,200-grit stone, the back should show the beginnings of a polish. Now you're ready for the final polishing on the finish stone.

Spritz your freshly dressed finish stone with water and press hard as you rub the back, keeping it flat on the stone. A gray/black slurry of stone and metal particles will begin to build up immediately on the stone as the chisel back starts to show a polish. When friction starts to prevent rubbing, spritz the stone with water. If you need to clean and dress the stone for more aggressive cutting, spray it clean rather than dipping it into your stone bath, where it can become contaminated with coarse particles from the other stones.

The stone really starts blackening up quickly as the metal starts to shine. The back should now have a very fine scratch pattern with a near-mirror polish. Stop when it won't polish up any more. You should never have to go through this entire process again because you should only ever touch the back to your finish stone during future resharpenings.

After aggressive rubbing on the #8,000-grit stone, the chisel back should be flat and have a near-mirror polish. The angle of reflection shown here shows virtually no scratches, but you would see a very light scratch pattern if you were looking straight at it.

Get Straight and Square

The next step is to grind the edge straight and square to the chisel sides, while removing any nicks or a badly rounded section at the cutting edge. As for grinding equipment, you can use a typical high-speed (3,450 rpm) grinder with a gray wheel, although you risk burning the steel unless you use a well-dressed wheel and a very light touch. A much safer bet is to use a "half-speed" (1,700-1,800 rpm) grinder with an #80- or #100-grit aluminum oxide wheel. Like waterstones, the particles on these soft-bond wheels break away in use, exposing fresh, sharp particles for quicker, cooler cutting. Before grinding, dress your wheel if necessary to clean and true it to remove any gullies or lodged metal particles. You'll also need a solid, adjustable grinder rest, which you can buy as an aftermarket accessory because most stock grinder rests are nearly useless for accurate sharpening.

Set the grinder rest at about

A diamond-faced dresser, such as the one shown here, cleans and trues the face of wheel for quick, accurate grinding.

Grind the edge straight and square to the chisel sides using light pressure and moving side to side as you cut. Check your progress occasionally with a small machinist's square.

When grinding the bevel, pinch the chisel firmly, using the second section of your index finger as a fence against the rest. A finger placed lightly on the back of the blade helps direct the grinding pressure against the wheel.

90° to the face of the wheel, then very slowly press the blade against the wheel, moving it side to side as you grind. Check your progress occasionally with a machinist's square. Don't apply so much pressure that you risk burning the steel. As long as the wheel is throwing sparks, it's cutting. If the metal turns blue, it won't hold an edge in that spot because you've ruined its temper.

Grinding the Bevel

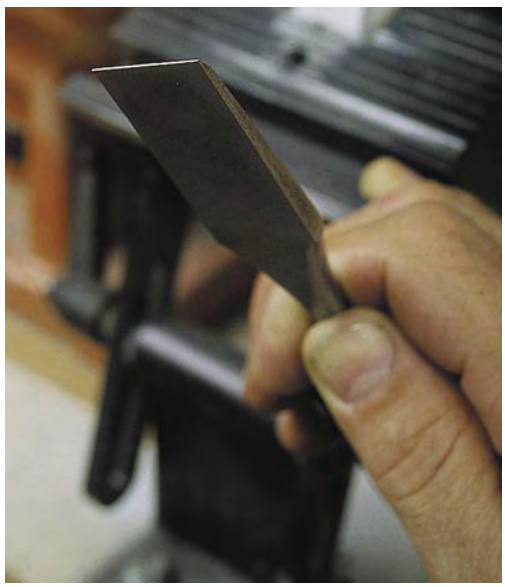
To grind the bevel, many sharpeners adjust the rest to the appropriate angle, then lay the chisel on it for grinding. I don't like this approach because the friction of so much metal on metal prevents the easy side-to-side grinding motion that is so critical to creating a consistent, evenly ground bevel.

Instead, I lay the tang of the chisel against the front edge of the rest, guessing as best I can where the bevel should contact the wheel to grind an angle of about 25°. I then pinch the tang between my thumb and index finger, with the second section of the finger against the edge of the rest to serve as a fence. This reduces metal-to-metal friction to a single point on the edge of the rest and allows very easy side-to-side movement.

Maintaining that grip, I turn on the grinder and lay the bevel against the wheel, sliding the chisel side to side without leaning it left or right. When I have created a facet about 1/8" wide, I check the bevel angle using a brass angle checker disk sold for the purpose. If I need to readjust the bevel angle, I slide my grip up or down the tang as necessary to change the lean of the chisel against the wheel. Then I take a few more swipes across the wheel before checking the angle again.

If it becomes hard to identify the most recent facet on a bevel full of facets, wipe the bevel with a wide felt marker, then try again. Once you have established an angle of approximately 25°, lock your grip and don't move it until you're finished grinding the bevel.

A finger placed lightly on the back of the chisel helps control downward pressure and serves as a good heat sensor. When the metal gets uncomfortably warm, let it cool to avoid destroying its temper. I avoid quenching it in water when the blunted edge is less than about 1/64" wide because quench-



Proper grinding technique results in the blunted end of the blade gradually and consistently narrowing in width until it's gone. Remember to maintain the same grip throughout the process.

TO JIG OR NOT TO JIG

Honing jigs will hold a chisel at a steady angle when honing the bevel. Although there is no dispute that these jigs work, there is some disagreement about the wisdom of depending on them. Those in favor argue correctly that a jig will prevent you from rounding over a bevel if you have trouble maintaining the honing angle freehand. On the other hand, there is no denying that the honing process goes quicker if you don't have to mount and adjust your tool in the jig before honing. Of course, in the latter case, you do have to invest the time into learning to hone freehand, which I recommend and describe here. But if you prefer to use a honing jig, that's perfectly fine. I don't argue religion, politics or sharpening. *– PA*

ing can cause minute cracks in a thin cutting edge.

As you grind (which may take 15-20 minutes when removing a lot of metal), the most important area to monitor is the very end of the chisel. Make sure the blunt area narrows consistently in order to ensure an evenly ground bevel. This may take some practice, but it's well worth the effort because a neatly ground bevel makes the subsequent honing a lot easier. Keep grinding until the once blunt area is just a hair's width.

Honing the Bevel

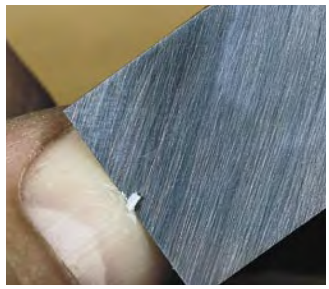
Begin honing the bevel using a freshly dressed #1,200-grit stone. Place the bevel down on the farthest end of the stone because you'll first pull it toward you. With the sides of the chisel pinched between the fingers of your dominant hand, and the chisel oriented at about 45° to the length of the stone, apply strong downward force behind the bevel with the index finger of your opposite hand. Make sure the toe and the heel of the bevel make firm contact against the stone. The other fingers of your dominant hand should curl under the blade and tang to simply hold the chisel at the proper angle, applying only enough lift to keep it from falling. The farther forward you keep your hands and the more downward pressure you apply at the bevel, the more you'll prevent the tool from rocking and rounding over the bevel in the process.

Now, with your wrists locked, pull the chisel toward you, maintaining firm pressure over the bevel. Afterward, hop the chisel back to the far end of the stone, and repeat once or twice. These initial pull strokes smooth out the grinding scratches at the very edge, making your upcoming pushes of the chisel much easier and reducing the chance of friction-induced rocking during pushing. After these first few strokes, you should now be able to hone easily with back-and-forth stokes the full length of the stone for efficiency. Remember to keep the cutting edge of the chisel oriented diagonally to the stone to help prevent rocking.

As soon as the newly honed facet runs all the way across the cutting edge, you're done with the #1,200-grit stone. At this point, take some time to check your progress under magnification. Then spritz water on a freshly dressed finish stone, and work the bevel on it in a similar manner until the facet is evenly polished.

The final quick task is to remove any fine wire edge created in the sharpening process. To do this, lay the chisel on its back at the far end of the stone, then pull it toward you applying a lot of downward pressure at the bevel. This initial pull stroke, instead of a push stroke, prevents trapping a wire edge under the chisel. Work the chisel back and forth three or four times, then flip it onto the bevel again for a few strokes. Finish with a few final strokes on the back and you're done.

If you've done your job well, at this point you should be able to shave your arm hair or pare just a whisper of a shaving from your thumbnail, as shown at right. You can also welcome a new member to your family of tools. **PW**



If a blade is truly sharp, it will take a light shaving from your thumbnail. This magnified shot, which shows the #8,000-grit scratch pattern, is the same polish seen on the restored chisel in the photos on page 74, but viewed from straight on.

HONING FREEHAND

Front view: The secret to successful freehand honing is to concentrate all of your attention at the business end of the chisel, applying strong downward pressure above the bevel with your left hand. Use your right hand to power the chisel, pinching its sides between your index finger and thumb, as shown here.

Side view: Curl the remaining fingers under the blade, applying just enough lift to keep the handle from falling (Lefties, simply reverse all these directions.)

"Real" PLANERS

Brawn, capacity and endurance make all the difference.

Is gaining 2" of planing width capacity worth an extra $300 to $1,000? Nope. So if that's the reason why you're considering buying a 15" planer, borrow a friend's instead.

The real reason to buy a 15" planer is the motor. Well, yes the extra capacity is nice, and the weight and sturdiness of the planer is a plus. But it's the 3-hp, 220-volt induction motor that makes these machines something to lust after.

While testing benchtop planers in an earlier issue we quickly noticed the significant strain put on the 110-volt universal motors by running a wide board. The 13" capacity on those planers is coming close to asking too much of the high-speed, short-duration design of universal motors. So while I won't say never, I will say it's unlikely you'll ever see a 15" planer powered by a universal motor.

On 15" planers, the motor can run for hours (under load running anything from pine to figured maple) with nearly insignificant drops in speed. These planers are designed for the woodworker who has occasion to run 300 board feet (or more) of hard wood a few times a month.

by David Thiel

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

What's the Difference?

Beyond the motor and capacity, the features found in both large and small planers differ mostly in material and size.

The weight of the 15" cast-iron machines is significantly greater than benchtop planers.This weight is an advantage for stability when running larger boards. If you put a 6/4, 10" board that's 6' long in a benchtop planer, you're going to flip it off the bench. The cast-iron planer will not only support the board as it passes through, but its mass and solid construction will hold the board tightly in place throughout the cut, reducing the chance of snipe.

Meet Our Contestants

We tested eight planers with the intention of keeping the price of the machines below $1,500. We broke our own rule with the Powermatic. This was mostly so we could take a look at the unusual spiral knives on this model. Other than that, all the planers are less than $1,100 and some are significantly less than that.

All the machines have 3-hp, 220-volt, single-phase motors. Each planer has steel bed rollers and serrated steel feed rollers. All offer two feed speeds to offer a slower "finished" pass and all have dual column locks to hold the head (or table) solidly in place to avoid snipe.

Three of the machines have the motors mounted below the table, and the table moves up and down to adjust the cutting height. The other five machines have the motors mounted above the table, and the cutterhead assembly and motor raise and lower to adjust the cutting height.

We found that the planers with moving tables rather than motors made for slightly smoother height adjustment, though all the machines were pretty smooth.

With the motor mounted above the cutterheads, we found it more difficult to access the knives to change blades. While this isn't a daily concern, changing knives isn't all that much fun anyway, so why make it harder?

On changing knives, all but the Powermatic employ jack screws to adjust the three high-speed steel knives for height after replacement. This requires a jig and extra time, and (except for the slight advantage of those with the motor mounted below) all suffer from this necessary evil.

The Powermatic planer has three flexible steel knives that lock into position without requiring setting for height. But more on these knives later.

Back to the weight thing: Cast-iron planers are best located in position and left alone. But in the realities of today's space-challenged woodworking shop, planers do get moved around. Three of the machines have integral mobile bases (coincidentally the three with the motors mounted below). This is a pretty nice perk, even if you're just moving your planer to clean around it.

Other similarities among the competitors include four machines with remarkably similar three-roller infeed and outfeed tables. Three other machines had solid cast-iron tables. All seven used threaded hex-head screws to adjust the table height, in conjunction with the bolts to attach the tables. The adjustment required a fine balance between the screws and bolts, and it made me feel like a cat burglar picking a lock. You needed to use two tools simultaneously. This was awkward and a little frustrating. Though the Delta tables also used bolts and screws, it was much easier to adjust.

Some other features of note were the lifting bars included on the Bridgewood, Powermatic, Yorkcraft and Jet machines. When it was time to lift the machines onto the bases, four guys on the lift bars was much easier than lifting with lumber run under the head (the other recommended lifting procedure in the manuals).

Also, two of the machines (the General and the Yorkcraft) offer a safety cut-off switch that requires you to twist the off button before the machine can be started. If you're not used to this type of switch it may seem awkward at first, but there won't be any accidental starts.

All of the machines came equipped with dust collecting ports. Some were plastic, some were metal. All appeared interchangeable (side deflection, 4" port) except for the Delta. It sported a 6" port and ejected the chips straight out.

The Test

We tested each of the machines for noise levels (dB), rpm and amperage draw. These three tests were made with the machines running idle and while taking 1/16" passes on 5"-wide ash boards.

We also checked the cutting heads for parallelism to the tables (all were within acceptable tolerances for woodworking), checked for snipe (after running the machine at the higher speed without the head locks engaged).

We then made a final pass with each planer set at the slower, finished feed rate with the head locks engaged. Afterward we had the staff evaluate the boards (the boards were only identified by letter to avoid favoritism) for the best finish, asking them to take snipe, knife marks and tear-out into consideration.

The Winners:

This was a tough one. Many of the planers are very similar and all performed well enough to be happy additions to your woodshop. We had to scrutinize features and performance, and even then the decisions were very close.

The Powermatic planer has the standard scale found (nearly identically) on all the planers on the post. But it also has a digital scale. This scale can be set to absolute zero and gives the accurate distance from the cutter head to the table. It also gives relative distance, such as when removing 1/16" from a board.

In the end we're awarding our Editor's Choice award to the Powermatic, though it was a difficult decision. The Powermatic has the best performance in most of the categories plus great features, foremost being not having to set the blade height after replacement. But its quality of cut didn't live up to our expectations for the spiral cutter (though it was a good finish) and it's expensive at $1,599.

Our Best Value award goes to the Yorkcraft, which has the undermount motor, faster slow-speed feed and a good quality of cut. The scale could be better and the value price of $799 may increase a little when you include shipping, so check first. **PW**

SPIRAL-HEAD KNIVES

The Powermatic's spiral head is designed to cut wood in a shearing motion rather than chopping, making the motor work less hard, and reducing noise and tear-out. Shown at left below is the flexible steel blade removed from the cutterhead. The actual cutting edge is the slim 1/4" edge at the left of the blade. The fins (to the right) are for aligning the blade in the cutterhead. The tabs on the fins fit into the center channel shown in the head. The gib plate is then placed over the blade and screwed in place. There are four plates for each blade and the only alignment necessary is orienting the holes in the gib, blade and head using a tool similar to a nail set. The blade is twisted into position against the head as the gib plates are secured. At right, the blade is shown in place and ready to use. The blades are not able to be resharpened and cost about $130 for a new set.

BRIDGEWOOD

BW-15P

One of the three motor-mounted-below machines, the Bridgewood gains points for ease of access to the blades and the rolling bars that let you pass lumber across the top of the machine. One difference from the other moving-table machines was a smaller hand wheel (6" vs. 7 3/4"). During testing the Bridgewood showed perfect head parallelism to the table and registered negligible snipe. While not the quietest of machines overall, the Bridgewood planer registered the least amount of increase in noise level during a cut, which is significant in a planer. The tables moved very smoothly, and the integrated mobile base was a pleasant accessory. It's performance during cut evaluation was good. In the end the Bridgewood planer proved to be a good machine with a good cut, priced toward the upper end of the scale.

Wilke Machinery:
800-235-2100 or wilkemach.com

DELTA

22-780X

One of the two unconventional machines in the test, the Delta offers an open stand that felt more like an enclosed model, but actually did something with the space underneath. The oversized, four roller tables collapse flat to the sides adding some very useful space to your shop. The tables were also a lot easier to adjust than on all the other models. Add a mobile base (not included) and you've got a very space-friendly machine. The Delta also stood out as one of two machines to offer a 30 feet-per-minute feed rate, compared to the standard 20 feet-per-minute (high speed). This means less time standing at your planer and more time building your project because of this increased feet rate. The cut performance was quite good and the head parallelism was nearly perfect. Another difference is the 6" dust port located center-line on the machine. We noticed some increased noise because of the larger port, but if you have a large enough collector to handle the capacity (and use a 6" hose), it should prove more efficient. The Delta is priced at the higher end of the scale ($1,100), but with all the above-mentioned features, as well as a five-year warranty, at least you feel like you're getting something for the extra cash. Too bad the motor's not mounted below the table.

Delta:
800-438-2486 or deltawoodworking.com

GENERAL

30-115 M1

Overall the General performed average. It offers the standard features, but doesn't go beyond in any significant way. Even the price is middle of the pack. We did record better-than-average performances during the noise-level testing (second best variance under load) and a low variance in amperage draw (again second best) indicating an efficient motor on the machine. A safety switch is included to eliminate accidental starts, which is nice. On the other side of the coin, we also registered worse snipe from this machine during testing. Plus we encountered a quality assurance problem with the hand wheel. Whether the wrong wheel was shipped, or it was machined poorly, the hole was oversized making it inoperable. The company responded to our concerns by sending us a replacement handle in a prompt manner. In summary, it's a fine machine but doesn't stand out in any significant ways to recommend it beyond the machines we selected as Editor's Choices.

General:
514-326-1161 or general.ca

GRIZZLY

G0551

The results on the Grizzly offered a "best of times, worst of times" scenario. We got good results on the finished cut test, showing few knife marks and little snipe, but the board didn't feel as smooth as it should have. It's a well-priced machine ($745), but after that our results fell short. We found the Grizzly to have a less-efficient motor. It's an enclosed-base machine, but the motor is mounted above making knife access less convenient. We also had the highest jump in noise level (15dB) when running our test board, to the point where I actually stopped the motor to make sure the head was spinning the correct direction. In the end it's not a bad machine and the price is good. But if you're looking for a bargain machine, we'd suggest you take a close look at the Yorkcraft.

Grizzly:
800-523-4777 or grizzly.com

JET

JWP-16OS

One of only two true open-frame machines in the test, we were actually very impressed with the ease of assembly of the base, and the quality and stability of the base when completed – nicely done. Another interesting statistic on the Jet is that while we're reviewing 15" planers, this model is classified as a 16" planer. Yes, the head and table will take a 16" width. And there's nothing wrong with that. The Jet is also one of three planers that registered negligible snipe during testing. The motor proved to be slightly less than we hoped, with the second highest drop in speed under load, though the amperage draw was acceptable. We also recorded more head parallelism variation (from side to side) on the Jet than on the other planers in the test, but still consider it to be within tolerances for woodworking. Overall it's a good machine, but for $200 less we felt better was available.

Jet:
800-274-6848 or jettools.com

POWERMATIC

1791210

The Powermatic has a couple of very strong features, which is why we recommend this machine. The spiral-blade design sets up and indexes the blades accurately without frustrating and time-consuming jigs. The undermounted motor makes accessing the spiral knives convenient. As a likely side effect of the spiral knives, the Powermatic is also quiet, and we found the least loss of rpm during cutting and very low amperage drop. We also liked and appreciated the addition of the digital-height readout and the mobile base. We were anticipating a better quality of cut than achieved. There was obvious sniping, even on the slow, locked-head pass, and the cut quality was generally average. While the convenience of not having to set the knives is important we also should note that the blades can't be sharpened and a set of replacement blades runs about $130. But, everything taken together, the benefits of the spiral blades and the added features make this an expensive, but quality machine – and our Editor's Choice.

Powermatic:
800-274-6848 or powermatic.com

WOODTEK

124-070

This is the least expensive planer in the test (at $599) and overall it performed pretty well. The Woodtek is very similar to a few of the other tested models, and while the open frame base is the most basic in the test, that certainly wasn't a problem. We saw good motor performance with actually the least amperage drop of any of the machines tested and the second best rpm variance. Noise and snipe tests proved average, though the head was slightly more than average out of parallel to the table. Although not shown, outfeed rollers are included. We did notice some oil dripping and flinging from the cutterhead when first running the machine, but after cleaning up the initial spatters we didn't see any further evidence of this situation. It also emitted a curious smell normally not found in a woodshop, but it certainly wasn't affecting the performance. The quality of cut overall was rated mixed by the staff, though sniping was well within the acceptable level. All in all, a good machine for the bargain hunter – and they even included lift handles to move the planer onto the stand once assembled.

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

YORKCRAFT

YC-15P

The Yorkcraft planer is another mixed bag in the test. The good side includes the undermount motor design, offering easy blade access, a decent integral mobile base, very good head parallelism and negligible snipe. The Yorkcraft also offers a 30 feet-per-minute feed rate, rather than 20. This means faster rough planing, reducing time spent prepping the wood. The cut quality was rated good by the staff and the price is a reasonable $799. The motor performance was about average with OK amperage climb and rpm drop. The noise variance was tied for second lowest in the test, though the starting level was on the loud side. The height scale on the Yorkcraft is the only one not inset and affixed to the front right post. Though the readability and accuracy of the scale are good, it's hanging out there in the middle of space which makes it rather vulnerable to bending and knocks. The locked-off safety switch makes inadvertent starts impossible and we like the larger side-mounted hand wheel ($7\frac{3}{4}$"). We noticed more vibration from the machine during operation, but that may be due to improperly aligned pulleys. In the end, the features, price and quality of cut make this our Best Value of the test.

Wilke Machinery:
800-235-2100 or wilkemach.com

All of the two-speed levers operate the same. Push in for fast planing, pull out for a slower, but cleaner final pass. The Delta (shown) and Yorkcraft offer a 30 feet-per-minute standard pass, while all the other machines offer 20 fpm.

The Delta planer has infeed and outfeed tables with four rollers and the ability to fold flat against the stand for easy storage. The tables quickly (and accurately) return to the ready position.

	Bridgewood BW-15P	Delta 22-780X	General 30-115 M1	Grizzly G0551	JET JWP-160S	Powermatic 1791210	Woodtek 124-070	Yorkcraft YC-15P
Street price	$1,049	1,099	899	745	999	1,599	599	799
HP	3	3	3	3	3	3	3	3
Motor position	Under	Over	Over	Over	Over	Under	Over	Under
Cuts/min.	13,500	15,000	15,000	15,000	13,500	13,500	15,270	13,500
Capacity (W" x H")	14 7/8 x 6	15 x 6 1/2	15 x 6	14 7/8 x 6 1/8	16 x 6	14 7/8 x 6	14 7/8 x 6 1/2	15 x 6
Max Cut (in.)*	1/8	1/8	1/8	1/8	1/8	1/8	3/32	1/8
Weight (lbs)	446	340	428	560	396	418	411	458
Feed speeds (fpm)	16 & 20	16 & 30	16 & 20	16 & 20	16 & 20	16 & 20	16 & 20	16 & 30
Warranty	1 year	5 years	2 year	1 year	1 year	2 year	1 year	1 year
Stand style	Enclosed	Open	Enclosed	Enclosed	Open	Enclosed	Open	Enclosed
dB level/no load**	86	92	85	80	86	72	80	91
dB level/load	90	104	90	95	95	86	90	96
dB level variance	4	12†	5	15	9	14	10	5
Amp draw/no load	6.4	6.8	6.1	7.0	7.4	4.4	7.8	7.4
Amp draw/load	9.2	12.9	8.5	14.5	11.4	7.6	9.5	12.6
Amp draw variance	2.8	6.1	2.4	7.5	4.0	3.2	1.7	5.2
RPM/no load	4,967	4,972	5,088	5,095	5,070	5,005	5,145	4,981
RPM/load	4,876	4,860	5,010	4,900	4,940	4,955	5,080	4,880
RPM variance	91	112	78	195	130	50	65	101
Snipe (in.)	0	<1/64	1/64	<1/128	0	<1/128	<1/64	0
Turns for 1"	11.25	6	6.5	6.5	6.25	13	6.5	17
Table adj. ease‡	5	4	5	4	4	5	4	5
Head parallelism	0	+/- .001"	+/- .004"	+/- .006"	+/- .010"	+/- .002"	+/- .007"	+/- .001"

*Max is stated on a 6"-wide board, not full width of planer. **dB recorded at head level of operator; load and no load levels include ambient noise from dust collector. †Elevated level credited to 6" port and hose (rather than 4"). ‡1 equals bad; 5 equals good.

Less than a week into building, Sailor Girl is ready for finishing. This shot was taken at the conclusion of a boat building course at The Home Shop in Charlotte, Mich.

Photo by John Wilson

Build a SAILOR GIRL On Your Own

A week in your own shop will produce a boat that's fun to sail or row.

When I was a Boy Scout 50 years ago, I remember reading an article titled "Building an Orange Crate Canoe." At the time I read it, however, oranges were no longer crated in anything suitable for canoes.

The concept, however, of making a boat from readily accessible materials stuck with me. Here is a boat, called Sailor Girl, that uses my design and construction methods. It's made from wood you can easily find at the local lumberyard.

Each May participants come to my shop to learn the boat building process for themselves. They come from a variety of backgrounds as diverse as a doctor and his 13-year-old son to a woodworker/blacksmith from a rural skills center. For each of them, making a boat fulfills a dream.

by John Wilson

John Wilson learned to sail growing up in the Finger Lakes region of New York. At the age of 9, his first boat was a used 12′ Moth that needed work. He raced a Snipe as a teenager, and taught boatbuilding at Lansing Community College for 15 years. Currently he operates The Home Shop in Charlotte, Michigan, where he teaches classes and sells Shaker box supplies.

At the class, just as in your shop, boat building begins with assembling all the side plywood and connecting pieces during an intense three-hour session. While the epoxy remains wet the boat sides will be sprung into shape. Here Lars Hamre (left) and Jim Hott (right) spread epoxy on the gunwale that goes along the top edge of the side panel. The chine log is already clamped to the edge where the panel and bottom will meet. Lars came with his father, Merlin Hamre (middle).

Epoxy and Plywood

Boats present challenges not found in cabinetry. Just about every line is a curved one. The joints need to be watertight and waterproof. And the whole project needs to be reasonably lightweight, yet be able to take the stress of use under sail.

A key ingredient in making this possible is the development of epoxy adhesives. In the early 1970s, a company in Bay City, Mich., pioneered the use of epoxy as a way to solve problems arising when wood gets wet.

The Gougeon Brothers were making large wood propellers for wind turbine electric generators. Wood was an excellent choice for lightweight and strong blades, but rot and wood swelling when wet were problems standing in the way of its use. They solved this by saturating the fibers with the strong-bonding substance epoxy. They called their product WEST, which stood for wood epoxy saturation technique.

In a 12'-long boat, the plywood must be scarf joined for length. The long beveled overlap joint uses scrap blocks on each side squeezed together with deck screws. Merlin (left) and Rick Eisenlord use waxed paper to prevent the blocks from being epoxied to the hull, as you see here.

From left to right, Hott, Merlin, Lars and Eisenlord wrestle the assembly of the sides, stem and transom into shape with a temporary spreader to hold the shape of the hull. As you can see, it takes all hands on deck to pull these parts together.

The other necessary ingredient is the familiar product plywood. Besides giving us standard wide sheets of 4' x 8' wood, plywood also solves the problem of solid wood expanding and contracting in water. It does this by cross directing wood fibers in each adjacent layer of wood. Wood fiber is dimensionally stable in length while expanding in width.

The net result is that panels cut from plywood don't change size when wet. With epoxy and plywood, a boat hull is strong and long lasting while at the same time lightweight and relatively simple to construct.

Anyone Can Build a Boat

Sailor Girl is a 12' sailing and rowing boat designed to take advantage of epoxy and plywood. The methods devised for her construction are straightforward so that basic shop tools can produce a fine boat in a reasonably short amount of time. Hardware is readily available from marine supply sources. Even the sail is designed for making at home.

The four boats proudly flying their new sails on a Sunday afternoon in May 2004 were all begun the previous Friday morning. Cutting materials for this assembly was done before the event started. Also, a minimal amount of time was spent reading the construction manual as I was directing the event. Sailor Girl is designed to be built with a minimal amount of fuss, with commonly available materials, using shop equipment you already have, in time measured in days – not months or years as you might think.

Buying Your Lumber

Let's start with sourcing materials. You'll need two sheets of 1/4"-thick 4' x 8' plywood. Properly reinforced with solid wood strips epoxied to the edges and bottom, luan plywood underlayment can be used for building a boat. It's 5.2mm thick, which is slightly thinner than the common 1/4" reference by which it's sold in this country. It's made from large, knot-free logs found in the Pacific rim countries where it's manufactured.

There is a wide range of quality in underlayment, so what do I look for? Inspect both sides for cracks, voids and overlapping edge joints of layers. Epoxy can repair most of these defects, but it is easier to start out with a clean sheet.

Secondly, I feel the weight of the sheet and select ones that are the heaviest. This will not adversely affect your boat's total weight, and the heavier sheets have more strength. A lightweight sheet of underlayment can weigh 15 pounds while a heavy one can weigh more than 20. Because I like to paint my boats for ease of maintenance, the color of the plywood does not affect my choice, but it may be important in yours.

Finally, I check for glue quality. As both interior and exterior grades are sold, you want to ask for exterior ply. At home, soak a scrap of plywood overnight in water to make sure that delamination won't happen to your boat.

Lumberyard etiquette may interfere with selecting the right stuff for your project. With hardwood suppliers, you can pick over

RESOURCES

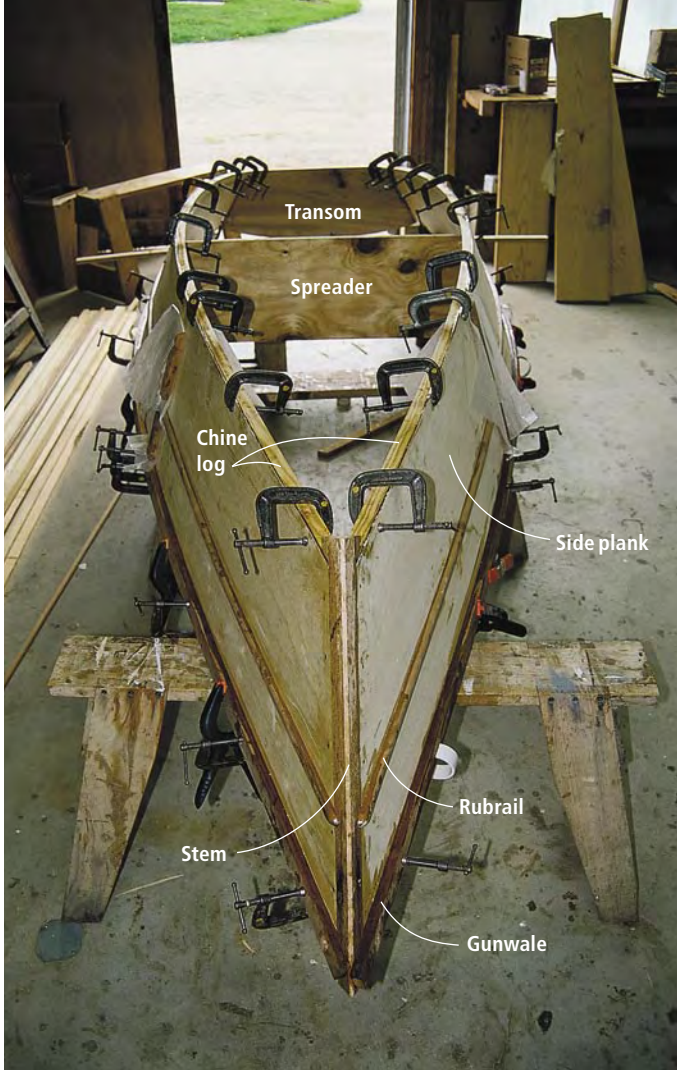
The Home Shop
406 E. Broadway
Charlotte, MI 48813
517-543-5325
(9 a.m. to 5 p.m. EST)
shakerovalbox.com

- A four-day class to build "Sailor Girl" will be held May 12-15, 2005. Fee of $950 includes all boat materials for hull, oars, mast and sail.
- A one-day class in paddle making ($90 fee) will be held March 19, 2005.
- "Building Sailor Girl with John Wilson" manual contains plans, material lists, and building methods with many photos. $30 + $3 S&H

West System Epoxy
West System Inc.
989-684-7286
westsystem.com

Marine Hardware
Jamestown Distributors
800-423-0030
jamestowndistributors.com

Single-unit design accomplishes the boat shape in one session. Less than three hours has elapsed since the epoxy was first spread. From left to right, Eisenlord, Hott, Merlin and Sarge clean the epoxy squeeze-out before it hardens. Note the use of 5-cent PVC clamps along with regular C-clamps.



The result of a three-hour work session is the completed hull.

the pile as long as you put it back. This is not so with softwood yards primarily catering to the home-construction market.

You need to enlist the support of the yardman at the outset. He may even wish to build a boat himself, and will want to see you be successful. After all, the number of pieces you need is rather small, but quality is important. If you don't get the help you need, try returning another day and work with another yardman, or go elsewhere.

Solid wood is used for the long thin pieces cut for mast and sprit, gunwales along the edges for clarity and keel for the bottom. The seats, small deck, transom knees, rudder and tiller, and leeboard are also all cut from solid wood (see above right). I use a combination of softwood and hardwood in my boats, but it can all be made from softwood by following simple rules of thumb: Select heavier pieces of wood that have more strength and increase the thickness by 25 percent when using softwood.

What you will find in straight-grained, relatively knot-free lumber the day you go shopping is pretty hard to say. Just don't forget to get on the good side of your yardman. Also, it's helpful to know that longer lengths are more likely to yield straighter-grained, knot-free sections than the shorter ones.

With the bottom ply cut to shape, and the chine logs planed flat, Lars and Hott hold the boat while Merlin trims the stem so that the bottom can go together.

Sarge and I begin the inside work with fitting the small deck block. Together with the inside gunwhale and transom knees, this will contribute stiffness to the hull.

The bottom fin, called a skeg, will help the boat track well underway. Sarge uses the thickened epoxy to fillet the joint for strength. The flat board going stem to stern is important both for protection from grounding and to support the plywood bottom.

The seats rest on blocks epoxied to the hull. My assistant, Tom Jarosch (left), and Merlin clamp the blocks with waxed paper between them to the seat. Using the seat this way ensures that everything will fit when the epoxy dries.

A key skill in using plywood for any boat more than 8' long is being able to scarf pieces to required length, as shown on page 88. The scarf joint is made by tapering the ends to be joined, thereby exposing wood fiber along their stronger orientation. The normal cut is a 1:8 to 1:12 ratio of thickness to length of the joint. In solid wood the joint strength will come close to that of a continuous piece.

In plywood underlayment I taper 1" back for the 5.2mm thickness, which is a ratio of 1:5. This works where panels are supported by solid wood. Stacking up layers of plywood will make planing and using the belt sander easier in preparing the tapered ends. Expose a goodly band of the top and bottom layer. Strength depends on having a continuous wood fiber layer on both surfaces.

Building the Hull

The single-unit design of Sailor Girl compresses much of the time needed to form the basic hull shape, greatly easing construction. It eliminates making a strong back, or building a frame on which to lay the planks and other parts to achieve the bends of the hull.

The side panels were originally glued up flat on the bench to save time in scarfing and attaching the edge trim. But these preassembled panels were too stiff for each assembly. The solution was to combine all the side-panel construction and attachment to stem and transom in a single three-hour session of epoxy "open time," as shown on page 89. A single spreader holds the boat shape in the center until the bottom and seats are in place.

Looking at the photographs of Sailor Girl being made may leave you wondering where you can locate so many C-clamps. There is a simple alternative that can replace most of them. I call them my 5-cent PVC clamps. Take a length of 2" PVC schedule 40 pipe and cut it into 1" segments. Then slit one side on your band saw. They will open enough for clamping the gunwale assembly as long as you use a C-clamp at strategic points to prevent slipping.

Making the Sail

The sail is the last major part of the boat, and it too can be done

The sail is made from Tyvek in a cloth finish rather than the stiffer building wrap used in home construction. The cloth comes 10' wide, thus avoiding the need for any center seams. From left to right, my partner, Eric Pintar, I and Lars use seam tape to add reinforcements into the corners.

Pintar and I hem the sail all around using seam tape. A bolt rope and grommets will add strength to the hem. The corners can be stitched by hand or by a sewing machine.

at home with good results. I had a prototype sail made by a professional sailmaker. It is a good design and well made. But I wanted to include making the sail in the boat event and give participants the satisfaction of doing their own, and saving some money.

Just as plywood sheets and epoxy glue make the hull possible, so do wide widths of Tyvek cloth and seam tape make sailmaking possible. The Tyvek used here is made for cloth applications such as hazardous materials' handling suits, and not the building material product that has a hard stiff surface. I plan to sell the Tyvek cloth I use to make my sails. To purchase contact The Home Shop (517-543-5325, 9 a.m. to 5 p.m. EST).

Tyvek comes in a roll 10' wide, which makes for a seamless sail. The edges are folded over and secured with double-faced seam tape used for basting, as shown on page 90. The corners are stitched to reinforce the bolt rope worked into the hem.

Boat building in your shop has come a long way since "Building an Orange Crate Canoe." However, the joy of fashioning a craft with your own hands still resonates the same responsive chord in the hearts of craftsmen. I hope you soon can experience this joy for yourself. **PW**

An important aspect of the set of the sail is the location of the mast and the angle at which the mast is held in the step. Here a simple jig is used to locate the mast step under the cross piece with the hole called the mast partner.

Merlin makes his boat ready for sail by attaching cord for lacing the sail to the mast. All the parts have come together for a boat, which now has oarlocks at two stations for rowing singly as well as with a passenger.

Four boats in less than a week! Here the participants in the class, Sarge, Eisenlord, Merlin and Hott line up before The Home Shop in the late afternoon sunshine.

A STATEMENT OF THE FREE

Building your own sailboat is an individual's declaration of independence. You are free from the uncertainty over being able to do it, now that she is built. You are free from standing on the shore, now that you are afloat. You are free from oar or motor power the moment the breeze first fills the sail. It is akin to being in flight. No engine roar, no sweating at the oars like a galley slave. Only the wind tugging at the sheet while the boat responds with the sound of lapping waves under the bow. To have the privilege of building your own sailboat is a statement of the free.

–Taken from "Building Sailor Girl with John Wilson"

Choosing Your Chucks

There are hundreds of chucks. Here's a quick look at the four most common styles.

Photos by Al Parrish

Chucks, such as this four-jaw, self-centering Talon, are essential for mounting your workpieces to your lathe. Choosing the right one simply depends on the type of turning you do.

One of the most important decisions to be made in planning any turning project is how to mount the workpiece on the lathe. This can be a difficult decision, as there are dozens of mounting possibilities, in at least three main categories.

The first type of mounting is when you're turning between centers. There can be any one of several different drives in the headstock, and usually a live center located in the tailstock; the piece is held by the pressure of the tailstock against the headstock.

In the second type of mounting, the workpiece is fixed to the headstock. This involves a faceplate, with or without a waste block (a piece of wood to which the workpiece is attached, usually with glue), or a chuck.

I call the third category hybrid mounts. The workpiece is attached at the headstock using a faceplate or a chuck; the tailstock is used for support during at least some of the turning process. A particular advantage of the hybrid mounts is that often the workpiece can be parted off, sanded and finished at the tailstock end (after the rest of the turning is done) and then parted off at the headstock end. This can save you lots of time and trouble, because it's usually much easier to sand and finish on the lathe.

Most of the mounts in the second and third categories involve a chuck, a device that attaches to the lathe and in turn holds the workpiece. There are many kinds of chucks beyond those in this article. It would take a book to describe all of them, and doubtless some would still be overlooked. Some of the commercially available chucks other than those described here are cup, collet, expanding collet, pin, eccentric, mandrel and vacuum chucks. In addition, there are many kinds of shop-made chucks such as donut jigs (for reversing a bowl to turn the foot), jam chucks and others. I will talk about some of these in future articles as the need arises. For now, I will look at a few of the most generally useful chucks, and why you might choose a particular chuck to mount a certain kind of work on the lathe when turning.

by Judy Ditmer

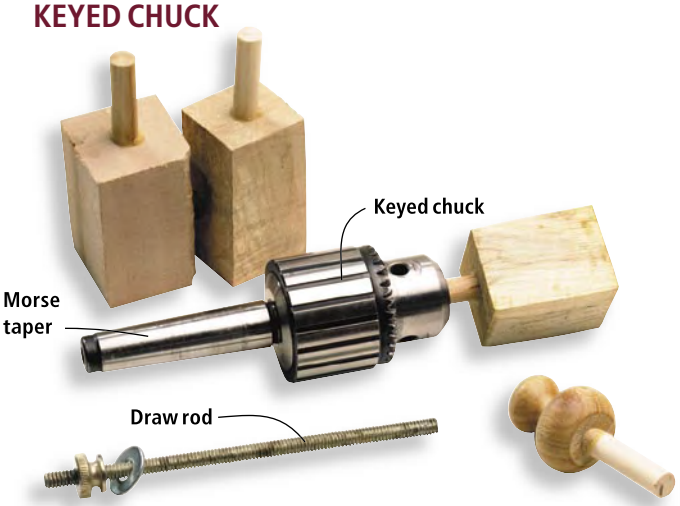
Judy, the author of two turning books and many articles, has been turning since 1985. She teaches and demonstrates her skills throughout the United States and Canada.

Keyed Chuck

Also called a drill chuck; a Morse taper (there are three sizes) fits into the headstock of the lathe. The chuck should be drilled and tapped in the end of the morse taper. This allows you to use a draw rod (shown in the photo above right), which is a threaded rod that goes through the hole in the headstock and is held in place with a knurled nut. The draw rod keeps the chuck from working loose when an item is being turned or finished without tailstock support.

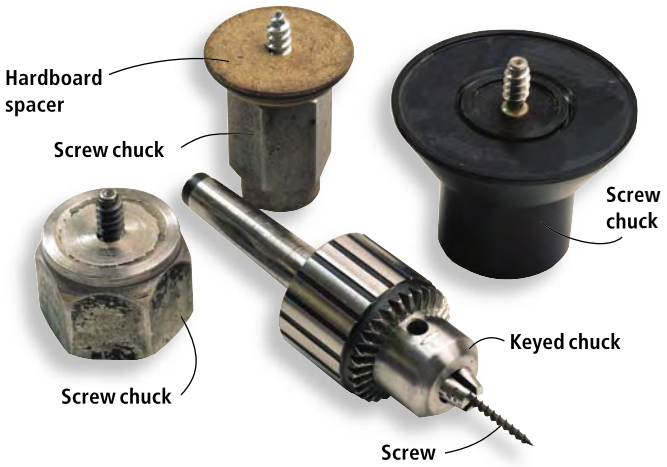
This kind of chuck is great for mounting anything that by its nature has a dowel in it (bottle stoppers, tops, spindle ornaments, etc.); you could also glue a bit of wood to a waste dowel for very small work. Stock for hair

KEYED CHUCK



Keyed chucks (such as the one shown here) use a Morse taper to fit into the headstock of a lathe. The Morse taper allows you to use a draw rod, shown.

SCREW CHUCKS



You can buy your screw chucks, or make your own simply by putting a screw (grind the head off) into a keyed chuck (center).

sticks, lace bobbins, etc. could also be held this way (after being turned round between centers). It's also a very safe chuck, as it's small and there are no irregular protrusions. Even if you don't have any other chuck, you will want one of these. Get the 1/2" capacity. They cost about $35 from Penn State Industries (800-377-7297 or pennstateind.com).

Tip: Knock out the crosspiece of the chuck key and mount it in a reversible drill. This allows you to open and close the jaws very quickly and securely. I hang the drill on a bungee cord next to the lathe so I don't have to continually pick up the drill and put it back down. When I am turning dozens or hundreds of something, as I often do, this matters – a lot.

Screw Chucks

Many versions and sizes of screw chucks exist. One shown at the top of this page has a spacer made from a scrap of hardboard; this is an easy way to shorten the effective length of the screw. Many versions provide a means of adjusting the length of the screw. The simplest screw chuck (shown above right, center) is an appropriately sized screw with the head ground off, held in a keyed chuck.

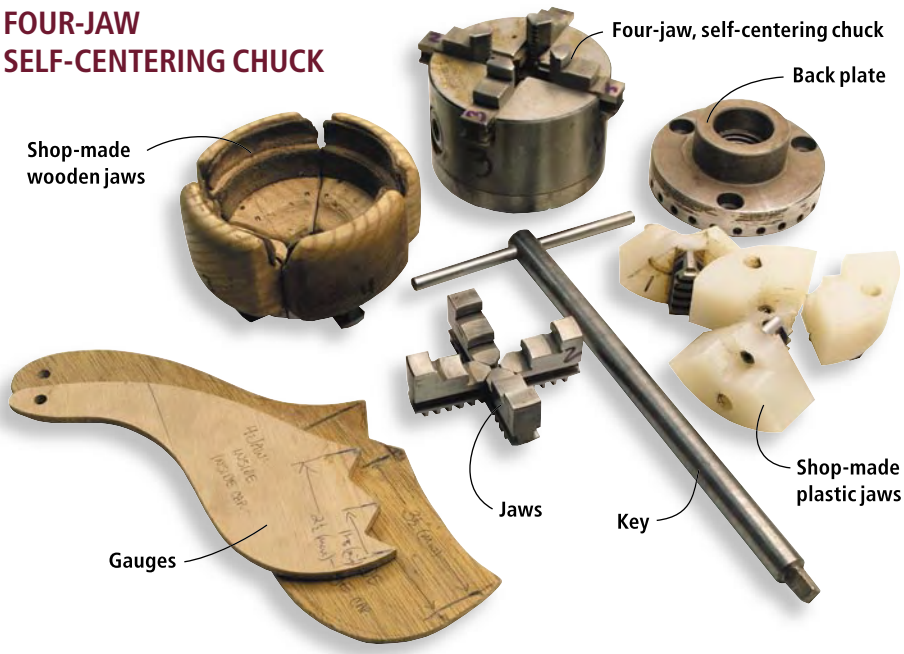
To use a screw chuck, the workpiece is pre-drilled with an appropriately sized hole and simply screwed onto the chuck. These are useful for everything from small items, such as corkscrews, to fairly large bowls. A workpiece that needs to have a recess, tenon, or flat turned on it (for mounting in a chuck or on a faceplate) can often be mounted on a screw chuck for this operation. The tailstock may be used for support anytime a screw chuck is used. They are very safe, because there are no protruding jaws, making them ideal for very small items or for working close to the chuck. I use the drywall screw to turn corkscrew handles. I can turn, sand and finish the entire piece, and when it's removed from the chuck, it has the necessary hole for gluing in the metal corkscrew.

Almost any supplier that carries turning supplies will have several kinds of screw chucks. Check out: Craft Supplies USA (800-551-8876 or woodturnerscatalog.com), Packard Woodworks Inc. (800-683-8876 or packardwoodworks.com), Penn State Industries (800-377-7297 or pennstateind.com) and Oneway Manufacturing (800-565-7288 or oneway.on.ca).

Four-jaw Self-centering Chuck

I've had the four-jaw self-centering chuck shown below for many years and it has no name on it, but I believe it's an Axminster. This is a machinist's-style chuck. The jaws work together when the key is turned, rather than independently. A back plate (shown below, upper right) is chosen to fit your lathe spindle. Different jaws can be attached to the slides for various purposes. The jaws may be

FOUR-JAW SELF-CENTERING CHUCK



Shown here is a machinist's-style, four-jaw, self-centering chuck. The jaws, which work together when a key is turned, can be expanded inside a recess or compressed around the outside of a piece.

expanded inside a recess (in the bottom of a bowl, for example), or compressed around the outside of a piece (such as a round tenon on the bottom of a bowl, box, etc.).

Square stock can be mounted in this chuck, though great caution should be used if working near the chuck, because the protruding jaws are very dangerous. This kind of chuck is better for bowls, platters, etc. where the workpiece will be between your hands and the spinning jaws.

Additional slides (the parts that actually move in the chuck body; the jaws themselves are attached to the slides) can be used to make custom jaws of wood or plastic for holding particular kinds of work. The wooden jaws shown on page 93 (left) and the plastic jaws shown in the same picture (right) are custom jaws I've made for particular projects. The flat pieces of wood on the left are gauges I made to quickly indicate (on a workpiece being prepared on the lathe for mounting in the four-jaw chuck) the capacities of each set of jaws, whether used inside or outside.

Craft Supplies USA (800-551-8876 or woodturnerscatalog.com) carries the Axminster chuck ($240) plus a variety of jaws.

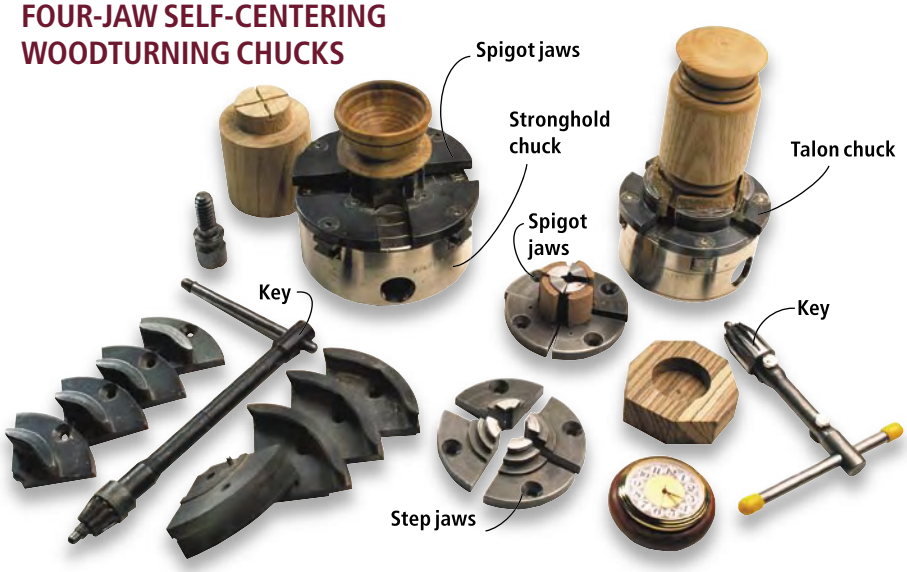
Four-jaw Self-centering Woodturning Chucks

Shown below, top left is the Stronghold from Oneway Manufacturing (800-565-7288 or oneway.on.ca); on the right is the Talon, also from Oneway. These chucks are designed specifically for woodturning. The jaws have teeth to hold the wood securely, and are profiled so that more of the chuck is holding onto the wood. Many different jaws are available, some in either toothed or smooth versions. These chucks are versatile and of good quality. There are many other brands of this type of chuck; most suppliers will have several.

With the wide assortment of jaws available, these chucks can be used for a huge variety of work. Shown below on the Stronghold are the spigot jaws, especially nice for smaller work such as boxes and small bowls. Also shown below, between the chucks, are the spigot jaws for the Talon chuck. I have glued thick pieces of leather to the outside of the jaws. This leather serves two purposes; it prevents the jaws from marring the wood (important, for example, where a finished box is mounted on the jaws for turning the bottom), and it allows cutting the workpiece right up to the edge of the recess without damaging the gouge. This is an important time-saver in turning the pocket watch pictured; this all-around access allows the item to be turned in one operation (using great care to avoid the spinning jaws, of course).

In the center of the photo below are the step jaws, which are used for a variety of small items; at the left, above the key, is a screw that can be mounted in the chuck so it can be used like any screw chuck. **PW**

FOUR-JAW SELF-CENTERING WOODTURNING CHUCKS



The four-jaw, self-centering chucks shown here are specifically designed for woodturning. The jaws are profiled so that more of the chuck is holding the wood.

DO YOU REALLY NEED A CHUCK?

If you're just getting started turning, you might be shocked to find that a good chuck can easily cost more than your first lathe. If you don't have unlimited funds available to spend on your new avocation, you'll be pleased to hear that you don't necessarily need a chuck, or at least not the most expensive one. There are few things, if any, that you can do with a chuck that can't be done either between centers, or with a faceplate and a waste block. What a chuck offers is repeatability and speed. If you don't need those, you may not need a chuck for turning.

When I began turning, the only chuck I owned was a keyed chuck that came with my machine. I used a faceplate and waste block for almost everything. I now have many different chucks, and I wouldn't want to do without them. But there are certain things I still turn by mounting them on a waste block because that is the best way to make them. You should learn how to do this (look for this in future columns), or you may find yourself designing your project for the chuck you know how to use instead of choosing the mounting method best suited to your project. Understanding the basics will enable you to decide what kind of chuck will improve a procedure, and how to use it (most of the time it will be necessary to prepare the stock in some way, usually by turning or partly turning it between centers). *–JD*

You can attach a faceplate (center) directly to the workpiece with screws. This method is often used in bowl turning. Or, the workpiece can be attached (usually with glue) to a waste block, which is fastened with screws to the faceplate (above left). On the right is a cylinder which has been turned round between centers, with a slightly tapered tenon on one end. This tenon is glued into a matching recess which has been turned in the waste block. The piece on the left is mounted this way, and has been partially turned.

Repairing Color Damage

If the scratch isn't deep, the fix isn't difficult.

Photos by Al Parrish; special thanks to Keith Mealy of Guardsman FurniturePro for assistance.

If a liquid darkens the scratch, just not enough, wipe the surface with a stain or colored paste wax.

Even if you aren't a professional woodworker, you probably get called on now and then to look at finish damage on cabinets or furniture belonging to friends and neighbors. Your woodworking skills are appreciated in our mass-production society, and your friends and neighbors may not recognize that repairing a finish is not the same as making something out of wood. But it would be nice if you could help them out anyway.

The most common damage to a finish is missing color in minor nicks or scratches. Here's an explanation of what to look for and how to go about repairing it. (I'm not going to discuss how to fill deep scratches or gouges; that involves a different and more complicated procedure.)

The Four Types of Damage

There are four categories of damage, each requiring a different repair procedure.

- Enough color remains in the wood, either from the natural color of the wood itself or from some remaining stain, so that all you have to do is apply a clear finish to the damage to blend it in.
- Not enough color remains in the wood, so you have to add some color to repair it.
- The wood is still sealed, and this prevents added coloring from penetrating. You have to apply a colored finish on top.
- The fibers of the wood are so damaged,

Before you can repair a scratch you need to diagnose the problem.

that any liquid you apply makes the color too dark. You have to use a neutral-colored paste wax, water-based finish or a very fast-drying finish.

Determine the Problem

Because the fix for each situation is different, you need to test in advance to learn what is most likely to work. Here's the easy test. Apply some clear liquid to the damage and see what happens. Does the liquid bring out the color already there to make the mark disappear? Does the liquid darken the damage, but not enough? Does the liquid do nothing? Or does the liquid make the damaged area too dark?

The best liquid to use is mineral spirits (paint thinner) because it will simultaneously show the color and remove any wax that might be partially sealing the wood. But mineral spirits isn't always handy, and you don't want to have to run home to get some. So here's the easy trick, the method I almost always use to provide the clue.

Take some liquid from your mouth and dab it onto the damaged area using your finger. You could call this "The Spit Test," but doing so might not endear you to your onlookers. "Liquid from my mouth" is how I describe it.

Whatever the liquid, and whatever the application tool, the liquid will tell you the situation within a couple of seconds. The color in the damaged area will blend, it will darken but not enough, it won't change, or it will become too dark.

Here is how to proceed once you know what you're up against.

If the Liquid Restores the Color

All you need to do is apply a clear finish. Your choices are oil (boiled linseed oil, Danish oil or antique oil), shellac or varnish. The differences are as follows:

Oil will penetrate deeper because it cures slowly, so it will make the wood darker than the other two finishes. Moreover, the color will continue to darken some as the oil ages. If the color produced by the test liquid is just a little light, oil might be the best choice.

Shellac dries very rapidly, so it doesn't penetrate as deeply or darken the wood as much. Clear shellac is probably what you should use, not amber, and you may want to apply the

by Bob Flexner

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

shellac with a fine artist's brush depending on the size of the damage.

Varnish darkens more than shellac but less than oil, and it also darkens a little as it ages. An artist's brush is also useful for applying varnish to small areas.

If the Liquid Doesn't Darken Enough

You need to apply a stain, and as long as you use an oil-based wiping stain or a water-soluble dye stain, you can simply wipe the stain over the damage and then wipe off all the excess. With this method you won't leave any mark on the surrounding finish.

Choose between the two types of stain based on how much color you're going to need to add. Wiping stains won't add as much color as dye stains will, and you can continue to put more dye onto the damage and make it darker, while wiping stain will have little additional effect after the first application.

If you use a water-soluble dye stain on a tabletop, you should seal it in by wiping over with an oil finish so it doesn't get washed out during cleaning and dusting.

Instead of using one of these stains, which gives you a lot of control of the color because there are infinite possibilities, you could use a commercial product designed for just such a problem. These include Howard's Restor-a-Finish and a number of brands of colored paste wax. Or you could use a touch-up marker, which is especially effective on sharp edges.

If the Liquid Has No Effect

If the liquid you applied in your initial test doesn't darken the damaged area at all, the wood is still sealed with finish. A lot of factory furniture is sealed first and then colored with toners and glazes. This coloring could have been removed without breaking through the sealer coat.

To reintroduce color to this type of damage, you have to paint it in. You can do this with a touch-up marker, or you can brush on any colorant that includes a binder. The binder should be shellac, varnish or water-based finish. In effect, you are painting with thinned paint. The trick is to get the color right, so standard paints seldom work. You need to mix up the colorant and binder yourself. Use Universal Tinting Colorants (UTCs) with shellac and water-based finish, and oil or Japan colorants with varnish.

If the Liquid Makes the Color Too Dark

This scenario usually indicates that the wood has been roughened, and too much of the liquid is retained. There are three possible finishes you could apply to get the color right. Clear paste wax will darken the least. Water-based finish will cause some darkening. A fast-drying finish like shellac won't penetrate much, so it will also cause very little darkening – especially if very little is applied.

This type of damage is actually the most difficult of the four to get right, because you can always add more color to make a repair darker, but you can't make it lighter.

Of course, experience is always helpful for achieving success, but the first step, even if you have a lot of experience, is doing the liquid test. **PW**

The simple test to determine the procedure to repair a scratch that shows white is to dab some liquid onto it.

If a liquid is all you need to restore the color in a scratch, wipe the surface with an oil finish.

Touch-up markers are very effective on scuffed-up sharp edges. They are available in a variety of colors. To best match your piece, do a sample piece first.

If a liquid has no effect on the coloring of a scratch, brush a colorant into the scratch.

If a liquid makes the scratch too dark, apply some clear paste wax.

Protecting Tools From Kids

Sometimes a little talking-to (and video surveillance) is all it takes.

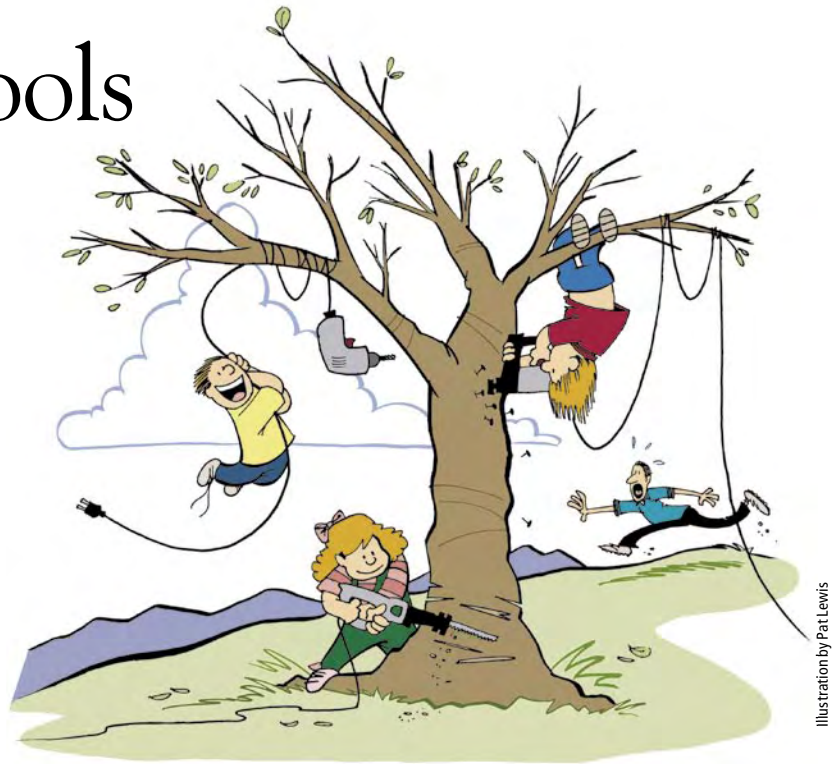


Illustration by Pat Lewis

I have noticed three things about tools and kids. Kids can find tools even if it requires tunneling under the garage wall. Kids can claim complete innocence when asked why tools are missing. Two days after the tools go missing the same kids manage to build a tree fort complete with lattice work.

Power tools are dangerous. To prevent your budding carpenters from doing irreversible harm – to the tools, not themselves – you should give them a quick course in power-tool safety. Here's what to tell them:

"First I will demonstrate the proper method for cutting a 2 x 4. What? No, we will not be using a blowtorch. That's later.

"Notice how fast the blade on the saw turns. This allows it to cut through wood. Can it be used to create shaved ice? I would have to check our insurance coverage.

"Please keep in mind that it is illegal in all 50 states to enter your Dad's shop without his permission. No, stealing his keys does not qualify as lawful entry, nor does asking his permission when he is half asleep.

"Notice all the tools hanging neatly from racks on the wall. They did not get that way by accident. After using a tool it must be put away. Well, yes, I know that those are just posters and that my real tools are stacked in heaps along the wall, but it wasn't that way until you gained access to the building.

"Also, tools, whether hand tools or power tools, don't like to spend long periods of time outside. With the reciprocating saw, that tool you played with that has the teeth that go back and forth, this causes rigor mortis to set in. Especially if it rains during the month it spends in your treehouse.

"One word on power cords: Don't ever let me catch you tying them up in a tree and swinging from them like grapevines again.

"It is a misuse of the electrical tape to wrap it repeatedly around the only pair of gloves I have. It also is inappropriate to stuff the said wadded mess in the car's tailpipe. The car can't exhale when you do this.

"Screwdrivers are not meant to be used as chisels, chisels were meant for this. And screwdrivers were not meant to be used as pry-bars, pry-bars were meant for this. A question? Hmmm ... what do you do if you have no pry-bar or chisel handy? You use a screwdriver. That's what they're made for.

"You wouldn't use a hammer to try to pound a nail into a board head first. You also would never try filling up a nail gun by putting the nails in upside down.

"The volt-ohmmeter can't test the household current when it is set to 'continuity.' Also, Dad's cordless drill doesn't like to power toy submarines in the bathtub.

"The 10-pound box of stud nails on the shelf does look like a fun toy, but it is not fun when you pour them out across the driveway. The popping noise you hear when I drive down the driveway? That was your Dad's means of getting to work being destroyed.

"That planer? It didn't like what you did last week. It wasn't designed to turn metal fence posts into spears. Yes, it did a good job.

"Now we come to the shop vacuum. As you may already know, nature abhors a vacuum. The feeling is reciprocal from the vacuum's perspective. Please do not try to use it to suck up leaves, twigs or bird nests, especially if the birds are still in the nests.

"You probably have been wondering what that tall thing with the drill bit is. That is a drill press. You use it to put holes in items. Those items do not include the family's inflatable raft, cassette tapes or books.

"See this thing? It shoots flames. It's the blowtorch we mentioned earlier. It should never be used to heat up hot dogs or roast marshmallows. It is used for soldering and loosening stubborn nuts. Say that again a little louder? That was not a very nice joke.

"Now that we have had this little session, here are a couple tools for each of you. Well, yes, a hammer and a hand saw may seem a bit outdated, but I'm sure with your imagination you'll go far with them. What's that? No, you may not have any nails." **PW**

by Sam Stickle

Sam lives in rural Ohio trying to keep his tools safe by padlock, barrel bolt and various other techniques.