3YR GUARANTEE

For total peace of mind every Triton precision product ships with 3 years' support as standard

Coverage includes freight, labor and parts

triton®

Precision Power Tools

10A BELT SANDER 4" X 24"

Triton's T41200BS Belt Sander is host to many significant features, from variable speed control for improved versatility, to belt tracking adjustment for accurate alignment of the sanding belt.

T4 1200BS

MSRP $179.00

2.5A RANDOM ORBIT SANDER 5"

A random orbit sander is only as good as the finish it can achieve. Triton's TROS125 is a powerful yet compact sander with a 5" hook-and-loop backing pad.

TROS 125

MSRP $79.00

2.6A OSCILLATING TILTING SPINDLE SANDER 15"

Offering outstanding performance, Triton's TSPS370 Oscillating Tilting Table Spindle Sander creates a precise, burn-free finish on woodworking projects every time.

TSPS 370

MSRP $229.00

6.5A ORBITAL ACTION JIGSAW

The TJS001's powerful 6.5A motor and three-stage pendulum action deliver an incredibly fast cutting performance. Dual-axis grips allow the tool to be held with both vertical pressure and horizontal direction control.

TJS 001

MSRP $129.00

THE BENCHMARK IN PRECISION POWER TOOLS FOR OVER 40 YEARS

Precision has been at the very heart of Triton's philosophy since 1976 when the first Workcentre was produced. From design through to the completed product, Triton engineering is all about **precision** and **attention to detail** – this makes all the difference to the final finish of your project.

Offering an **excellent choice** of workshop tools, the Triton range includes Work Support tools, Bench Top tools and versatile Workcentre Systems, while a **comprehensive range** of accessories provides **maximum versatility.**

Engineered Precision

tritontools.com

SEE OUR FULL RANGE & FIND YOUR LOCAL RETAILER NOW!

BONUS SHOP GUIDE

Full Workbench Plans

TOOL TEST
Cordless Trim Router

POPULAR Woodworking

October 2018 ■ #241

Easy-to-Build Dining Table

Attractive Design with Unique Fire Finish

13 Essential Finishing Terms Defined

MAKE IT!
Truly Custom Cabinets

PLUS

- Make a Custom Slöyd Knife
- Handmade Saw Cabinet
- Increase Accuracy with CNC Templates

popularwoodworking.com

CONTENTS

OCTOBER 2018

30

36

44

FEATURES

50

PHOTOS BY THE AUTHORS

Popular Woodworking presents

BEST NEW WOODWORKING

Viking Mountain Tool Works

Now Available! The SHELIX OEM Cutterhead for Dewalt 735 Paners
by Byrd Tool Corp

The ORIGINAL SHEar & heLIX spiral tooth action cutterhead! Made in the USA by Byrd Tool Corp., these indexable carbide-insert cutterheads provide a shear, staggered cut instead of a single straight knife cut, giving your work pieces a superior finish. Rotate dull carbide inserts to expose an unused cutting surface, or replace damaged inserts individually – no more expensive full-length knife blade replacement! Machined to the exact diameter of your factory-installed Dewalt 735 cutterhead.

Visit VMTW.com
or call 563-387-7315

CARD #40 or go PWFREEINFO.COM

Bessey

Introducing the New BESSEY GearKlamp

The first of its kind in the world, the BESSEY GearKlamp works "BIG" in small spaces to provide a unique solution for cramped locations, up against another object, or when reaching across something to clamp. The patented gear mechanism separates the spindle from the rail-mounted handle for greater clearance and is fully enclosed to keep out dust and debris. Available in 6, 12, 18 & 24 Inch capacities with 450 lbs of nominal clamping force!

Visit BesseyTools.com
or call 800-828-1004

CARD #101 or go PWFREEINFO.COM

Woodpeckers

Perfect Clamping for Mitered Corners

The new Miter Clamping Tool from Woodpeckers applies direct clamping pressure straight across the miter joint, pulling the joint together, instead of forcing the mitered cuts to slide against each other. These handy tools work with any stock width, from tiny cove molding to the largest picture frame stock. Just clamp a tool to each joining workpiece and a third clamp across the joint. Full details at woodpeck.com.

Visit Woodpeck.com
or call 800-752-0725

CARD #52 or go PWFREEINFO.COM

Knew Concepts

3" Mk IV Heavy Duty Fret Saw

The 3" Mk IV Heavy Duty Fret Saws with Swivel Blade Clamps is designed to pull 50-60 pounds of tension on the blade, making the blade so taut that it "sings" when plucked. Incredibly maneuverable, it makes turns that are tighter than ever before. The Lever Tension is designed for rapid blade changes and the tension does not change when resetting the blade. The Swivel Blade Clamps can rotate a full 360° with click stops every 45°. You are gonna be amazed!

Visit KnewConcepts.com
or call 831-234-4652

CARD #60 or go PWFREEINFO.COM

Next Wave Automation

Next Wave Automation's Shark II

The All New CNC Shark II® features a heavy-duty gantry reinforced with plate aluminum and a rigid interlocking aluminum table. It has anti-backlash, wear-compensated high precision lead screws on all 3 axes. Shark II is built to handle your large 2¼ HP routers or the new water-cooled spindle (sold separately) and includes a host of software. Perfect for carving and machining a large variety of projects made from wood, soft metals or plastics.

Visit NextWaveAutomation.com
or call 419-318-4822

CARD #127 or go PWFREEINFO.COM

Forrest Blades

Woodworker II 30T Ripping Saw Blade

Our American-made, 30-tooth Woodworker II RIPPING blade yields smooth cuts right from your saw, removing 25% less material than other blades and eliminating the need for second-step finishing. Designed for low-resistance, easy-feed ripping of soft or hard woods of any thickness, and for fast ripping of plywood sheets without splintering the veneer. 7¼" to 16" diameters, $105 to $191 MSRP. The 7¼" diameter, thin kerf version is designed for lower power handheld circular saws, and its retail price of $105.00 makes it an affordable – and highly useful – addition to your shop!

Visit ForrestBlades.com
or call 800-733-7111

CARD #13 or go PWFREEINFO.COM

TOOLS & PRODUCTS

Kreg Tool

New Kreg® Track Horse

Work on DIY and woodworking tasks anywhere with a versatile, sturdy, expandable work support

- Sturdy steel and aluminum construction supports 2,200 lbs. as a pair
- Versatile design works as a sawhorse, work support, clamping center, and more
- Portable for easy transport and compact storage
- Expandable by pairing with another Track Horse or Mobile Project Center
- Equipped with a Kreg Bench Clamp featuring Automaxx®
- Adjustable to six different working heights

Visit KregTool.com or call 800-477-8638

CARD #107 or go PWFREEINFO.COM

Kutzall

Dish Wheels for Contoured Shaping

When it comes to freehand carving on your larger projects, no other tool gets the job done better than a Kutzall Dish Wheel. Paired with a quality right-angle grinder, these Dish Wheels have helped skilled craftsman create truly remarkable things. The pronounced carving radius on our 4½" Dish Wheels is perfect for effortless contour shaping, adding extra levels of dimension into your creations. The rugged tungsten-carbide coating on all Kutzall Dish Wheels allows you to cut faster and longer with minimal clogging and time spent cleaning. Kutzall Dish Wheels are available in 2 different coating styles, **Original** and **Extreme**.

Visit Kutzall.com or call 810-765-1000

CARD #94 or go PWFREEINFO.COM

Wagner Meters

MMC220 Extended Range Wood Moisture Meter

Our most popular selling non-invasive fast and accurate woodmoisture meter, the MMC220, is ideal for measuring wood moisture in all wood species; from rare tropical species to the more common softwoods and hardwoods. Wagner Meters' IntelliSense™ technology ensures that the MMC220 is measuring deeply IN the wood for a true moisture picture without damage to the wood surface and without interference from surface moisture. Two-button controls make one-handed operation simple, and there is no need to adjust moisture content (MC) readings for temperature.

Visit WagnerMeters.com or call 800-505-1405

CARD #123 or go PWFREEINFO.COM

CONTENTS

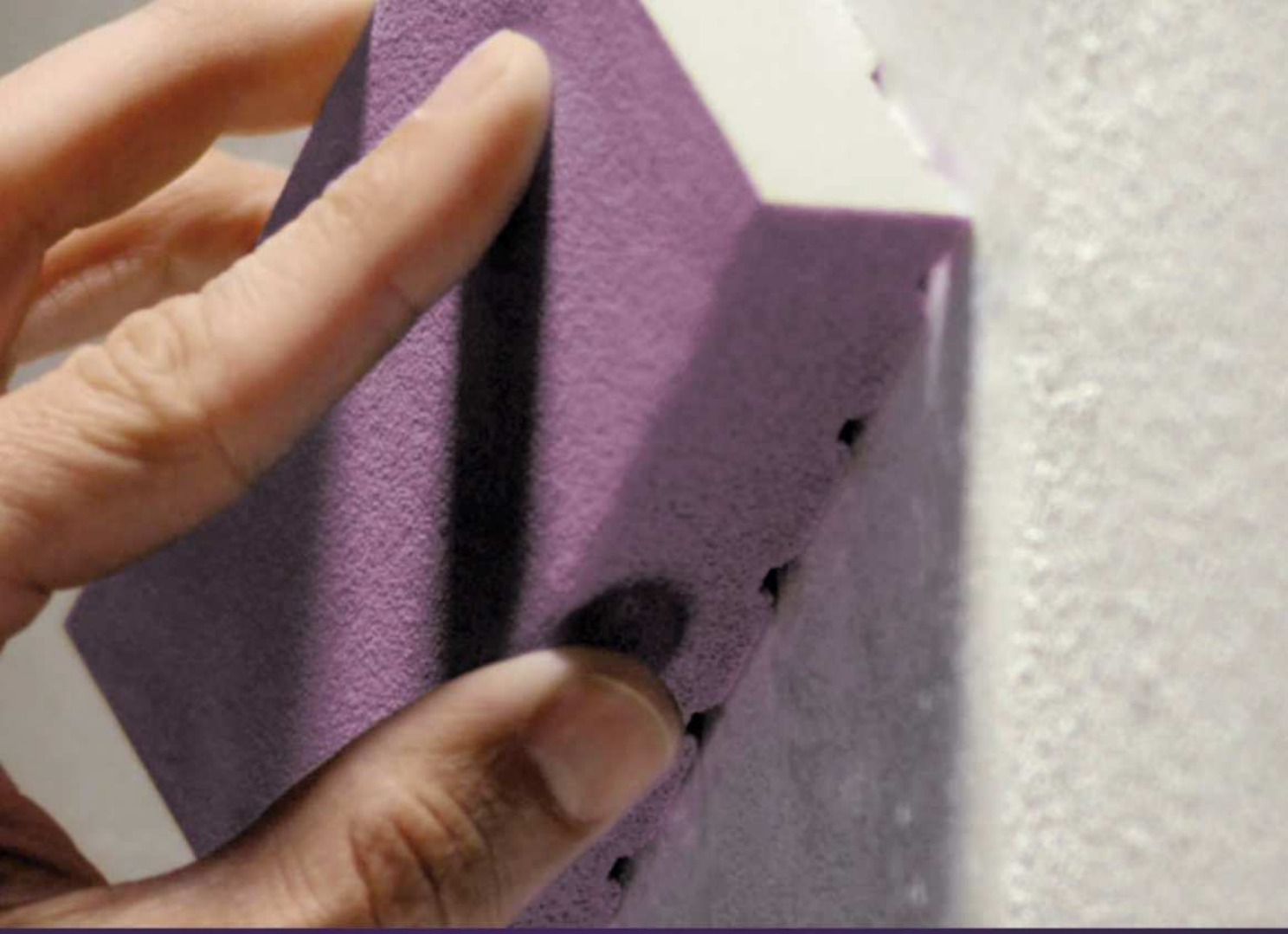
OCTOBER 2018

REGULARS

POPULAR Woodworking

Number 241, October 2018. *Popular Woodworking Magazine* (ISSN 0884-8823,USPS 752-250) is published 7 times a year, February, April, June, August, October, November and December, which may include an occasional special, combined or expanded issue that may count as two issues, by F+W Media. Editorial and advertising offices are located at 10151 Carver Road, Suite #300, Blue Ash, OH 45242. 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 $24.95; outside of the U.S. add $7/year ▪ Canada Publications Mail Agreement No. 40025316. Canadian return address: 2835 Kew Drive, Windsor, ON N8T 3B7 ▪ Copyright 2018 by F+W Media, Inc. Periodicals postage paid at Cincinnati, Ohio, and additional mailing offices. Postmaster: Send all address changes to *Popular Woodworking Magazine*, P.O. Box 420235, Palm Coast, FL 32142-0235 Canada GST Reg. # R132594716 ▪ Produced and printed in the U.S.A.

TABLE PHOTO: MARC CARTER / ALL OTHER PHOTOS BY THE AUTHORS



GET MORE OUT OF YOUR SPONGE.

3M™ PRO GRADE PRECISION™ Dust Channeling Sanding Sponge

You expect a lot from your tools. Get the sponge that works as hard as you do, with a patterned design that channels dust away from the sanding surface for less clogging and longer sponge life.

See how it works at 3M.com/ProPainter.

3M PRO GRADE PRECISION™

All This Stuff

This summer, my girlfriend and I moved from our one bedroom apartment, where we lived for eight years, to a big old house on the other side of the city. Moving in and of itself is stressful – renting a truck, calling in favors to friends and family to help move and doing all of the fixing and cleaning and updating that happens when you move to a new place. But on the other side lies more space, a spot for a dedicated shop and a charming old house.

Moving into that first apartment together felt very adult. It meant combining all of our stuff, making choices about what stays and goes and getting furniture that fit our new space. It's that last one – getting furniture – that still gnaws at me. We were impatient and anxious to make our apartment seem like a home, so we felt the need to fill it with stuff.

I have a love/hate relationship with physical objects. I much prefer to read a physical book, feel the pages between my fingers, to sit in a chair and get lost in the text. But then I see a bookshelf full of books that I know I won't have time to read again, and I get anxious. Disposable pieces of furniture make me anxious, too.

If I had my way, we'd just give away our current crop of Ikea bookshelves and leave our books in boxes until I make bookshelves. There's nothing inherently wrong with our Ikea furniture, but I know that it won't last and that I probably couldn't repair it if something breaks. That's the exact opposite of why I started woodworking. I want to make stuff that stands the test of time! Or at least a few moves.

I wish I'd discovered Enzo Mari's designs 10 years ago. The table we feature in this issue (page 30) is quick to construct from inexpensive lumber, looks cool and will last decades – exactly what I needed from a piece of

furniture then. The kitchen at my new house also needs some work, and with Nancy Hiller's no-nonsense approach to building cabinets (page 36), I feel empowered to build my own cabinets exactly how I want them, to fit the space I have (and without resorting to buying something inferior).

We launched the new and improved popularwoodworking.com this summer, too, and the process reminded me a lot of moving. Do we keep this? Is this functionality that was really important a few years ago still necessary? What should we do with these piles of old magazines? Can we make the new place better? For the most part, we kept it all (with a little bit of rearranging). And, we made room for more great content from our contributors (and added some new ones to the mix).

To begin, you'll see more videos on the website, and more plans and projects from the archives of *American Woodworker* and *Woodwork*, too.

I'd also like to invite you to join the community by making an account on our website and commenting on our content. We read every comment that comes through and respond as time allows. Come be part of the conversation! Head to popularwoodworking.com/join.

PHOTO: JACOB MOTZ

Popular Woodworking

OCTOBER 2018, VOL. 38, NO.5
popularwoodworking.com

PUBLISHER ■ Allison Dolan
EDITOR ■ Andrew Zoellner
SENIOR EDITOR ■ David Lyell
SENIOR DESIGNER ■ Danielle Lowery
CONTENT DIRECTOR ■ Patty Craft
ONLINE CONTENT DEVELOPMENT MANAGER ■ David Thiel
ONLINE CONTENT DEVELOPER ■ Jacob Motz
WEB PRODUCER ■ Rachel Fountain
CONTRIBUTING EDITORS ■ Bob Flexner, Christopher Schwarz
PROJECT ILLUSTRATOR ■ Donna R. Hill
LETTERS & TRICKS ILLUSTRATOR ■ Martha Garstang Hill, garstang-hill.com

EDITORIAL CONTACT
popwood@fwmedia.com
513-531-2690

F+W Media, Inc.
CHIEF EXECUTIVE OFFICER ■ Gregory J. Osberg
CHIEF FINANCIAL OFFICER ■ Kenneth Kharbanda
SVP, GENERAL MANAGER F+W FINE ART, WRITING, OUTDOORS & SMALL BUSINESS GROUP ■ Ray Chelstowski
MANAGING DIRECTOR, F+W INTERNATIONAL ■ James Woollam
VP, GENERAL COUNSEL ■ Robert Sporn
VP, HUMAN RESOURCES, CUSTOMER SERVICE AND TRADE ■ Gigi Healy
VP, MANUFACTURING & LOGISTICS ■ Phil Graham

ADVERTISING
VP, ADVERTISING SALES ■ Kevin Smith
ADVERTISING DIRECTOR ■ Don Schroder
331 N. Arch St., Allentown, PA 18104
TEL. 610-821-4425; FAX. 610-821-7884
d.schroder@verizon.net
ADVERTISING SALES COORDINATOR ■ Connie Kostrzewa
TEL. 715-445-4612 x13883
connie.kostrzewa@fwmedia.com

NEWSSTAND SALES
Contact Scott T. Hill
scott.hill@procirc.com

SUBSCRIPTION SERVICES
For subscription inquiries, orders and address changes go to: www.popularwoodworking.com/customerservice

U.S. Subscribers: 877-860-9140
International Subscribers: 386-246-3369
Email: popularwoodworking@emailcustomerservice.com

NEWSSTAND DISTRIBUTION
Curtis Circulation Co., 730 River Road, New Milford, NJ 07646. PHONE: 201-634-7400. FAX: 201-634-7499.

SHOPWOODWORKING.COM
Visit ShopWoodworking.com for woodworking books, projects, plans and back issues of this magazine.

FINISH FAST. FINISH ONCE. FINISH LIKE A MASTER.

Nathan Wiens
Artist & proprietor, Chapel Arts
Master woodworker
Vancouver

Varathane® stain gives true color in one coat. And Varathane Triple Thick Polyurethane has the durability of three coats, in only one. Providing you the ultimate finish, in less time. That's why master woodworkers, like Nathan, prefer Varathane. So don't just finish it. Varathane it.

Available at THE HOME DEPOT

Varathane® SINCE 1958

Dowel Joints for Chairs

I build furniture as a hobby and have used dowels for some projects and mortise and tenons for some projects. I use a Dowelmax and have found it to be much easier and faster than making mortises and tenons. The dowel joints produced with this jig are often more accurate than the mortise and tenon joints I make.

I would like to be able to confidently use dowels on my next chair project, and the Dowelmax website even has plans for a chair using dowels for all joinery. However, books and articles I have read dismiss the dowel joint as being inferior and insufficient to withstand the stress endured by a household chair and the authors of these articles suggest avoiding the use of dowels for any joints in a chair.

I have seen Bob Flexner's furniture repair and refinishing videos, and read some of his articles. He has certainly repaired a lot of furniture and I would value his opinion.

Are mortise and tenon joints really necessary, or can dowels be used as an acceptable alternative for chair joints? Also, wouldn't modern glues be more likely to produce stronger dowel joints than ones made 50 or 60 years ago? And does the type of glue affect the strength of the joint significantly? Any advice is appreciated.

Don Polick
Hinckley, Ohio

Hi, Don,

The difference in long-term strength of a mortise-and-tenon joint and a dowel joint is relative. A mortise-and-tenon joint that is made well (that is, tight wood-to-wood contact) is stronger than a dowel joint because there's lots more side-grain (or long-grain) contacting the sides of the tenons up against the vertical sides of the mortises in the stiles — that is, the legs of the chairs.

In contrast, nearly half of the surface area of the holes drilled in the vertical parts for the dowels are end grain, and end grain doesn't hold a glue bond as well as, or as long as, side grain. Think of the sides of straws versus the ends of straws. There's lots more possibility for contact in the sides of straws than in the ends of straws, which are largely air.

But it's relative. I have also made lots of chairs using dowel joints with a jig similar to yours. As you say, the choice between dowels and mortise-and-tenons is often based on time. My choices were based on this also.

Contrast the difference in strength and longevity of dowel joints with Kreg Pocket Hole joints. Why would a person choose a Pocket Hole? The same. Less time and skill required.

I base my conclusion of how long dowel joints will last on the countless doweled chairs I have reglued. Chair joints have to absorb a lot of pressures from people sitting on them and leaning back or scooting. Still, my experience is that, if made well, the chairs should last upwards of 50 years before working loose. (This differs from the life expectancy of many chairs made in factories in the last three or four decades, but the difference is due to the dowels not being glued well.)

Concerning glues, PVA (white and yellow glues) have been around since the early 1950s. Before then, hide glue was the common glue used. By "modern" glues, I hope you're referring to PVAs and not the more recent epoxy, gorilla and similar glues. These are not reversible, so I would never use them on anything I want to be able to reglue because the glue can't be removed (to achieve clean wood) except by scraping, which can't help but remove some of the wood, making for a weak joint.

Bob Flexner, contributor

More Feedback on Learning Happens Through Doing

We would like to express our support to Popular Woodworking for publishing the June 2018 End Grain column "Learning Happens Through Doing," and our appreciation to Jess Hirsch for writing it.

As woodworkers and woodworking instructors, we understand the importance of learning how to better attract and include every individual who has an interest in working with wood. In this (and all) cases, listening to people who have life experiences that differ from our own cannot be understated. The best teachers are also eager students, and we welcome the opportunity to learn how to be an ally in the effort to, in Jess's words, "work alongside one another in a way that feels comfortable for everyone".

Peter Follansbee
Elia Bizzarri
Jeff lefkowtiz
Glen Rundell
Greg Pennington
Tim Manney
Peter Galbert
Curtis Buchanan

I was a little taken aback at the content of a letter published in the August 2018 issue entitled "Leave Politics Out of Popular Woodworking." The story of one person's path, struggle and contributions to the woodworking community is only political when your worldview is too narrow to encompass the experience of others.

I'm glad you published an article from a different voice, and I hope you continue to produce content that is inclusive rather than exclusive. I'm also glad you published that letter. Without it, I wouldn't have even considered the possibility that you'd be getting negative feedback.

I don't care for articles on power tools. However, they don't make me angry. Not every article is for every reader. I'd venture to say that those who are so incensed by an article of

CONTINUED ON PAGE 10

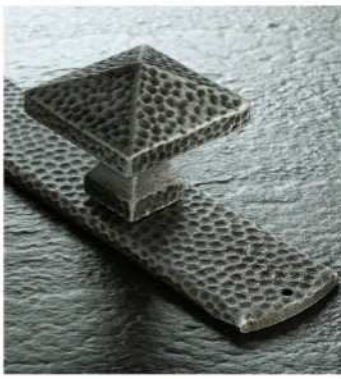
Make It Beautiful.

It's the little details that can make the biggest impact. Sometimes, all it takes to give a kitchen or bathroom a fresh look is to update the hardware. Our extensive selection of cabinet hardware suites includes a range of coordinating pulls, handles and knobs available in a variety of finishes, from antique brass to zinc plate, to complement any style, from classic to chic.

Discover why Lee Valley is your best resource for a wide variety of kitchen and bathroom hardware. Browse our catalog online or download it to the Lee Valley app.

leevalley.com 1-800-683-8170

Lee Valley



CARD #28 or go to PWFREEINFO.COM

CONTINUED FROM PAGE 8

this nature are the ones who most need to be reading it.

Jeremy German
Baltimore, Maryland

I was amused to read Lee Starling's letter to the editor about Jess Hirsch's End Grain piece. I thought it was fairly benign — that women are under-represented and met with a fair degree of condescension in the woodworking community should come as no surprise to anyone. I agree that PW should not get into politics — but I didn't read that piece as political. Your reply that all should feel welcome was absolutely right on target, and was exactly how I interpreted Jess's article.

I can't help but wonder where Mr. Starling's indignant reaction was when the American Legacy Firearms ad ran back at the end of 2017. That was loaded with political commentary aimed directly at right-wing fringe groups. I am glad to note that the ad hasn't run again. Keep up the good work. I love PW.

Robert Stickney
New Orleans, Louisiana

Lee Starling's letter in the August 2018 issue prompted me to go back and reread Jess Hirsch's June 2018 article about Women's Woodshop. My reaction was the same as when I read it the first time: I loved it.

I also appreciated your response to Lee and your stance that inclusivity only makes us stronger.

I've seen firsthand the gender dynamics that discourage women and persons from other under-represented groups from joining our craft. I've been to woodworking classes and witnessed the female students getting "extra help" from their neighbors. I've battled it myself when my wife joins me in the workshop, and I detect that my instruction is becoming patronizing. The bias is real, and talking about it is essential to addressing it.

Thank you for your courage to publish Jess's piece and responding politely but firmly to detractors. Keep up the good work.

Matt Miller,
New York, New York

Turning Safety Reminder

I really enjoyed David Lyell's article on making a Shaker-inspired settee in the August 2018 issue of Popular Woodworking. It was well documented and clearly explained. However the lead cover photograph is bothersome.

When I am teaching woodworkers aspects of a project, I firmly stress safety above all else. While David is wearing safety glasses, a face shield would have been better.

Using a lathe is a relatively quiet process compared to that of a table saw, router or planer. However the noise level when turning wood averages around 80dB. While OSHA considers noise levels below 85 dB to be safe, 80 dB is too close to this limit. While turning noise will often spike, the fact is that turning is not a short time activity and long term exposure to even relatively low noise levels can adversely effect hearing and health. Consequently, David should also be wearing some form of hearing protection.

Another safety rule that I stress when turning is to keep the elbows close to the body. David's right elbow is away from his side, resulting in less control of the gouge he is using. Lack of control can result in damaging the item being turned and worse yet having the tool torn out of his hand to fly somewhere, hopefully not the face. Having the elbows in also means less muscle fatigue which can lead to accidents.

Phil Rasmussen
Hendersonville, North Carolina

ONLINE EXTRAS

We want to hear from you.

Popular Woodworking Magazine welcomes comments from readers. Published correspondence may be edited for length or style. All published letters become the property of *Popular Woodworking Magazine*.

Send your questions and comments via email to popwood@fwmedia.com, or by mail to 10151 Carver Road, Suite 300, Cincinnati, OH 45242.

Popular Woodworking

Customer Service

How can I contact customer service with questions regarding my subscription, including a lost or damaged issue?
Visit popularwoodworking.com/customerservice. Or write to Popular Woodworking Magazine, *P.O. Box 421751, Palm Coast, FL 32142-1751. Or, if you prefer the telephone, call 1-877-860-9140 (U.S. & Canada), 386-246-3369 (International) and a customer service representative will be happy to help you.*

When does my subscription expire?
The date of your subscription expiration appears on your magazine mailing label, above your name. The date indicates the last issue in your subscription.

Can I get back issues of *Popular Woodworking Magazine*?
Back issues are available while supplies last. Visit popularwoodworking.com/backissues. Or if you know the exact month and year of the issue you want, call our customer service department toll-free at 855-840-5118 to order.

What if I want more information about the projects or tools I read about in *Popular Woodworking Magazine*?
For all editorial questions, please write to Popular Woodworking Magazine, *10151 Carver Road, Suite 300, Blue Ash, OH 45242. Or send an email to popwood@fwmedia.com.*

Does *Popular Woodworking Magazine* offer group discounts?
Group discounts are available by special arrangement with the publisher. For more details, send an email to Debbie Paolello at debbie.paolello@fwmedia.com or call 513-531-2690 x11296.

Our Privacy Promise to You

We make portions of our customer list available to carefully screened companies that offer products and services we believe you may enjoy. If you do not want to receive offers and/or information, please let us know by contacting us at:

List Manager, F+W Media, Inc.
10151 Carver Road, Suite 300
Blue Ash, OH 45242

Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking Magazine*, 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.

GO DIRECT
CUT OUT THE MIDDLEMAN

Great pricing on custom-welded saw blades

Q101® – Extremely Hard Cutting, Spring-tempered Edge

Q101® Band Saw Blades – 72"x½" (6'0"x½")
72" length for Shopsmith or similar models, hard edge, Flex-back Carbon
only $13.77ea

Q101® Band Saw Blades – 93½"x½" (7'9½"x½")
Flex-back Carbon, fits most 14" Delta Jet, etc.
only $16.71ea

Q201® – Precision Ground Tooth, Computer Controlled Hardening

Q201® Premium Band Saw Blades – 72"x½" (6'0"x½")
72" length for Shopsmith or similar models, hard edge, Hard Back Carbon
only $12.57ea

Q201® Band Saw Blades – 93½"x½" (7'9½"x½")
Hard Back Carbon, fits most 14" Delta Jet, etc.
only $15.11ea

Q201® Band Saw Blades – 105"x½" (8'9"x½")
Hard Back Carbon, fits most 14" band saws with risers
only $16.38ea

Ideal for the woodworking industry, our custom-welded blades feature spring-tempered backs and precisely hardened teeth allowing for very accurate cuts.

- Manufactured with precision ground tooth
- Computer controlled hardening
- Custom welded to any length
- Shipped in 24 hours

Blade Guide Upgrade Kits

A drastic improvement over factory blade guides which translates into cleaner cuts, quieter operation and less wasted wood.

Delta 14" Blade Guide Conversion Upgrade Kit
only $166.47

Jet 14" Blade Guide Conversion Upgrade Kit
only $166.47

Circular Saw Blades

Q-Saw Wood Blade 7-1/4" x 5/8" x 24T
$9.30 ea.

Q-Saw Wood Blade 10" x 5/8" x 40T
$20.35 ea.

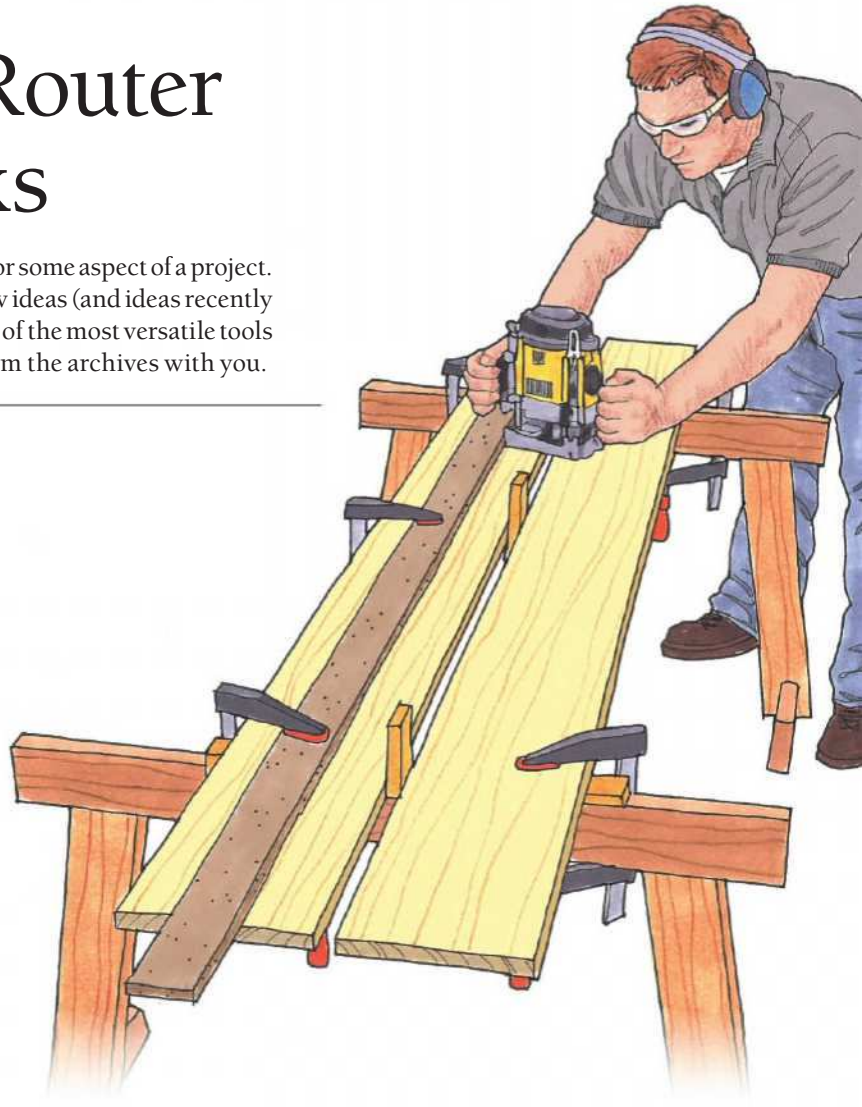
800.754.6920

CARD #83 or go to PWFREEINFO.COM

SAWBLADE•COM® GO DIRECT

Our Favorite Router Tips and Tricks

Rarely a day goes by when we aren't using a router for some aspect of a project. We've been building all kinds of jigs and trying new ideas (and ideas recently unearthed from our archives). A router is truly one of the most versatile tools in the shop, and we just had to share these tips from the archives with you.

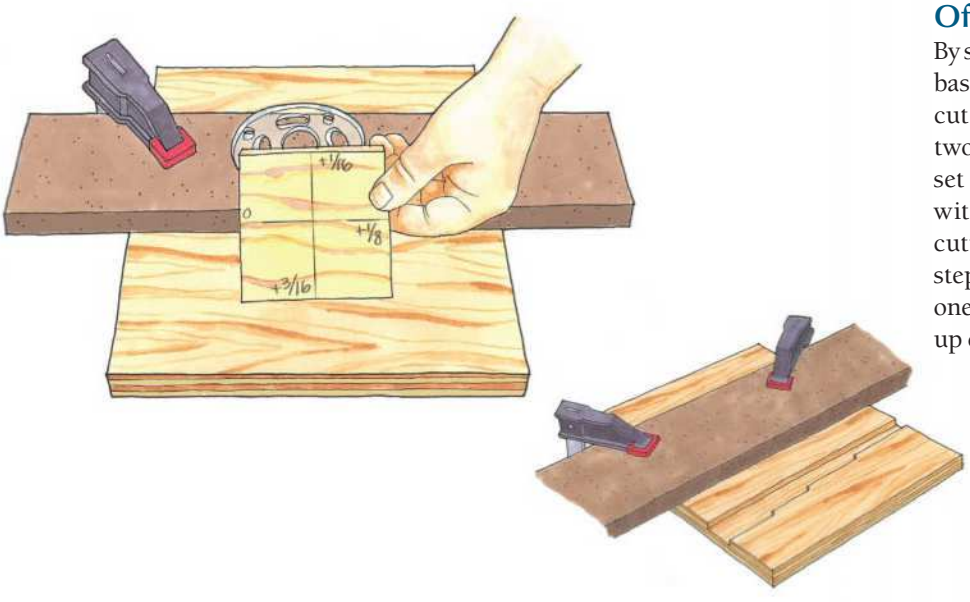


Router Jointer

You can use a router to joint two boards at once. This is a really handy trick if you don't have a long-bed jointer or you don't have a jointer at all, and you're working with really long stock.

The trick is to rout both boards at the same time, so the edges mirror each other. Bowed or not, they'll always fit tightly. To set this trick up, mill three spacer blocks to 11/16" thick. Clamp the boards to a pair of sawhorses with the spacers between them.

Chuck a 3/4" bit in your router. Clamp the guide board so the bit takes an equal amount off both boards, about 1/32". Ride the router tightly against the guideboard, removing the spacers as needed. Any deviation or wandering from the router will be mirrored on the opposite board, providing a perfect fit.



Offset Router Base

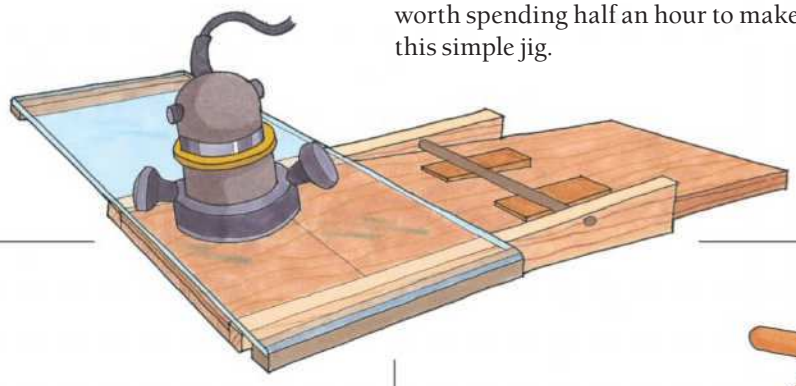
By simply adding a custom, shop-made base to your router, you can adjust your cut distance from the fence. A turn (or two, or three) of your router and you've set a new distance. This kind of base, with different offsets, can be used for cutting dadoes and rabbets, as well as stepped rabbets. You could also make one with 1/32" graduations for sneaking up on cuts and fine fitting dadoes.

ILLUSTRATIONS BY MARTHA GARSTANG HILL

CONTINUED FROM PAGE 20

Router Scarfing Jig

Boatbuilders often need to join boards end to end to make longer planks. Instead of a butt joint they make a long taper on each board and overlap the ends. This is called a scarf joint. One or two scarf joints are easily planed by hand, but for any quantity it's well worth spending half an hour to make this simple jig.



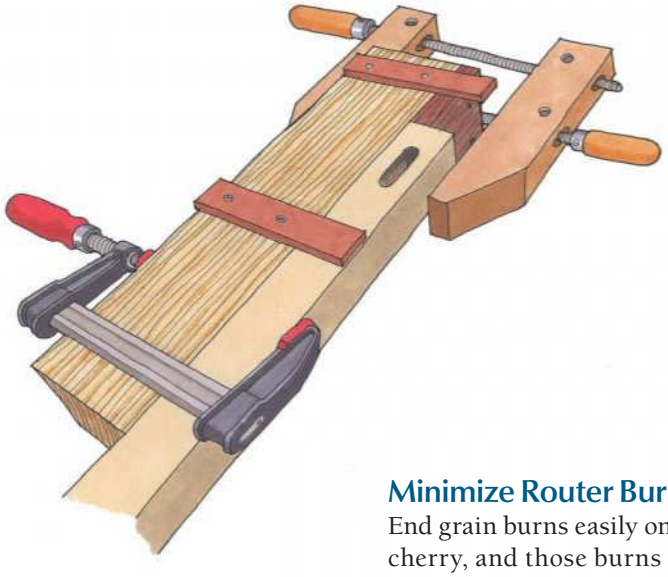
The illustration shows 3/4" stock being joined with a slope of 8 to 1, which gives an overlap of 6". Position the plank so the end to be joined is flush with the end of the jig and wedge it securely. Make one pass with the router using a straight-flute plunge bit to remove the bulk of material. Then reset the router for a second, lighter cut, stopping just short of a feather edge at the plank end. You may wish to clean up the scarf with a few passes of a low-angle block plane.

No-Fuss Mortising Jig

Want a dirt-simple mortising jig? This one takes just a few minutes to put together, not the whole weekend. You will need a plunge router equipped with an edge guide.

First, clamp a 3"- to 4"-square block to your bench. Fasten a 5"-long stop block to its side, near one end. Butt your workpiece up to the stop block and clamp your workpiece to the large block. (A large handscrew is ideal for this job because it has a deep reach.)

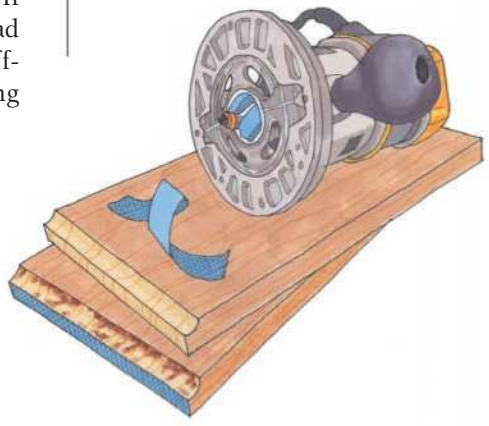
Lay out your mortise on the workpiece and adjust the router's edge guide so the bit cuts within the layout marks. Finally, add two stop blocks on top of the big block to limit the back-and-forth movement of your router. These blocks define the mortise's length. If your mortises are centered, go ahead and cut all of them. If they are offset, simply change the fence setting as needed.



Minimize Router Burns

End grain burns easily on maple and cherry, and those burns are hard to remove. Here is an easy solution that removes those unsightly burns without requiring that you adjust the bit's height or fuss with an edge guide.

Before routing, three layers of masking tape on the bottom of the board's edge, where the bit's bearing rides. Then make two passes. The first pass produces the rough profile, when burning is most likely to occur. After making the initial pass, remove the tape and rout again. This very fine second pass removes all but the worst burns. If this method still leaves scorches, your feed rate is too slow or you need a new router bit.



QUICKSCREWS GUIDE TO YOUR HOME RENOVATION

KITCHEN

Quickscrews carries the screws you need for every stage of your kitchen remodel:

- **Cabinet Assembly Screws**
- **Cabinet Install Screws**
- **Drawer Slide Screws**
- **Drawer Front Adjusting Screws**
- **Countertop Bolts**
- **Sink Hardware**
- **Hinge Screws**

BACKYARD

Get your backyard ready for summer with the only screw you will need to build your new fence or deck:

- **Exterior Decking & Fencing Screws**

BATHROOM

Create your own at-home spa retreat using Quickscrews:

- **Cabinet Assembly Screws**
- **Cabinet Install Screws**
- **Drawer Slide Screws**
- **Hinge Screws**
- **Drawer Front Adjusting Screws**
- **Drywall Screws**

CLOSET

Give yourself the space and storage you need:

- **Confirmat Screws**
- **Cabinet Assembly Screws**
- **Cabinet Install Screws**
- **Drawer Slide Screws**
- **Hinge Screws**
- **Drawer Front Adjusting Screws**

WWW.QUICKSCREWS.COM | (800) 743-6916

Milwaukee Cordless Chainsaw

No gas, no fumes and plenty of power for green woodworking.

I made the switch to battery-powered chainsaws for my tree service work in 2011 when pro-duty models first became available, and I never looked back. Battery power has replaced 2-stroke fuel on my jobs for all but the largest removals, and also replaced corded electric power at the shop for all but the longest rips when milling. As with many other tools, the grab-and-go convenience of cordless makes the choice easy. And compared to gas, there are appreciable benefits with reduced noise, toxic exhaust fumes, small engine maintenance and fuel hassles. It's also nice to have a saw you can use indoors when needed.

Milwaukee is the latest manufacturer to come out with a battery-powered chainsaw, and it's part of the same 18-volt platform as their most common cordless tools. The compatibility with other batteries and tools is a nice feature. Many similar chain saws are part of higher voltage outdoor power equipment lines so the battery pack you buy with those saws has limited uses.

I process interesting tree pieces into unusual lumber and sculptural parts, so I rip a lot of logs, tree crotches and curved branches down their length. Since these pieces are usually too unwieldy to run through the band saw, a chainsaw is the tool for the job. After filling the Milwaukee saw with biodegradable bar and chain oil (well worth the cost—trust me), I put it to work sectioning up various hardwoods into rustic bench parts. The 16" bar is a size I use frequently, and the saw had decent balance and handling. It's a bit heavy at 14 pounds, but 3.35 pounds of that is the monster battery pack. I liked the steel bucking spikes and didn't mind that adjusting the bar required a wrench, but I wished the tool had a motor brake. And while I'm complaining, the acute angle of the clutch cover (seemingly designed for cosmetic appeal) trapped shavings readily behind the sprocket and was difficult to clear.

While not as fast under load as the more powerful saw I usually rely on, overall the Milwaukee proved to be a very gutsy saw, capable of powering through wood with the bar fully buried. That is, as long as I had the proper battery pack installed.

A great roughing saw. *An electric chainsaw is a great tool for turners, green woodworkers and anyone who doesn't want to deal with gas and engines for sizing and roughing out raw logs.*

To evaluate cutting speed and runtime, I crosscut a freshly felled aspen trunk 7 1/2 inches in diameter – sized about half the usable length of the saw's bar. Using Milwaukee's new 12 Ah battery pack, which is optimized for the tool's brushless motor, I made 54 half cuts and timed the first several at an average 5.43 seconds. With a 9 Ah high density pack it also ran strong and almost as fast at 5.68 seconds. However, with a standard size 4 Ah pack, I only made 8 cuts at an average 7.43 seconds before the battery cells overheated and cut out.

So though this saw fits M18 battery packs of all capacities and ages, buying the saw tool-only and relying on any old M18 packs you already have around won't cut it. For satisfactory performance with full-speed cutting free from stalling, the large 9 Ah or 12 Ah packs are the key.

— Michael Springer

M18 FUEL Brushless Chain Saw

Milwaukee Tool ▪ milwaukeetool.com

Street price ▪ $400 with 12 Ah battery and charger

PHOTOS BY THE AUTHOR

SHOP FOX

INNOVATIVE PRODUCTS SINCE 1989!

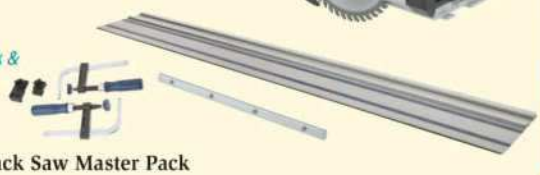
SHOP FOX® machines are backed by a 2 Year Warranty!

TRACK SAW MASTER PACK

- Motor: 120V, 1.1kW, 5500 RPM, 9A
- Blade rim speed: 9070 FPM
- Max. cutting depth at 45°: without rail 1 5/8", w/ rail 1 7/16"
- Max. cutting depth at 90°: without rail 2 5/32", w/ rail 1 31/32"
- Includes saw blade: 160mm x 20mm x 48T
- Dust port dia.: 1 1/2"
- Saw weight: 11 lbs.

W1835 Track Saw

Includes:
Accessory Pack & 55" Guide Rail



W1832 Track Saw Master Pack

7" 2 HP PLANER MOULDER W/ STAND

CSA C 177335 US

- Motor: 2 HP, 240V, single-phase, 10.8A
- Cutterhead speed: 7000 RPM • CPM: 14,000 • CPI: 64-300
- Feed rate: 0-18 FPM • Max. profile: 6 3/4"W x 3/4"D
- Planing width: 7" • Min. stock length: 9"
- Min. stock thickness: 1/4" • Max. stock thickness: 7 1/2"
- Overall dimensions: 36 1/4"L x 22"W x 34 1/2"H
- Approx. shipping weight: 324 lbs.

PATENT OWNED BY WOODSTOCK INTERNATIONAL INC.

W1812 7" 2 HP Planer Moulder w/ Stand
D3393 Elliptical Jig for W1812

10" TABLE SAW WITH RIVING KNIFE

- 3 HP, 230V, single-phase
- Blade tilt: Left, 0°–45°
- Table height from floor: 34"
- Cast iron table size: 27" x 40 1/4"
- Table size with extension: 27" x 53 5/8"
- Arbor speed: 4300 RPM
- Arbor size: 5/8"
- Max. dado width: 13/16"
- Max depth of cut @ 90°: 3 1/8", @ 45°: 23/16"
- Max. rip capacity: 29 1/2"
- Overall dimensions: 62" L x 41" W x 40" H
- Approx. shipping weight: 527 lbs.

Includes 10" Carbide-Tipped Blade

CSA C 232857 US

W1819 10" 3 HP Table Saw with Riving Knife

13" 3/4 HP, BENCH-TOP OSCILLATING DRILL PRESS

- Motor: 3/4 HP, 110V, 1725 RPM
- Overall height: 38"
- Spindle travel: 3 1/4"
- Swing: 13 1/4"
- Drill chuck: 5/8"
- Speeds: 12, 250–3050 RPM
- Table: 12 3/8" dia.
- Table swing: 360°
- Table tilt: 45° left & 45° right
- Approx. shipping weight: 123 lbs.

W1668 13" 3/4 HP, Bench-Top Drill Press

12" X 15" VARIABLE SPEED BENCH-TOP WOOD LATHE

- Motor: 3/4 HP, 110V, single-phase, universal motor
- 12" swing over bed
- 15" between centers
- Two spindle speed ranges: 500-1800 RPM & 1000-3800 RPM
- 1" x 8 TPI RH thread spindle size
- Spindle indexing in 15° increments
- Heavy-duty cast-iron construction
- Approx. shipping weight: 87 lbs.

W1836 Bench-Top Wood Lathe

KNIFE BELT SANDER/BUFFER

- Motor: 1 HP, 110V, 14A, 1725 RPM
- Belt size: 2" x 72"-76" range
- Belt speed: 4500 FPM
- Left arbor: 1" x 8 1/2" extension with 5/8" arbor
- Height with belt arm horizontal: 11 1/2"
- Height with belt arm vertical: 37"
- Overall width: 29 1/2"
- Cast iron body
- All ball bearing construction
- Approx. shipping weight: 113 lbs.

New

W1843 Knife Belt Sander/Buffer

14" SUPER-DUTY RESAW BANDSAW

- Motor: 2 HP, 110V/220V (prewired 110V), 1720 RPM
- Amps: 15A at 110V, 7.5A at 220V
- Table size: 21 3/4"L x 16 1/2"W
- Table tilt: 5°, 45°
- Floor to table height: 37"
- Max cutting height: 14"
- Max throat capacity: 13 1/2"
- Max cutting width with fence: 12"
- Overall size: 29"W x 32 1/2"D x 76"H
- Dual 4" dust ports
- Footprint: 23"L x 18"W
- Approx. shipping weight: 388 lb.

New

Made in an ISO 9001 Factory

W1849 14" Super-Duty Resaw Bandsaw

WALL DUST COLLECTOR

CSA C 247569 US

- Motor: 1 HP, 120V/240V, single-phase, prewired 110V, 7A/3.5A
- Air suction capacity: 537 CFM
- Static pressure: 7.2"
- Intake hole size: 4"
- Impeller: 10" balanced cast-aluminum
- Bag size (dia. x depth): 13 1/2" x 24"
- Bag filtration: 2.5 micron
- Dust level viewing window
- Height with bag inflated: 44"
- Approx. shipping weight: 55 lbs.

W1826 Wall Dust Collector

WOODSTOCK® INTERNATIONAL, INC. IS ALSO HOME TO ROMAN CARBIDE®, PLANER PAL®, JOINTER PAL®, AND MANY OTHER FINE BRANDS.
PLEASE VISIT OUR WEBSITE OR CALL TOLL FREE TO FIND AN AUTHORIZED DEALER NEAR YOU.

SHOPFOX.BIZ
sales@woodstockint.com WHOLESALE ONLY

WOODSTOCK INTERNATIONAL INC.

1-800-840-8420

19401

Bosch Cordless Palm Edge Router

There's something to be said about the form of a tool that impacts your desire to pick it up and use it – especially when the form has been designed to address a particular process. And that's what initially caught my eye with this Bosch router.

The Bosch 12-volt palm edge router is designed for edge work, with its elongated base plate and a grip that centers your hand directly over the bit. The form provides a degree of balance that is uncommon to most other trim routers in this category. The traditional barrel shape of routers predisposes the user to tip the tool when uneven pressure is applied.

GKF12V-25 Max Palm Edge Router

Bosch Tools ▪ boschtools.com

Street price ▪ from $150 (tool only)

In my testing, I had no issue with irregular edges due to tipping and found the micro adjust to be convenient and simple. A black button releases a coupling from the adjustment thread and the black plastic nut dials in the depth. Bit changes were easy with the prominent red spindle locking bar. And even though it only uses a 12-volt battery, it had plenty of power for all of the edge routing and trimming I do over the course of a project.

I tested the advertised drop sensing technology in our office and was surprised to find that the router had to hit the floor with a generous amount of force before the tool would turn off automatically.

And you really can't beat the convenience of a cordless router. Just like most shops today use cordless drills, a cordless router is a great addition to your arsenal. At just over 3" tall when lying on its side, this router can comfortably fit in any toolbox drawer, ready for edge work.

— David Lyell

Morakniv Wood Carving Set

If you're looking to jump on the Slöyd bandwagon and start carving spoons and other wooden objects, this set of two knives is a great starting point. And they're made in Sweden, where Slöyd is still a part of the school curriculum.

First, you get a straight carving knife (Morakniv's wood carving 120 model). Its thin blade is about 2 1/2" long and made from laminated steel. It comes razor sharp out of the box and held its edge well through a variety of carving tasks in both green and dry hard wood. It's stout enough to do some roughing work, but it really excels at detailing and refining shapes.

The hook knife (model 164) has a 1/2" internal radius that works well for spoons, refining bowls and shallow surface carvings. Its single-edged and made for right-handers making pull cuts (sorry, southpaws).

Both knives come with roughly-finished birch handles. They felt a little bit small in my meaty mitts, so re-handling the knives is in my future. Because the handles are wood, you can also shape them to your liking. The package comes with a plastic sheath for the straight knife, too, but mine broke after some particularly hard use in the woods. I wasn't too upset, though, as a custom wood and bark sheath is an excellent next project (see page 24).

This set of two carving knives retails for $60, saving you about $20 versus buying them separately. That means you have enough leftover to pick up some sharpening supplies.

— Andrew Zoellner

Wood Carving Set

Morakniv ▪ morakniv.se

Street price ▪ $60

ROUTER PHOTO: COURTESY OF THE MANUFACTURER / KNIVES PHOTO: ANDREW ZOELLNER

nova DVR Saturn

AVAILABLE EXCLUSIVELY AT WOOODCRAFT

teknatool.com

The power and capacity to handle any project within a compact working area. 16" bowls to 29" platters. Pens to extra long spindle work. With its wide variable speed range and powerful motor, the NOVA Saturn DVR Lathe can handle all turning projects.

- DIRECT DRIVE - NO BELTS
- 1.75HP DVR MOTOR
- 100 - 5,000 RPM
- 16" SWING OVER BED - EXTENDABLE*
- 24" BETWEEN CENTERS - EXTENDABLE*
- 360° SWIVEL HEAD

* WITH ADDITIONAL PURCHASE OF OPTIONAL ACCESSORY

CARD #46 or go to PWFREEINFO.COM

Woodpeckers®

ULTRA·SHEAR WOODTURNING TOOLS

Keep the tool level on the lathe center line for fast stock removal & shaping of your project.

Roll the tool to one of the 45° bearing surfaces for a finishing cut that needs little or no sanding.

Nano-grain carbide & superior grinding methods make *Ultra·Shear* inserts the best on the market.

Woodpeckers, Inc. • STRONGSVILLE, OHIO
800.752.0725 **woodpeck.com**

MADE IN USA

CARD #52 or go to PWFREEINFO.COM

Oneida® Air Systems

The Industry Leader in Dust Collection

DUST & DEBRIS CYCLONE SEPARATORS

SUPER DUST DEPUTY®

Our patented Super Dust Deputy® cyclone turns your single stage dust collector into a SUPER Cyclonic Dust Collector and prevents filter clogging and suction loss!

- *Removes up to 99% of dust & debris from the airstream*
- *Eliminate clogged filters and suction loss*
- *Available in multiple inlet diameters*

DUST DEPUTY® DELUXE

Turn any wet/dry vacuum into a cyclonic super vacuum!

- *Removes up to 99% of dust & debris from the airstream*
- *Eliminate clogged filters and suction loss*
- *Saves time & money on expensive replacement filters & bags*
- *Adapts for use with any wet / dry vacuum*

Go to our website to see the nearest retail locations that carry these products and to learn more about the Dust Deputy® family of separators.

oneida-air.com

MADE IN THE USA SINCE 1993

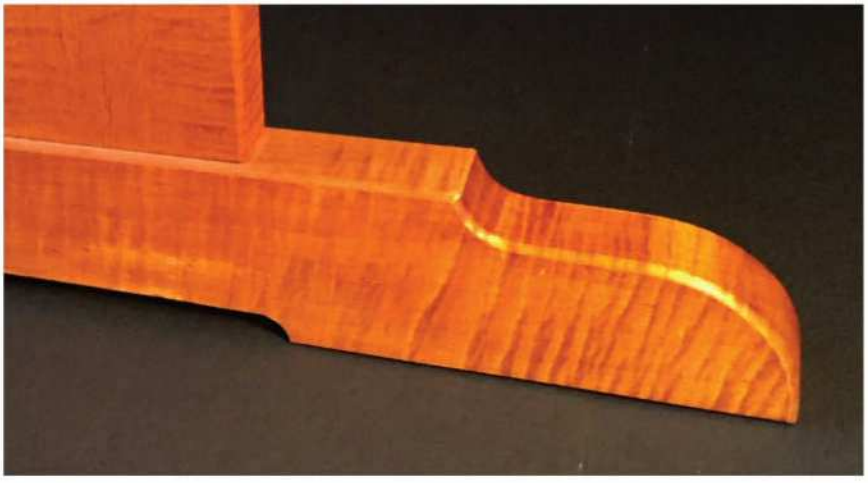
CARD #35 or go to PWFREEINFO.COM

Put Your Best Foot Forward

Understanding the details of a design.

For years, I gave little thought to what constituted good design aside from holding strong opinions about what I liked or disliked. A graceful Windsor chair could bedazzle me, but if pressed to explain why I found the chair beautiful, I struggled to find words to express myself. It was the same situation with furniture that set off my ugly meter. The siren would go off in my head with lights flashing and horns blowing, but I was dumbfounded to explain what details tripped the alarm. On a practical level, that meant that if I wanted to make even a small adjustment to a design, I was stumbling in the dark guessing without any confidence at what was wrong, unsure if I was moving in a positive direction.

It's good to begin your design journey by focusing on your strong likes and dislikes. That inner sense, your gut reaction to design, is one of your most powerful tools. The skills needed to become a proficient designer require leveraging your inner likes and dislikes with solid facts about design. As you develop design skills you'll likely become more opinionated, even downright curmudgeonly, but in a good way. Your opinions will reflect a truer grasp of what works or doesn't work in a design, and that's a huge step forward in your design abilities. It means less guessing in the dark. And because your opinions become more defined, when you do begin to home in on a sweet spot, you'll feel sure of the direction you're taking.



Find the sweet spot. *Finding the sweet proportion on this trestle table foot is a good way to train your eye.*

Mind your neighbors. *Gauge small parts with the nearest neighbor. How does this pull compare with the height of the drawer?*

Does This Go With That?

In any creative endeavor there is a set of foundational skills that provide structure to express your idea. For a painter, those foundational skills might be learning about the color wheel or understanding value (light and shadow). For a musician, it might be learning scales and understanding tempo.

Traditionally, in the building arts, the important foundational skills are mastering proportions, learning to draw and developing a working knowledge of artisan geometry. Artisan geometry is not some fancy math, but a practical understanding about how to construct simple shapes using points and lines. Geometry is used to imagine a structure, and then proportions are employed to tie all the parts in that structure into a harmonious whole. Drawing combines those two skills in rough sketches and more finished renderings to help visualize and sort through ideas.

Of these three skills, mastering proportions is the one that will help you most to harness your powerful inner sense. At the simplest level, proportions express how one part relates to another part and how that initial part relates to the whole. We are acutely aware of proportions in our own human form, and patterns of proportions in our own bodies. This understanding spills over into how we make judgments about the thickness of a chair seat or the width of a door panel.

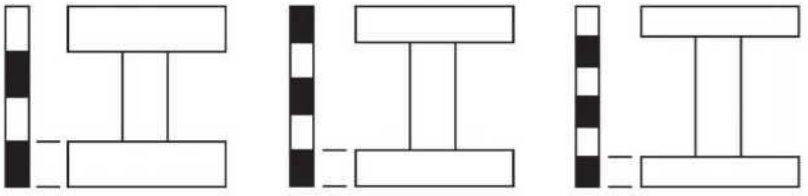
Patterns of Proportions

We respond to proportions on two levels. On the first level, we look at individual parts and compare how they relate to other nearby parts. With small parts like a drawer pull, we might compare it to the height of the drawer it's attached to. It wouldn't help much to

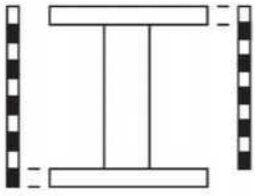
CONTINUED ON PAGE 22

PHOTO & ILLUSTRATIONS BY THE AUTHOR

CONTINUED FROM PAGE 20



Test and refine. *Sneak up on the height of the foot until you hit the sweet spot.*



Use division. *To size the upper bracket, divide and then divide again.*

A multi-purpose foot. *This carving makes a bold visual beginning, anchoring the form to the floor and telling a story.*

compare the drawer pull on the bottom of a chest with the crown moulding at the top of the piece any more than if we compared the size of our nose with our big toe.

On the second level, we compare how major parts relate to the whole piece. We might consider how the thickness of a table leg compares to the entire table. This comparison is completely subjective. A country farm table may call for a stouter leg than what's appropriate for a more formal table with the same overall dimensions.

A Good Beginning

A practical exercise that helps us understand proportions is sizing a foot for a table leg. Furniture often has some sort of foot to establish a beginning to the form. There's a wide variety in traditional designs from the boldly carved ball and claw to much more subdued feet that can be as simple as a small tapered cuff or even a narrow band of inlay marking the bottom of the leg. All of these design elements are telling a story that the viewer can read with his eyes. The elements say, this is the beginning of this form, and here is where the form transitions to the ground. The main difference between these design elements is that the carving points out the beginning with a strong voice while the band of inlay whispers.

We're doing the exact same thing when we employ a base moulding on a cabinet. We're giving it a distinct beginning, and hopefully a good one. The tricky part is getting that base or foot to harmonize with the structure above it.

Sizing a Trestle Foot

Here's a drawing I worked up to size the foot section for a small trestle table. It consists of a base or foot (beginning), a support structure (middle) and a top bracket (ending). Before I make any decision about the final contours of these components, I block them in with simple rectangles to workout the overall proportions.

In this case, I'm focusing on the height of the base and how it complements the structure above it. I do that by taking the entire height of the trestle and dividing it into equal parts, then assigning one part to the height of the foot. If I wanted to have a stout foot, I might divide the height into four parts and give the bottom fourth to the foot. Yikes, that's way too clunky, but I'm giving that inner sense of proportion in my head something to actually compare with.

More importantly, by dividing the overall height, I'm making my eye compare the proportions of the base with the height of the whole trestle assembly. Since dividing by four was way too heavy, I tried dividing by six. Then dividing by eight and then by nine, which didn't work either. For my eye, the sweet spot was dividing by 10.

Here's a tip on proportioning the upper bracket on this trestle assembly. You could make it the same height as the lower foot since it's hidden from view. However, it will complement the entire assembly by making it lighter by decreasing its height. You often see this on the rails of windows or doors; the upper rail is reduced in height, giving it a lighter feel toward the top.

Traditional artisans had a quick way to proportion this top component in comparison to the bottom. Since the bottom is sized by dividing the overall height by 10, simply dividing the remaining height above the foot again by 10 gives you a top bracket that's just slightly less in height than the bottom foot.

George Walker is the co-author of two design books and writer of the By Hand & Eye *blog (with Jim Tolpin).*

ONLINE EXTRAS

For links to all these online extras, go to:

- **popularwoodworking.com/oct18**

BLOG: *Read more from George R. Walker on his By Hand & Eye blog with Jim Tolpin.*

About This Column

Design Matters

Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.

Slöyd Knife and Sheath

Hone your skills and customize your tools.

I have used a slöjd (or slöyd) knife for decades. Fitting them with a handle of your own making is pretty simple, and quite rewarding. You can tailor the handle to suit your hands and/or your eyes. I start with a knife blade made by Morakniv. They have several sizes and shapes, and their #106 is a favorite of many carvers the world over. I use the laminated steel version; it's easy to sharpen, but holds an edge just fine.

I've made handles from many different woods, often using figured maple. The past few knives I've carved designs in the handles, so I want no figure to compete with the patterns I've planned. I've gone for softer hardwoods like birch, or in the case of the knives here, butternut. The stock I use is riven and air-dried. Cut the handle blank just shorter than the knife's tang.

I lay out centerlines around the blank horizontally and vertically. I start with stock that is oversized and only roughly shaped. Stand it up in a vise and bore a hole through it from end to end. This hole matches the small end of the tang. I come in from each end and hope to meet in the middle. I trace the tang's outline on the side of the handle. Using the same bit, I bore holes above and below this first hole, to widen the opening at the top of the handle.

Once I've widened the holes enough I grip the blade in locking pliers and drive the handle on from below. I sit the blade in a dog hole on the bench for this step.

To shape the handle, I work around the blank evenly. Start by beveling each corner, working from the mid-point toward the handle, then reverse things and cut down toward the end. I start with a long-bladed paring chisel, sometimes with its bevel down to get a bit of a scooping cut. Keep testing the way

Make the opening. *I use an egg-beater drill and eyeball its relationship to the centerlines marked on the blank. Then I mark the outline of the flared tang on the handle blank. I tilt the bit over as I crank the drill to widen the opening for the tang.*

Shape the handle. *Pare the handle to shape now. I keep a swelling at the mid-point and taper the handle to each end. I begin by beveling the corners off then evenly pare every surface. The goal is to make the handle comfortable and no bigger than it needs to be.*

Assemble. *I start with the pliers on the upper end of the tang, and drive the handle most of the way on. Then I wrap the blade with duct tape and reposition the pliers for the last 1/2" or so. Drive the handle on so the tang exits just a bit at the bottom end of the handle.*

Shape with another knife. *Lightly pare with the slöyd knife. Keep alert to not hit metal with metal.*

CONTINUED ON PAGE 26

PHOTOS BY THE AUTHOR

CONTINUED FROM PAGE 24

A little metal work. *Peening the tang across the end of the knife handle is as much metal work as I want to do.*

No glue required. *I don't bother gluing the blade into the handle, nor the wedges, but gluing won't hurt. The bevel around the handle's end is carefully cut with the tip of a slöyd knife.*

Bark. *The yellow side of the bark forms both the inside and outside of the sheath.*

the handle feels in different grips. It's easy to leave it too thick and bulky. Fine-tune the shape with a slöyd knife. In all this work, be extra careful not to hit the blade with your edge tools, it's bad for both of them.

Mount the knife blade in a machinists' vise and gently peen the protruding tang across the end of the handle. Glancing blows from the hammer will spread the tang.

You can drive small wedges into the spaces around the blade. Make the wedges slight enough so they will not split the handle. While you're working that spot, you can also lightly bevel around the ends of the handle.

To make a sheath for the knife, I use strips of birch bark. Other bark – hickory, basswood/linden, elm and more – has all been used in one place or another. I have also used basket splints of both ash and oak for the same sort of sheath.

Make a strip wider than the blade, and four times its length. Fold it in half, and then fold the ends back to the middle, in on themselves. Next, slit one outside section in half. This slit just runs from one fold to the middle fold. It helps simplify the weaving.

The weaver is a long thin strip of bark, with one end tapered in width. Fold up the sheath so it's closed, and slide the tapered weaver under one half of the slit section at the bottom of the sheath. Wrap it over the next bit, and then wind it into the opening on the other side of the sheath.

Weaving proceeds inside and out, over one section, under the next. Alternate over/under and inside/outside as you wrap around the sheath. Pull the weaver snug, but not too tight. Taper the weaver again as you get to the top, and pull it in tight to finish.

Peter Follansbee has been involved in traditional craft since 1980. Read more from him on period tools and other topics at pfollansbee.wordpress.com.

Slice the bark. *Slice through the bark, just along one outside length.*

Weave. *Start the weaver under one part of the slit section. Wrap it over the next part, then push it in tight to the bottom end of the sheath.*

Fold and weave. *Now it becomes clear how the inside of the sheath is created with this folding and weaving.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct18**

ARTICLE: *"Spoon Carving"*

About this Column

"Arts & Mysteries" refers to the contract between an apprentice and master. The 18th-century master was contractually obligated to teach apprentices trade secrets of a given craft (and the apprentice was expected to preserve those "mysteries").

THE DC-3 CLASSIC MEN'S WATCH

MULTI-FUNCTION CHRONOGRAPH WITH 2 SUB DIALS AND STOP WATCH FUNCTION

IMAGE OF DC-3 PLANE ON WATCH FACE

GENUINE LEATHER STRAP

PREMIUM GRADE STAINLESS STEEL CASE BACK ETCHED WITH DC-3 AND IMAGE OF THE PLANE

FOR THOSE OF YOU WHO JUST MIGHT CHANGE THE WORLD

The DC-3 airliner will go down in history as the plane that gave passengers their first transcontinental flights, and changing the face of travel forever. Now you can wear a custom collector's watch that is destined to become as popular as the aircraft that inspired it—***"THE DC-3 CLASSIC" Men's Watch***.

INNOVATIVE DESIGN AND THE BOLD DETAILS OF A CLASSIC

This distinctive multi-functional watch features a vintage white dial adorned with an image of the plane along with "DC-3" and "1937", the year the aircraft first went into service. The solid stainless steel case back also features an image of the plane and *DC-3*. Numerals are in contrasting black as are the two sub dials indicating minutes and seconds. Special functions include a chronograph with a stop watch feature and a date display at the 6:00 marker. A genuine leather strap completes the classic look. This quality timepiece has a precision quartz movement and a quartz mineral lens... and it is backed by a full-year limited warranty and our unconditional, money-back, 120-day guarantee.

COLLECTOR'S EDITION - LIMITED TO 5000!

This hand-crafted collector's watch is a remarkable value at $179*, payable in 5 installments of $35.80. The watch arrives in a custom case along with a Certificate of Authenticity. Send no money now, just return the Priority Reservation below. **This is a limited edition watch—only 5,000 will ever be made!** So don't miss out—order today!

*For information on sales tax you may owe to your state, go to bradfordexchange.com/use-tax.

www.bradfordexchange.com/25429

A CUSTOM-CRAFTED WATCH DESIGN FROM THE BRADFORD EXCHANGE

LIMITED-TIME OFFER

*Reservations will be accepted on a **first-come, first-served basis**. Respond as soon as possible to reserve your watch.*

PRIORITY RESERVATION **SEND NO MONEY NOW**

THE BRADFORD EXCHANGE JEWELRY

9345 Milwaukee Avenue · Niles, IL 60714-1393

YES. Please reserve the **"DC-3 Classic" Men's Watch** for me as described in this announcement.

*Plus $11.98 shipping and service (see bradfordexchange.com). Please allow 4-6 weeks for delivery of your jewelry after we receive your initial deposit. Sales subject to product availability and credit approval.

Signature _____

Mrs. Mr. Ms. _____
Name (Please Print Clearly)

Address _____

City _____ State _____ Zip _____

E-Mail (optional) _____

01-25429-001-E28101

An Experimental Table

BY CHRISTOPHER SCHWARZ

Designer Enzo Mari gave the world this design (and many others). But are they worth building?

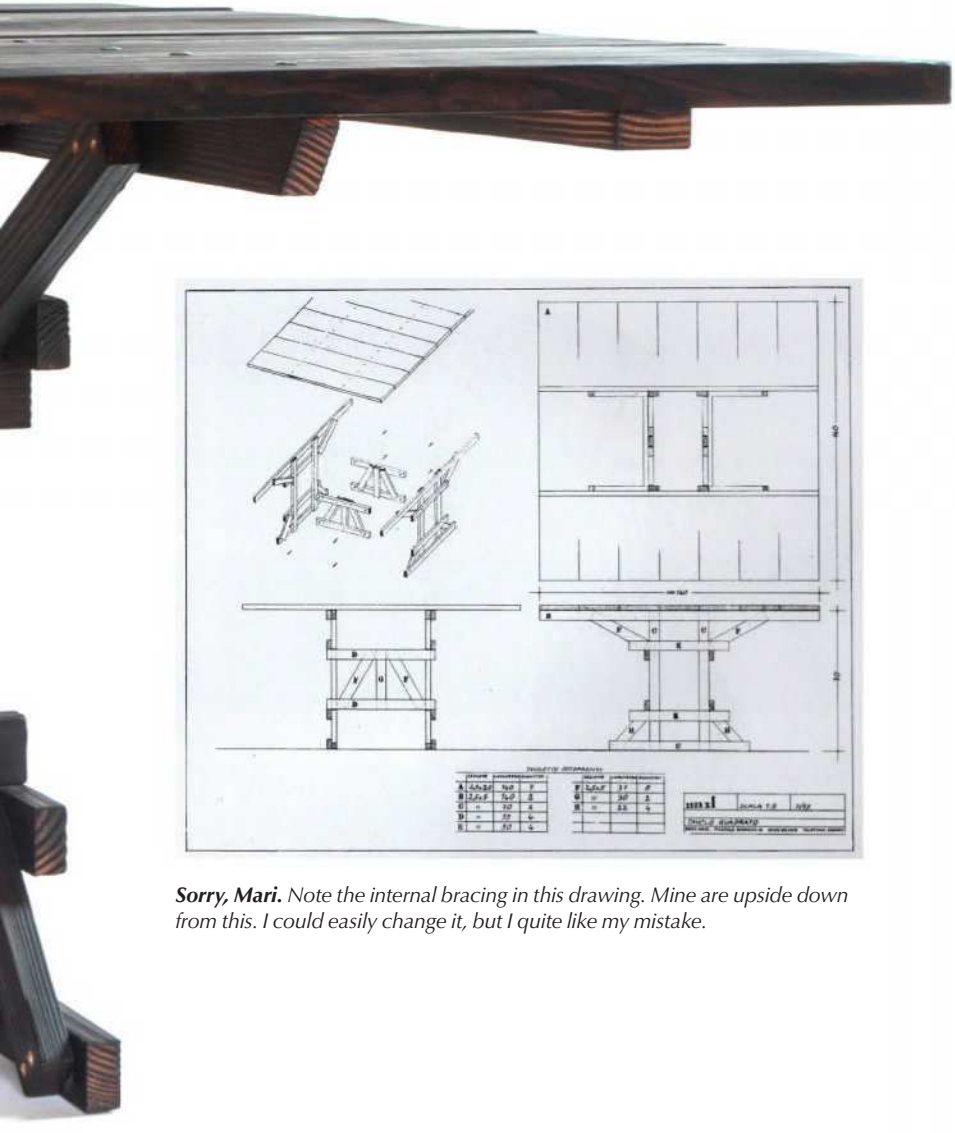
PHOTOS BY AUTHOR, ILLUSTRATIONS BY DANIELLE LOWERY

When my grandparents married before World War II, they bought a dining room set that cost several months of my grandfather's salary as a paper salesman. At that table, Popo and Grandma raised my father and uncle. And our family ate at that table every time we visited my grandparents until they died and the table was sent to who knows where.

Though this behavior might sound crazy now in the age of disposable flat-pack furniture, my grandparents were typical for their day. Before the 1950s, it was common for your furniture to stay with you your entire life. It also was common for it to cost quite a bit.

In 1974, Italian designer Enzo Mari observed how furniture was becoming less expensive and less durable. And so, he created an experiment that we can still hear echoes of today. The experiment developed into a book called "Autoprogettazione?" (Corraini), and it was a set of free plans for furniture that could be built using a handsaw and a hammer.

Mari wondered: Would people accept these pieces of utilitarian furniture into their homes? What would the reaction be to a series of sticks that were nailed together but served perfectly well as a bookcase, bed, dining table or chair?



Sorry, Mari. *Note the internal bracing in this drawing. Mine are upside down from this. I could easily change it, but I quite like my mistake.*

Furthermore, would people who built the pieces learn something from the construction process? Would they gain an appreciation for things that are well-made after having made something themselves?

This, according to Mari, is an important aspect of design: "Design is only design if it communicates knowledge."

I've often wondered about the pieces in "Autoprogettazione?" Could an experienced woodworker learn something from his designs? This year I decided to find out.

Tavola Quattro

This dining table, called Tavola Quattro, is larger than it looks. With a top that's 55" square, you can seat eight around it, thanks to the clever base that works like the truss on a bridge. The material required to build it is minimal. If you have a table saw, you can easily cut the material from five $1\frac{5}{8}$" x $11\frac{1}{4}$" x 12' pieces of construction lumber (total cost: $80). To assemble the table, you can use nails or wood screws. I planed all the pieces down to 1" thick and used #8 x $1\frac{5}{8}$" screws. If you don't have a planer, use #8 x 2" screws. Cost of the screws: $12.

My finish is shou sugi ban, a charred finish popular in Japanese architecture for making building materials fire- and bug-resistant. I charred the wood with a propane torch, brushed off the soot and then applied a finish of linseed oil and beeswax.

In the end, this might just be my fastest time ever for building a dining table for eight; only 10 hours of work. But was it a waste of time?

Parts & Fire

This project is a bit unusual in that it's best to cut all the pieces to size according to the cutting list, finish them, then assemble the project. Normally it's best to use a cutting list as a rough road map and make adjustments as you go. For this project, however, cut up all the parts, letter them and stack them in piles.

If you don't want to use the shou sugi ban finish, apply your finish of choice at this point using varnish, shellac,

paint, whatever. Or get out the propane weed burner and prepare for a blast (of heat, that is).

Propane weed burners are cheap tools that typically cost about $35 to $50. They attach to a propane tank such as one that fuels your gas grill, and they work like a flamethrower. The wood doesn't stand a chance.

I rested my project parts on cinderblocks and blasted them with the propane-fueled flame. Keep a squirt bottle of water (and a fire extinguisher) on hand to douse any flare-ups.

After charring the parts, use a stiff-bristled brush to scour the wood. This removes the excess soot so it won't end up on your hands and clothes when you use the table. Add any topcoat finish over the wood. I used Allbäck Linseed Oil Wax (available from Swede Paint Enterprises, swedepaint.ca). With the parts finished, it's time to start assembling the table (what, already?).

First the Top

The top is easy to assemble; there are no edge joints. Butt the edges of the boards together, drill clearance and pilot holes through your battens and screw the battens to the underside of the top.

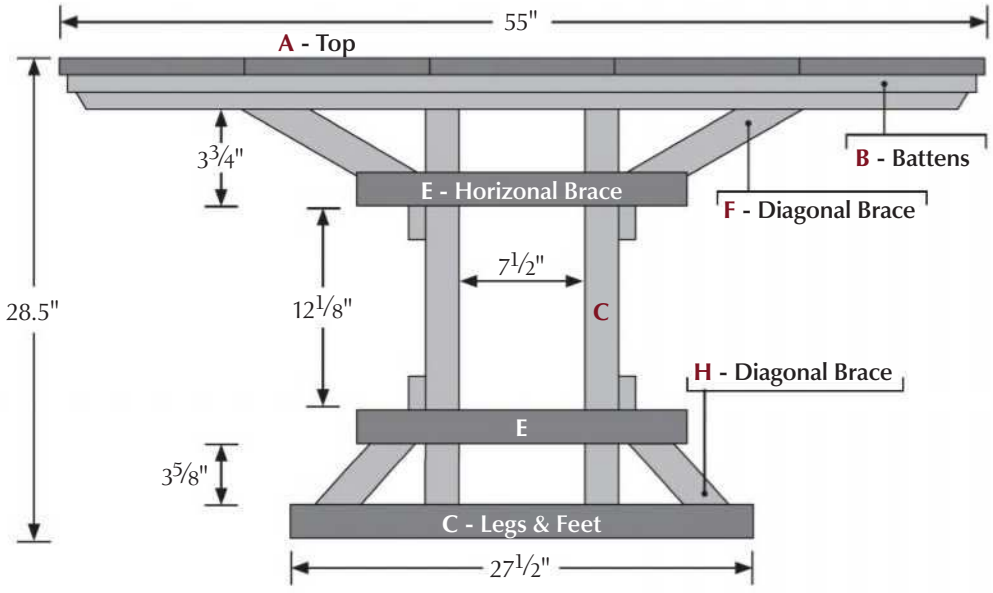
To help accommodate wood movement, I reamed out the clearance holes in the battens a little to allow the screws to pivot when the top boards shrink and expand. Set the top aside and make sure all your other parts are stacked and labeled with the appropriate letters as indicated in the cutting list.

Flattish. *The battens keep the boards of the tabletop in line. They weren't shown on Mari's original plans but were present on the pieces built by him and his students. You need them; otherwise the top will behave like a bunch of unruly diving boards.*

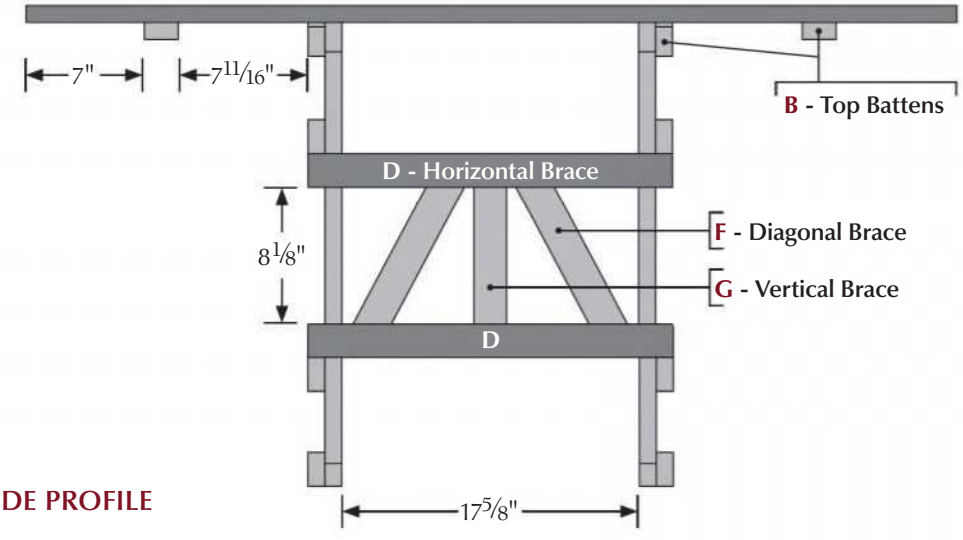
An odd way to work. *Normally I wouldn't cut and finish all my parts before starting a project, but this table is different. It's more like a factory-built item with standardized and interchangeable parts.*

Say hello to my little friend. *A propane weed burner, at left, pumps out 500,000 BTUs and gets the job done quickly and inexpensively.*

Black but clean. *Keep brushing the wood until you can touch its surface without turning your fingers black (below). Then apply a topcoat finish to the parts.*



FRONT PROFILE



SIDE PROFILE

Supplies Needed

- ❑ #8 x 1⅝" screws (Planer not available? Use #8 x 2" screws)
- ❑ 50mm square-shank nails (made by Rivierre Nails)

- ❑ Propane weed burner
- ❑ Propane tank
- ❑ Squirt bottle of water
- ❑ Fire extingusher

- ❑ Stiff bristled brush
- ❑ Top coat finish (such as Allbäck Lineseed Oil Wax)

- ❑ *Recommended:* MDF for making spacer jigs

Enzo Mari's Tavola Quattro

NO.	ITEM		DIMENSIONS (INCHES) T	W	L
❑ 5	A	Top	1	11	55
❑ 4	B	Top battens	1	2	54
❑ 6	C	Legs & feet	1	2	27 1/2
❑ 4	D	Horizontal brace	1	2	21 5/8
❑ 4	E	Horizontal brace	1	2	19 5/8
❑ 8	F	Diagonal brace	1	2	12 1/4
❑ 2	G	Vertical brace	1	2	11 3/4
❑ 4	H	Diagonal brace	1	2	8 5/8

Spacers at work. *The MDF spacer jigs allow you to line all your parts up without a lot of measuring. Mostly you are ensuring all the parts are centered on the legs.*

EXPLODED VIEW

Assemble the Ends of the Base

To make the ends easy to assemble, I recommend making four jigs from MDF that will space the parts accurately as you screw them to their neighbors.

Make one spacer jig that is 3 5/8" x 24". This will go between the foot of the table's base (C) and the horizontal brace (E). The second spacer jig is 3 3/4" x 24" and goes between the horizontal brace (E) and a top batten (B). The third spacer is 7 1/2" x 24" and goes between the legs of the table (C).

Lay the parts on top of one another as shown in the drawings and photos, using the spacer jigs to keep things square. Then screw the foot, braces and top battens to the legs.

After screwing the horizontal and vertical pieces together, add the four diagonal braces (F at the top, and H at the floor). To be effective, these braces need to contact the legs, plus the underside of the top and the feet. This diagonal bracing gives the table base its strength. After building one end assembly, build the second identically.

Connect the Assemblies

The two end assemblies are joined by four horizontal braces (D), which nest in corners created by the legs and the horizontal braces on the ends (E). To assemble the base, clamp the four braces (D) to the end assemblies. Screw them to the legs.

Now there is some internal bracing to install in the open spaces between the end assemblies. The vertical and diagonal braces here also keep the base from racking. Use the drawings as a guide. Note that I made a small error in my version of this table. My braces are arranged like the letter "W." On Mari's table they are arranged like an "M." I don't think it makes a difference.

Add the Top

The last step is to attach the top to the assembled base. I opted to use 50mm square-shanked nails made by Rivierre Nails (available from Lee Valley Tools or Lie-Nielsen Toolworks). These nails hold like the

That escalated quickly. *The base comes together fast when you screw the four horizontal braces (D) in place. If you don't have clamps, a helper can do that work as you drive in the screws.*

Finish nails. *Nails move with the seasons and, when properly installed, hold quite well. Also, I think modern screw heads are ugly. The blue tape helps guide my drilling.*

dickens and look nice, too. Drill pilot holes and nail the top to the table base below.

And in the End

After I completed the table, I was surprised by how much I liked it, despite the fact that it looked like a popsicle-stick craft-fair item. To my eye, its proportions are excellent. Thanks to IKEA, the table doesn't look all that strange (though I doubt my grandparents would have liked it). It is shocking how quick and easy it is to build. All the cuts are square. All the joints are quickly installed fasteners.

The biggest question is: Will it last? Are the screws stout enough to prevent the table from swaying (or worse) after a dozen Thanksgivings? There is only one way to find out: It has to be used and abused by a young family.

Mari once said his intention was this for his free furniture plans: "An idea came to me. If someone actually tried to build something, they probably would learn," he said. "If, for example, they were to buy a table, which is an industrial product, they would check on the prices of that item. And, having constructed something with their own hands, they would understand if a leg was well-made and did not wobble. This person would learn little things."

I learned a little thing, too. Maybe everything I make doesn't have to be dovetailed, drawbored and fussed over for weeks. Maybe, just maybe, I can relax a bit at times and build something simple and quick that is worthwhile and useful. **PWM**

*Christopher Schwarz is the editor at Lost Art Press and the author of "*Ingenious Mechanicks: Early Workbenches & Workholding.*"*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct18**

VIDEO: *Watch an interview with Enzo Mari.*

WEB: *Download other plans from "*Autoprogettazione?*"*

WEB: *Download our free "*I Can Do That*" manual*

A Woodworker's Guide to Custom Cabinets

BY NANCY R. HILLER

Use this simple, strong method for constructing kitchen cabinets and other built-ins.

I am often tempted to say that there are as many ways to build cabinets as there are cabinetmakers. It's an exaggeration, I know, but it gets at a basic truth about the world of cabinetry and built-ins: There is no single "right" way to build them.

At the first shop where I worked, a custom cabinetmaking business in rural England, we built casework out of melamine-coated particleboard. We joined the sides, tops and bottoms using thin plywood splines, then applied solid wood face frames made with a shaper-cut bridle joint. The face frames were glued onto the cases with more plywood splines. Our doors and drawer fronts were inset, and we hung the doors on solid-drawn brass butt hinges mortised only into the door, then simply screwed onto the inside edge of the face frame.

At the next shop, also a rural English operation, we made casework out of solid pine floorboards. The first step was to glue and clamp the tongue-and-groove material in long lengths, then flatten them on a stroke sander and saw the parts to size. We housed the cabinet floors in dados. Although I can't recall which type of joinery we used for the tops, I know we weren't using biscuits; I didn't encounter a biscuit joiner until I moved back to the United States. We applied face frames with a simple butt joint and glue. All of our doors were inset, hung on solid-drawn brass butts; our drawers ran on traditional wooden runners, and we dovetailed our drawers by hand.

Much of my current carcase-building technique comes from what I learned at a contemporary furniture business in Vermont. There, we built casework from beautifully veneered MDF, joining the parts with biscuits and Twin-thread screws. It was amazingly quick and simple. Doors were full overlay, hung on European hinges; a novelty for me. Drawers, too, were full overlay and ran on Accuride ball bearing slides.

In the 23 years since I started my own business, I have selectively adopted new materials and methods. The method I use most often for built-in cabinetry combines simplicity and strength for the basic casework with materials and techniques that owe more to the world of furniture than that of contemporary commercial cabinetmaking. The technique I will describe here is a hybrid that draws on what I learned at the different shops where I have worked. I have chosen materials and methods that make sense for my business, given my clientele and the styles in which I specialize.

Just like the originals. *For a recent job, Hiller built new cabinets, such as the sink base visible here, on details drawn from the surviving original built-in at right.*

Preliminaries

When designing built-in cabinets, you need to think about installation – and take into account certain features of the cabinets' future context. I'm not referring to aesthetic features alone – timber species, hardware, how the various cabinet components will interrelate (will the doors be inset or overlay?), or style (slab doors or frame-and-panel?). I'm also referring to how the cabinets will literally intersect with the walls, floors, and ceilings, which are rarely square, level, or plumb. There are many ways of handling these points of intersection, and each has distinct period

PHOTOS BY AUTHOR, ILLUSTRATIONS BY DANIELLE LOWERY

and other cultural connotations.

For example, many built-ins from the early 20th century were made with flush kicks – the bottom rail of their face frames extended all the way down to the floor. By the 1930s the recessed kick had become nearly ubiquitous – no surprise, considering how much easier it is to install than a flush kick that has to sit on an uneven floor.

The cabinet I'm building in this article was designed for the kitchen of a 1912 house. I planned to scribe (saw and plane) it to the floor and to the wall at its left; that's why the face frame protrudes beyond the cabinet's left side.

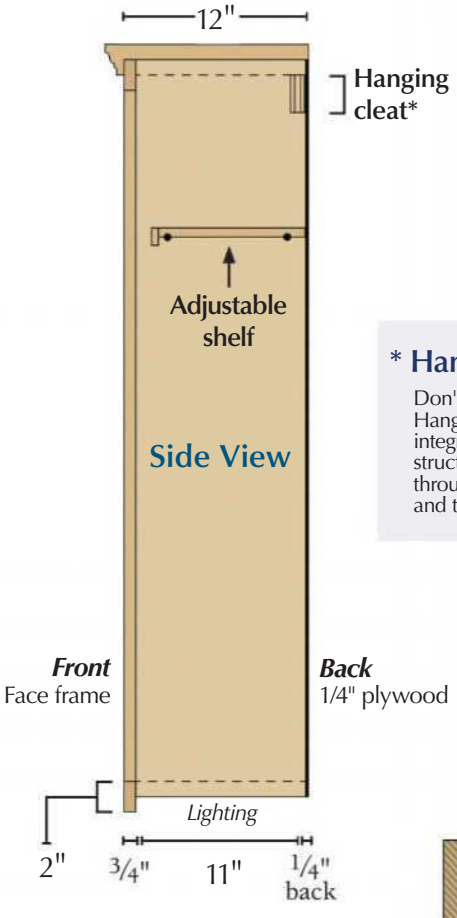
Unless you're running a production facility where you build things in multiples to standard sizes, you should take the building work in stages. That way you'll have a chance to adjust the different parts to fit what you've made so far, instead of finding that your face frame is 1/16" too narrow or you cut the recess for your kick ¼" too high. Some people start with face frames then build their carcases to fit. I work the other way around. Once the basic cases have been assembled, I move on to faces.

Let's Get Going

So you have your scale elevations at hand and have made a cutting list based on them. My typical material for kitchen casework is ¾" maple-faced veneer-core plywood, prefinished on one side. The prefinished side goes to the cabinet interior; it saves a lot of time, which helps make my work affordable. That said, some jobs call for painted interiors or other finish treatments, so I always choose the sheet material to suit the job. (See page 38.) The next step is to cut your basic parts (sides, tops and cabinet floors) to size. Because I'm building each job to genuinely custom dimensions, some base cabinets may not be designed to end up 24" deep or 36" high. (For example, I love a 38"-high counter. It should go without saying that the carcase height must be adjusted to allow for the thickness of whichever counter material you'll be using.) And even if most of the uppers in a kitchen job will be 12" deep, one may be a 5"- deep spice cabinet, while another may be 16" deep.

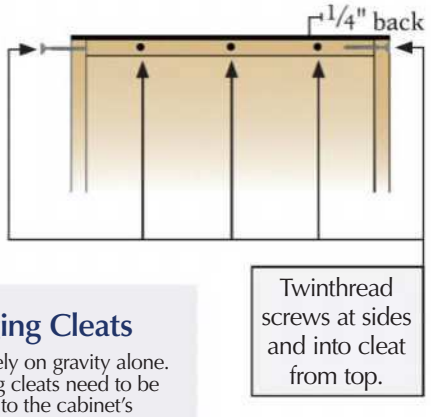
Rip all of the sides and floors to width. The edges and corners of sheet goods may not be square, and they of-

UPPER CABINETS



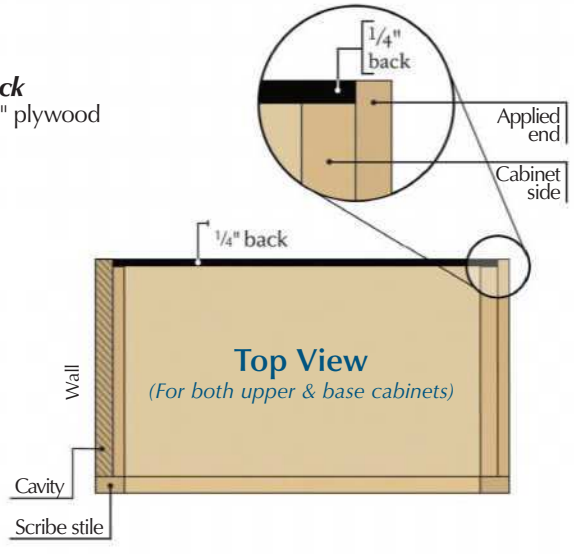
Plan View

(Showing hanging cleat before side panel attachement)

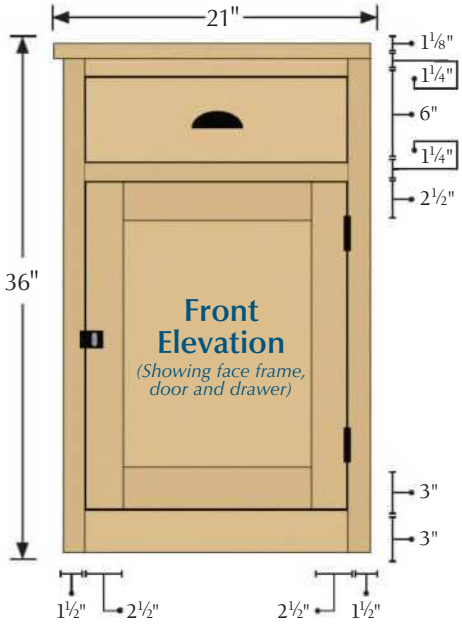


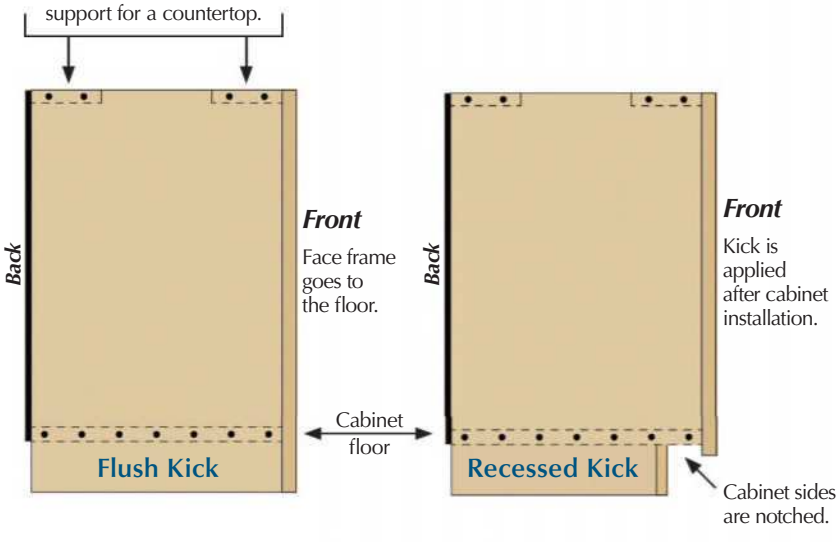
* Hanging Cleats

Don't rely on gravity alone. Hanging cleats need to be integral to the cabinet's structure. Attach them through the cabinet sides and top.



BASE CABINETS





SHELF-SPACING CONSIDERATIONS

- There is no point in putting shelf support holes too close to the cabinet floor or top (or in cases where there will be drawers above the shelf compartment, too close to the drawers) where there would not be enough room to store anything on the shelves. Think about what the shelves will need to hold and plan their spacing accordingly. If the bottom of the cabinet will be holding flower vases that are 12" tall, there may not be any point putting shelf support holes lower than about 13" above the cabinet floor.

- Holes at the back of the cabinet should be about 1" forward from the back edge to allow enough space for fingers when inserting and removing supports.

- Holes near the front of the cabinet should be positioned close enough to the front edge of the shelves that they prevent the shelves from tipping when someone is putting an object away or taking it out. At the same time, take any lipping at the front edge of the shelf into account. In general it's a good idea to center the front shelf support holes about 5/8" on center behind the back face of a shelf lipping that hangs below the underside of the shelf.

- Consider how much adjustability is really necessary for the shelves in a given cabinet. For cabinets that will store shorter items such as juice glasses and dishware, closer spacing may be warranted; I often lay these out at 1 1/4" on center. For cabinets storing large items such as tall jars of dry goods, 2" on center may be more practical. The point is to allow as much versatility in positioning the shelves as may be needed while avoiding the visual busy-ness of too many holes.

Rip first. *I store my plywood on sturdy sawhorses near the table saw so that I can pull one end of a sheet over to the edge of the saw, adjust it against the fence and rip.*

Be there and be square. *A sliding table set at 90° makes it easy to cut the first end of each casework part square. You can then cut multiple parts to the same length by crosscutting with the rip fence.*

ten have minor damage. It's ideal to make the first rip slightly over-width, then turn it around and rip the other edge to the size you require. That way you'll have two square, clean edges for joinery.

After ripping, cut the parts to length. There are various ways to do this. Aside from cutting each part accurately to length, it's important to cut the ends square. You can do this with a track saw if you have one. Alternatively you can use a straightedge and a pattern-cutting bit to rout one end square, then crosscut on a table saw, running that end along the fence. (The same technique will work with a radial arm saw for the second cut, which trims the piece to length.) My current method is to crosscut one end of each piece using a slider on my table saw, then crosscut it to length using the rip fence. Be sure you add an identifying mark (for example: upper 1, left side) to each part as you cut it.

My method for joining cabinet floors to sides may not be refined, but it's quick, simple and strong. I use a spacer made from scrap 3/4" plywood to position the floor and support it. Twinthread screws run in through the cabinet sides will fasten the whole thing together.

But First...

Your elevations will determine how high the kick needs to be and whether it will be flush or recessed. Calculate the height of the space that will be beneath the cabinet floor and rip spacers from scrap plywood to this width, then cut them to length. If your kick will be flush, the spacer should be a hair under the width of the cabinet sides in length; if the kick will be recessed, the spacer should be a hair under the width of the cutout portion at the bottom of each cabinet side. Next, predrill for the screws that will tie the sides together with the floor.

Move on Up

Most base cabinets do not need a solid plywood top. A strip several inches wide at the front and back offers plenty

Top joint. *In most cases you can simply hold the strip in place and mark the center line for each biscuit from the strip to the cabinet side.*

Steady on. *For safety and accuracy, clamp the cabinet side in your vise and hold the biscuit jointer firmly against the fence to make a square cut.*

Flat and firm. *Clamp the top (whether it's solid or strips) to your bench and hold the biscuit joiner firmly in place, then make the cut.*

of material to tie the sides together and support a counter. Using less material lightens the weight of these substantial cabinets while minimizing waste. Sink bases, in particular, do not need a solid top; the vast majority of a sink base's top will be cut out to accommodate the sink. For narrow cabinets (those 18" or less wide) it's usually quicker to go ahead and make a solid plywood top, following the same directions as those for a strip top.

The strips for a particular cabinet will be the same length as the floor for that cabinet, so cut them to length at the same time. The sides of the cabinet will be joined to these strips with Twinthread screws, but I also use biscuits, for increased strength as well as a positive means of locating the parts during assembly. Mark each strip with the cabinet name or number and "front" or "back," so you'll be able to identify quickly which end is right and left, and which long edge faces forward. It is a good idea to have at least two biscuits in each strip to help prevent the strips from twisting during assembly.

If you have ever found yourself on hands and knees, searching for that custard pan in the very back of a base cabinet, you'll understand why most base cabinets today are made with drawers or pullout trays on full-extension mechanical slides instead of with shelves concealed by doors. I rarely put shelves in base cabinets, but I do use them in upper cabinets and in shallow base units such as bookshelves.

When a cabinet will have adjustable shelves, I usually use 1/4" pin-style supports, which are unobtrusive, extremely strong (I have used them to store large shelves of LPs) and fast. Now is the time to drill shelf support holes, because you can clamp the cabinet sides together and mark them at the same time. Lay out the positions with a long square.

Predrill. *Even though the screws will be run in from the outside of the cabinet, I predrill from the inside, because that way I don't need to measure for the holes' positions. The spacer tells me where the holes should be: 3/8" on center above its top edge. Then I flip the side over and countersink. Five or six screws are usually ample for a 24"-deep base cabinet.*

Simple and strong. *Clamp the spacer in place at the bottom of the cabinet side and attach with 1 1/4" Twinthread screws. Four or five are plenty for each side of a typical base cabinet. You can predrill and countersink or use an impact driver, as I did here.*

Assembly Time

With the basic carcase joints cut and shelf support holes drilled, you're ready to glue up the cabinets. Run a bead of glue along the top edge of each floor spacer then stand the sides on the floor, front edge facing up. (You can lean each side against a workbench, stationary machine or sturdy trash can to hold it temporarily.)

Set the cabinet floor in place between the sides and clamp loosely. Depending on the size of the assembly and whether you have a helper, it may be more practical to hold the floor and sides together by clamping the floor to the bottom spacers instead of clamping across the cabinet's width. At this point the clamp is just to hold the parts together while you insert the top (or top strips); there will be time to adjust the fit and get things square.

Maximize the efficacy of glue. Make sure the bottom face of the cabinet floor is tight against the top edge of the spacers; the bead of glue along the spacers' top edge will contribute to the cabinet's strength, especially if you are using plywood that's prefinished only on the interior face and so offers limited opportunities for gluing. Now apply glue to the biscuit slots for the top (or top strips), insert the biscuits and set the top in place. Apply a couple of clamps to hold the assembly together while you adjust the fit.

After squaring the cabinet, sight across the top edges to check for winding. Shim at the bottom as necessary to remove twist, then drill and screw. Let the cabinet sit until the glue has set, per the glue manufacturer's instructions.

Vertical Dividers

Plywood that is prefinished on both sides comes into its own for vertical dividers. I measure for dividers at this point and fasten them in place with screws.

Instead of using a tape measure, I cut a couple of pieces of scrap plywood (one for the bottom, the other for the top) to the distance between the divider and the nearest cabinet side. Clamp the scrap in place and you have an instant way to predrill the screw holes, 3/8" on center from the edge of the scrap. This method also makes locating the divider a snap when you're ready to screw it in place.

Of course, you cannot insert that divider until you've cut it. Don't precut dividers to size; cut them to fit. Otherwise you may find that your divider is too small. The most accurate way to determine a divider's length is by setting one end in place and marking the other.

Wide cabinets should have support feet below or near vertical dividers to prevent sag. Make these from strips of 3/4" plywood cut to the same height as the spacers supporting the cabinet sides. Screw a batten on each side of the foot through which you can fasten to the underside of the cabinet floor.

Face Frames

After using several kinds of joinery for kitchen-cabinet face frames, I now regard a pocket screw jig as my go-to. Pocket screws are quick, simple and strong. If you make a mistake, you can often remove the screws and replace a part.

Mill the stock for your face frames to thickness and width but do not cut anything to length until the cabinets are assembled. Direct measurement is the quickest, most accurate way to go: Start with stiles, setting a squared end on your shop floor for face frames with stiles that go to the floor; for cabinets with fully recessed kicks, start at the top and mark the location of the cabinet floor's underside, then add 1/2" (or however much you want the face frame to hang down, which will hide the joint between the cabinet and an applied kick). Clamp the stiles in place, then hold one end of the top rail against one stile and mark the position of the other. Repeat with the bottom rail.

For vertical dividers, wait until you have the main part of the face frame screwed together so that the spacing of all the parts is locked in. Then continue with direct measuring. Hold one squared end of the divider stile in place and mark the other, then cut. Hold the skeleton face frame against the cabinet and transfer the position of the divider onto the edge of the top and bottom rails. Drill pocket screw holes at the ends of the stile and insert the stile.

Drawer Rails

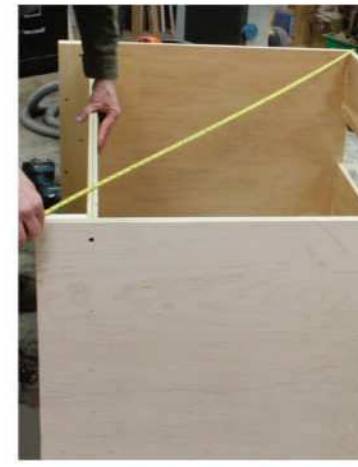
Even if your drawers will slide on mechanical runners, you may wish to install drawer rails for a more traditional look (at least for built-ins from the late-19th through the mid-20th century). With the vertical divider in place, repeat the same steps to size and install these rails.

When you have completely assembled your face frame, give a light sanding to the inside edges (this is much easier to do before the frame is glued against a prefinished surface that you would not want to mar). Brush glue onto the front edges of the carcase, spreading it over the surface and apply the face frame. Make sure that the top edge of the bottom rail is flush with the floor of the cabinet; do the same with any critical inside or outside edges. Then clamp.

Maximize the efficacy of glue. *Make sure the bottom face of the cabinet floor is tight against the top edge of the spacers; the bead of glue along the spacers' top edge will contribute to the cabinet's strength, especially if you are using plywood that's prefinished only on the interior face and so offers few opportunities for gluing.*

Glue guide. *Apply a bead of glue to the top edge of the spacer and where the biscuits will go. Don't waste your time or glue on the prefinished surfaces; it won't bond to them.*

Adjust clamps and square up. *I find light clamps useful in holding the floor against the spacers while getting things adjusted. Here I am tightening the clamps at the top, having flushed up the front and back edges. Next I will move to the cabinet floor, tapping the back down firmly onto the bottom spacer before I insert a clamp under the back edge to tighten everything up.*



A screw can help. *If you are working alone on a relatively large assembly, it's sometimes helpful to insert one screw at each side before the carcase is fully squared up to keep the parts joined together. You can remove that screw if necessary, then redrill and replace it once the cabinet is squared. The carcase is square when the diagonals are equal.*

Drill, then screw. *Predrill for the screws using a bit just smaller than the shank of your screws. Countersink to prevent breakout. Insert screws with a driver.*

Hanging Cleats

Next I usually tackle the hanging cleats, through which the cabinets will be screwed to the wall. Then I cut the backs. After these steps, the structure of the cabinet will be finished and I can turn to the fun parts – doors and drawers, both of which deserve their own articles and have been covered amply elsewhere.

For safety, the attachment cleat must be firmly fastened to the carcase, otherwise a cabinet could be separated from the cleat and fall off the wall, with potentially fatal results. I make a sturdy cleat from solid wood or ¾"-thick veneer-core plywood and attach it to the carcase with Twinthread screws run through the top and sides. The cleat becomes part of the cabinet structure, not only supporting the weight of cabinet and contents from beneath the top, but also resisting the kind of leverage (such as that imposed when a child leans on an open cabinet door – please, please teach your children not to do this!) that could pull the cabinet sides away from the cleat if gravity alone were holding the cabinet in place.

It should go without saying that a cabinet designed to store pantry goods, appliances or dishware must be attached to the wall through studs or heavy-duty blocking, not just fastened to a wall with molly bolts or drywall anchors.

Backs

Many people think backs are optional for built-ins, but backs are almost always worth incorporating. A good back will help a carcase resist racking, in addition to giving a more finished interior look.

Generally, for kitchen cabinets I simply apply a back cut from ¼"-thick veneer-core maple plywood, prefinished on one side. The prefinished side goes toward the interior. Measure the width of the carcase and cut the back to that width, then measure the height from the underside of the cabinet floor to the top of the cabinet and cut the back to that dimension. Fasten the back to the cabinet with #6 1" or 1¼" Twinthread screws after drilling countersunk pilot holes.

Direct measure. *Determine the length of dividers by holding one end against the cabinet floor, then marking the other. Because it's typical for floors and tops of wide cabinets to sag or bow, measure for dividers at the nearest end. That way your divider will even up the height of the cabinet near the center.*

Spacers for the win. *Use a piece of scrap plywood to lay out holes for vertical dividers and locate them for fastening. Then rely on the scrap to locate the divider while you drill pilot holes with a countersink/drill bit and screw it in place.*

Intermediate support. *A batten screwed to each side of the foot allows you to attach it to the cabinet's underside. I stagger the battens, putting one toward the front, the other toward the back, so that I can screw into them from the opposite side of the support foot.*

Direct measure again. *For vertical dividers, wait until you have the main part of the face frame screwed together. Clamp (without glue) to the carcase. Hold one squared end of the divider stile in place and mark the other, then cut.*

Shelves

In most cases, kitchen cabinets will be far more functional if made with shelves that are adjustable, rather than fixed, allowing you to customize placement so as to utilize the available space efficiently. I generally make shelves from the same 3/4"-thick veneer-core plywood as the carcase and add a solid front lipping to finish the edge and increase rigidity.

For shelves, as with vertical dividers, it's nice to use stock that is prefinished on both sides if you have it available. Resist the urge to make your shelves a perfect fit. They need to have a gap of about 1/32" to 1/16" on each end in order to be easily adjustable.

Kicks

If your cabinets have a flush kick, as does the one in this article, you're home free – at least until it's time to scribe the kick to fit the floor. If your kicks are recessed, mill them to thickness but leave them over-width and over-length until your cabinets are installed. Then cut them to fit.

Finished End Panels and Trim

The basic cabinetmaking method above will work well for cabinets that are trapped by walls at both ends. But it's also designed to allow for finished end panels. I find it more efficient in many cases to build and install the cabinets, whether uppers or bases, then carefully fit and apply finished ends. Regardless of whether the finished ends will be frame-and-panel construction, solid wood sides, or sheet goods custom-veneered to match the cabinets, I cut them roughly to size in the shop, then scribe them to fit on site. The end panels will cover the 1/4" back, which would otherwise be exposed.

Likewise, crown moulding and other applied trim goes on after the cabinets have been installed. That way you can cut it to fit the room. **PWM**

Nancy R. Hiller operates NR Hiller Design, Inc. near Bloomington, Ind. and is currently working on a book about kitchens for Lost Art Press.

Pocket the difference. *A pocket screw jig makes strong face-frame joints quickly. You can buy a special clamp to hold the rails and stiles in place, but I simply clamp the parts together on my bench, making sure they're square.*

Let's face it. *Clamp position is important. Put the clamps where they will do the most good. For joints that will be seen from the inside of the cabinet, such as the one between the cabinet floor and the bottom rail of the face frame, put the clamp inside. Sometimes, such as when the face frame is flush with an outside face that will be a finished end (see the right end of the cabinet), it's preferable to put the clamp on the exterior. Cauls protect the face frame.*

Just for looks. *Cabinets made with mechanical drawer slides don't need rails to hold runners and kickers, but if you're after a period look, you may want to consider including them.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct18**

VIDEO: *Build a Baking Cabinet*

WEB: *Guide to load, span and shelf construction basics*

BLOG: *Check out Nancy's weekly posts*

STORE: *Purchase* "English Arts & Crafts Furniture: Projects & Techniques for the Modern Maker"

Getting Started with CNC Patterns

Use a CNC service to make perfect patterns.

BY TIM CELESKI

Stay organized. *I keep my patterns with my parts through each step of a project. All the information is right there on each pattern.*

Woodworkers who make things consisting of more than straight lines need patterns. Patterns open up the worlds of form, shape and detail. They make furniture production faster and consistent. A CNC-machined pattern has perfect shapes, curves and detail. Plus, they're the ultimate story sticks – you'll be able to produce this piece of furniture over and over.

The greatest benefits of CNCs are precision and repeatability. However, most woodworkers don't own a CNC, and that's okay. I've got a great trick that gives you most of the benefits of a CNC without having to own or understand how to run one. How? If you make digital drawings of your furniture parts, you can have a CNC service machine your patterns for you. And, armed with a perfect pattern and a router table or shaper, you can make perfect parts for your next project.

It's fair to say I'm a serious user of patterns. I have hundreds. Long before

PHOTOS AND ILLUSTRATIONS BY THE AUTHOR

I owned a CNC, I had all of my patterns made by a service. As a furniture maker, I rely on patterns and use them every day. In my shop, the rules are, if you need to make two of anything, if there's even the slightest chance you might make something again or if you just need a way to produce accurate details, it's time to make a pattern.

I've found that good patterns are critical for accurate, efficient and error-free furniture making. They really work. I built a woodworking career using patterns. Here's how.

It Starts with Drawings

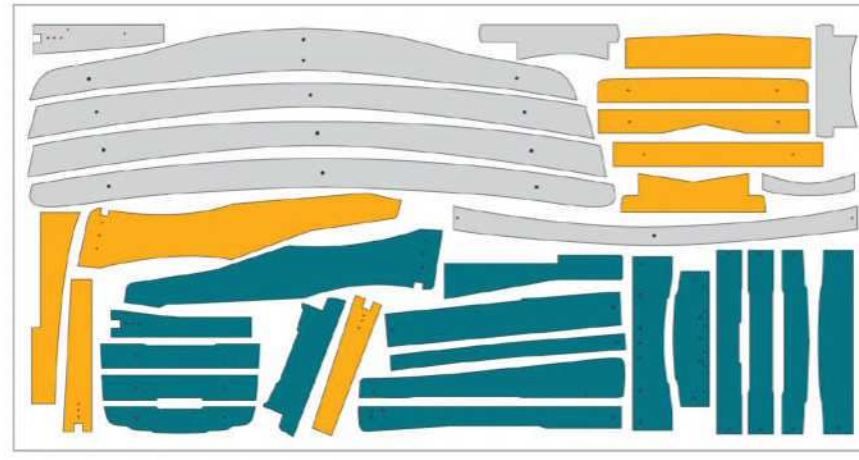
My furniture designs are created on a computer. I prepare and hand off drawings to a CNC service to mill my patterns out of MDF. I used Adobe Illustrator initially then moved to CAD software to draw my furniture parts.

What kind of software do you need? Like me, you could do this with any designer-focused drawing program such as Inkscape, which is free. However, the better choice by far is to use CAD software. It's designed for the kind of precision drawing tasks that woodworkers need. And, CAD has capabilities that make it easier, faster and more efficient to use.

There are many choices when it comes to CAD programs, but for the purpose of making patterns most any 2D capable program will do. Free programs like Fusion360 or FreeCAD, low-priced TurboCAD, Vectric Cut2D, mid-price Rhino3D or CorelCAD and many others, all have the ability to create 2D drawings for woodworkers.

Rout with a top-bearing bit. *A router table, a simple jig and a straight bit with a top bearing are all that's needed to safely rout your pieces to size with patterns.*

Easy to draw. *Drawings just need to be simple 2D outlines of your parts. Here are four renderings that will become patterns.*



Take advantage of extra space. *I try to gang my projects when I go to a CNC service. Projects are organized by color and spaced out for efficient machining on a full 4′ x 8′ sheet of MDF.*

Unfortunately, Sketchup, does not produce quality 2D, machinable files needed for CNC work. Whatever your choice, the software needs to be capable of exporting or saving in standard file formats like DXF, SVG or AI, so that a CNC service can import your files into their own CAD/CAM software to prepare your designs for machining.

Drawing for CNC Patterns

The drawings should be quite simple; patterns are intended to duplicate flat parts. We're drafting in 2D, not 3D. Each part has to be drawn full-size, individually in 2D. Full-size is critical. If, for example, you're making a 62"stretcher pattern for a table, draw it 62" long. You can't provide a drawing of a 31" stretcher and ask the CNC service to double the scale.

Fortunately, CAD software includes tools to make measured, precise drawing easy. For efficiency, parts such as chair arms, legs, stretchers, back splats, seat parts, etc., can be ganged together in the same drawing.

Make sure the outlines of each part are completely closed and "joined." This means the ends of lines, curves and shapes are connected so that a square, for example, is a unit rather than four individual lines. If you can click and the entire part is selected, you're set. CAD and drawing software have joining tools just for this task. This is an important detail, so check your work because strange things can happen on the CNC if you leave something open.

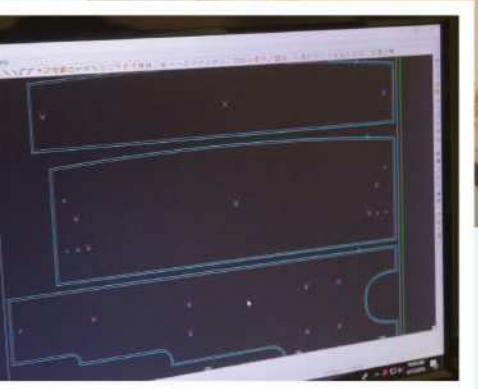
Consider adding any additional details you may need machined. If there are any holes or openings needed in the part, there will be holes or openings cut on the CNC. Also, make sure that no detail is smaller than the bit that will be used. You can't cut a 1/8" hole with a 1/4" bit.

Organize Your Patterns

Once your designs are complete, organize your individual patterns in a way that's efficient for the CNC service, and therefore, economical for you. That means you'll want to gang all your patterns together and lay them out in a drawing the size of a minimum piece of blank stock that could encompass all of them.

Most CNC service vendors will

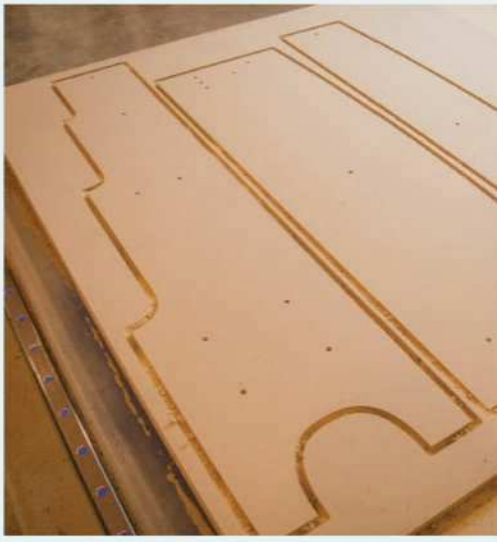
Trying the Process



Perfection in 10 minutes. *Edensaw Woods' CNC service imported Todd's drawing into their CAM software to program the machine operations. The blue lines show the tool paths the CNC will follow. The CNC works very quickly and cuts the patterns in just 10 minutes.*

Finding a Local CNC Service

Look for a local CNC service that could make your patterns for you. Because patterns are usually made out of MDF or plywood, I prefer a vendor with a common 48"x 96"or larger CNC that uses vacuum hold down.



MDF is material of choice. *The completed patterns are machined out of 1/2" MDF.*

Though I've made a lot of CNC patterns, I wanted to see how somebody else handled the process. I asked my friend Todd Butler to give the process a try. Todd is an experienced woodworker but had never used CAD software or a CNC service. I explained my process and followed him along the way.

For this project, Todd wanted to modify and build a classic, late 18th-century bookcase from *The Woodworker, Volume 4*. His goal was to change a few dimensions, bow out the shelves and lay it out for future builds using tusk tenons. He used my favorite CAD program, Rhino3D. He used readily available online courses and videos, many of which are free, to learn the basics. Studying the drawings in his book, he recreated the sides in CAD and drew up new bowed shelves. On my suggestion, he added 1/4" holes at center points and key joinery locations for reference.

Once the drawings were complete, he prepared them for a CNC service. He organized his patterns to fit efficiently on a small board leaving 1/2" spacing between each part and 1″ along the outside edges, to allow room for the cutter to travel between parts. He put the 1/4" marker holes on a separate layer to help the CNC service plan and program their machine processes.

Next, Todd needed a CNC service to make his patterns. He lives outside of Seattle and went to a popular hardwood lumber supplier in Port Townsend called Edensaw Woods. They recently started offering CNC services and were eager to give pattern making a try. As recommended, Todd specified 1/2" MDF for his patterns and a 1/4" bit. Since he only needed a few patterns, the job was completed in about 10 minutes and billed at the minimum shop rate.

Back at his shop, he used the patterns to lay out the materials to be cut and shaped for his project. Using layout markers for joinery connections and center points, he transferred them to his boards.

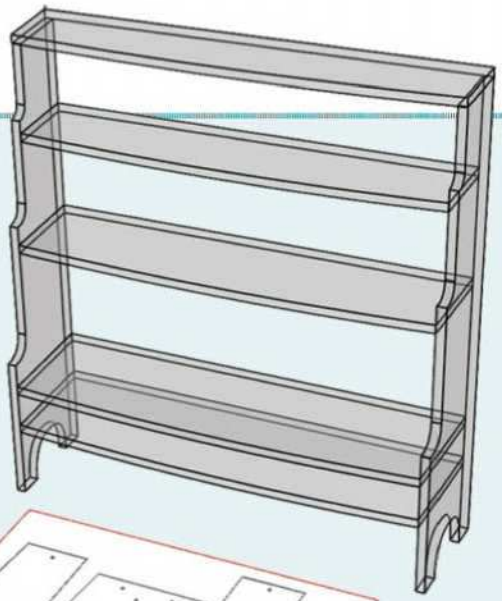
After rough cutting the sides and shelves on a band saw, the patterns were used for shaping on his router table. The final result is a bookcase with smooth shapes that fits together perfectly plus a set of patterns he can use to make more furniture in the future.

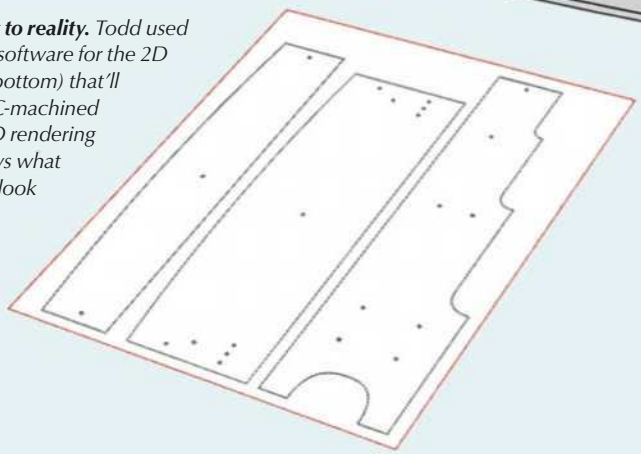
Places to Look

- CNC Service Bureaus
- Cabinet Shops
- Sign-Making Shops
- Maker Spaces
- Furniture Makers

How Much Does it Cost?

Prices can range from under a $100 for half a 4x4 sheet full of patterns to twice that for a full sheet. Create precision drawings, take advantage of them, skip measurements whenever possible and use smart patterns.





Virtual drawing to reality. *Todd used Rhino 3D CAD software for the 2D drawing (right, bottom) that'll be used for CNC-machined patterns. The 3D rendering (right, top) shows what the cabinet will look like when done.*

Prepping for routing. *Back at his shop, Todd traces the patterns onto his boards. He then draws a centerline through the .250" holes for his joinery locations.*

Start shaping. *After roughing out the parts, Todd shapes them to exact size at the router table.*

A perfect fit. *Todd's bookcase gets a dry fit before final assembly.*

ask that you leave at least 1" around a sheet of plywood or MDF to allow for clamping and at least at 1/2" between individual parts if your patterns are being cut with a 1/4" bit. It doesn't matter where patterns are located or if they line up. A CNC doesn't care how you lay it out as long as there's an adequate gap between parts. Move parts around to make best use of the space.

I always specify my patterns to be cut with a 1/4" bit. I do this for a couple of reasons. For one thing, it's a small enough that I get a reasonable level of detail in tight areas and yet cut efficiently. For another, it allows me to place the patterns close together to make efficient use of raw materials.

Prepare Your Files

Each CNC service will have its own requirements for file preparation. First, contact them, tell them what you have in mind and the software you're using, and find out exactly how they want their files prepared. They will use some kind of CAD or sign-making software plus CAM software to program the CNC. You don't need to use the same programs they use, but you do need to provide them with files they can read or import. For example, if you're using a drawing program it's likely they can import "AI" (Adobe Illustrator), "EPS" format or "SVG" files. For CAD, almost all of them can export the universal "DXF" format files.

Patterns are the ultimate story sticks. *All the information you need is right there on each pattern. Patterns have furniture name, pattern function, sequence and dimensions for a cut list. Add joinery specifications and positions plus finishing details.*

Include Instructions

Instructions to the CNC service can be simple. Ask them to cut around the outside of your parts and to use a .250 bit. If there are openings in the middle of a part or holes to be milled for markers, make sure they are in the drawing and let the service know that they need to be cut out. Some CNC programming software will auto detect these openings, but just in case, I place all my holes and openings on a different drawing layer so the CNC operator can easily find them and program the CNC accordingly.

Pattern Materials

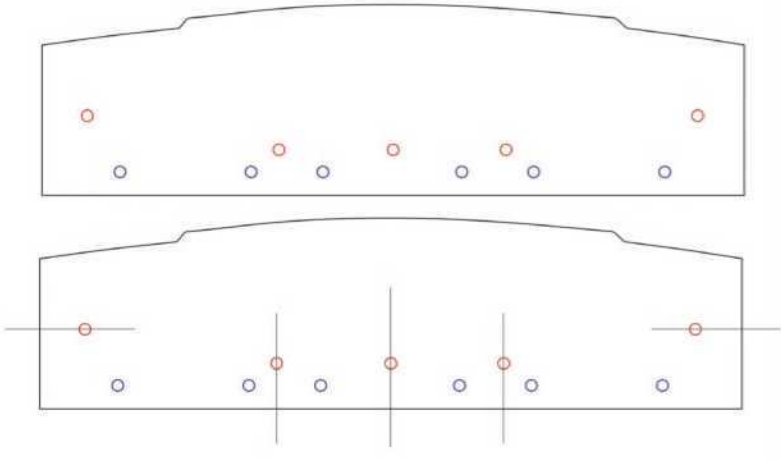
Every woodworker has a preference for which material is best for patterns. Though Baltic birch plywood might last longer, I've always used 1/2" MDF. It's flat, cheap, simple and available. I've never worn out a pattern even after hundreds of uses. Check with your CNC service to find out if they will supply your pattern stock or if you need to deliver the material for your job.

Add Precision Where It Counts

Patterns are a convenient aid to help you repeat shapes and details. But, a CNC produced pattern can add a lot more by making use of the .001" precision available. So, why not add precision markers to your CNC machined patterns that will greatly improve your setups and layouts?

When you add high precision to key locations, layout information and joinery positions in the form of .250" holes as markers, it takes patterns to a level beyond simple story sticks. I think of them as "smart patterns."

If you deal with curved shapes, accurate reference points help to keep everything lined up. First, I make sure I add a center point on every symmetrical part. For example, with a semicircle shape, I place a marker where the centerline is located. That gives me a reference point for alignment. On long parts, I sometimes make the pattern a little over half the length and add a center point marker to line each half up. If a hole or other detail – like a plug, mount point, inlay, etc. – is needed, markers are added to their locations. Next, at every joinery position or attachment point, I put a centerline marker at the joint intersection. If there's a mortise on one part and a tenon on the other, a centerline marker is placed on both parts where they'll meet with the joint closed. Sometimes, I even build router joinery templates right into patterns.



Take advantage of CNC capabilities. *Add precision layout to your drawings in the form of CNC machined .250" holes at key locations. Red holes show joinery positions. Blue holes are for square plug locations in this crest rail. Centerlines are drawn on the patterns later for positioning.*

These .250" markers need to be accurately placed and tested in your drawings prior to machining. Essentially, you're testing a joint to make sure everything lines up the way you intend, before machining. Use guidelines in drawing software or take advantage of various snap-to or alignment features that are common in CAD programs to help line parts up. This is easier to do than it sounds.

Marking Up Your Patterns

In furniture classes, students frequently ask about plans and instructions for my furniture. They expect to see the usual printed drawings with pages of instructions. I tell them that I don't have any plans or instructions because I never use them. I keep no notes, notebooks or story sticks on anything I build. Every detail I need to build a particular part is written onto my full-size, CNC patterns. The patterns, notes and key positions are how I keep my work organized and accurate.

Using a marker, I write the name of the furniture piece, the part name, the function the pattern is intended for and the rough and nal dimensions of the blank material. This is what I use to make up my cut lists. I add the date the pattern was made in case there are variations of the design or series. If there's a pattern count for a given furniture piece, I include it and assign a number to each pattern so I can spot if one is missing from the series. If there are subgroups of patterns or sets, such as parts for a tabletop, each pattern is identified individually and noted where it fits in sequence.

Next, I use a square and fine-point marker to draw alignment or centering lines from the center of my .250" marker holes out to the edge and wrap them around the pattern with a small square. Also, I always make my patterns at final size without added length for joinery. At joinery locations, I note how much to add for tenons, dovetails and the size of the joints and other details.

Extra info, such as roundovers or chamfer edge detailing, is noted at the appropriate locations on the pattern. Special blank stock alignment points are added to align odd-shaped parts. I'm careful to indicate any 90° locations, confusing angles and special trim angles to be saw cut later. Finally, I include notes about any "gotchas" that might come up during construction.

Better Than Patterns

A CNC-made pattern is precision digital woodworking where it counts. Creating them is smart, inexpensive, accurate and easy to do. Precision patterns make your projects more consistent and less prone to errors. Any woodworker benefits from this trick and can still build their projects with their choice of tools, skills and methods. As a bonus, it's a giant step beyond the adage, "measure twice, cut once." I think it's better to create precision drawings, take advantage of the precision, skip measurements whenever possible and use smart patterns.

Of all the digital woodworking recommendations I've made to readers, getting patterns CNC machined by a service is at the top of my list. You don't have to be a computer expert, you just have to commit to learning how to make basic digital drawings. Finally, in future Popular Woodworking projects, I'll include not just printed information to work from, but will offer project pattern files for CNC machining. I hope it starts a trend. **PWM**

Tim Celeski is a furniture designer and artist based in Seattle, Wash. See more of his work at celeski.com.

ONLINE EXTRAS

For links to all online extras, go to

- popularwoodworking.com/oct18

BLOG: *CNC digital woodworking*

PLANS: *Blacker mirror full project files*

Our products are available online at

- ShopWoodworking.com

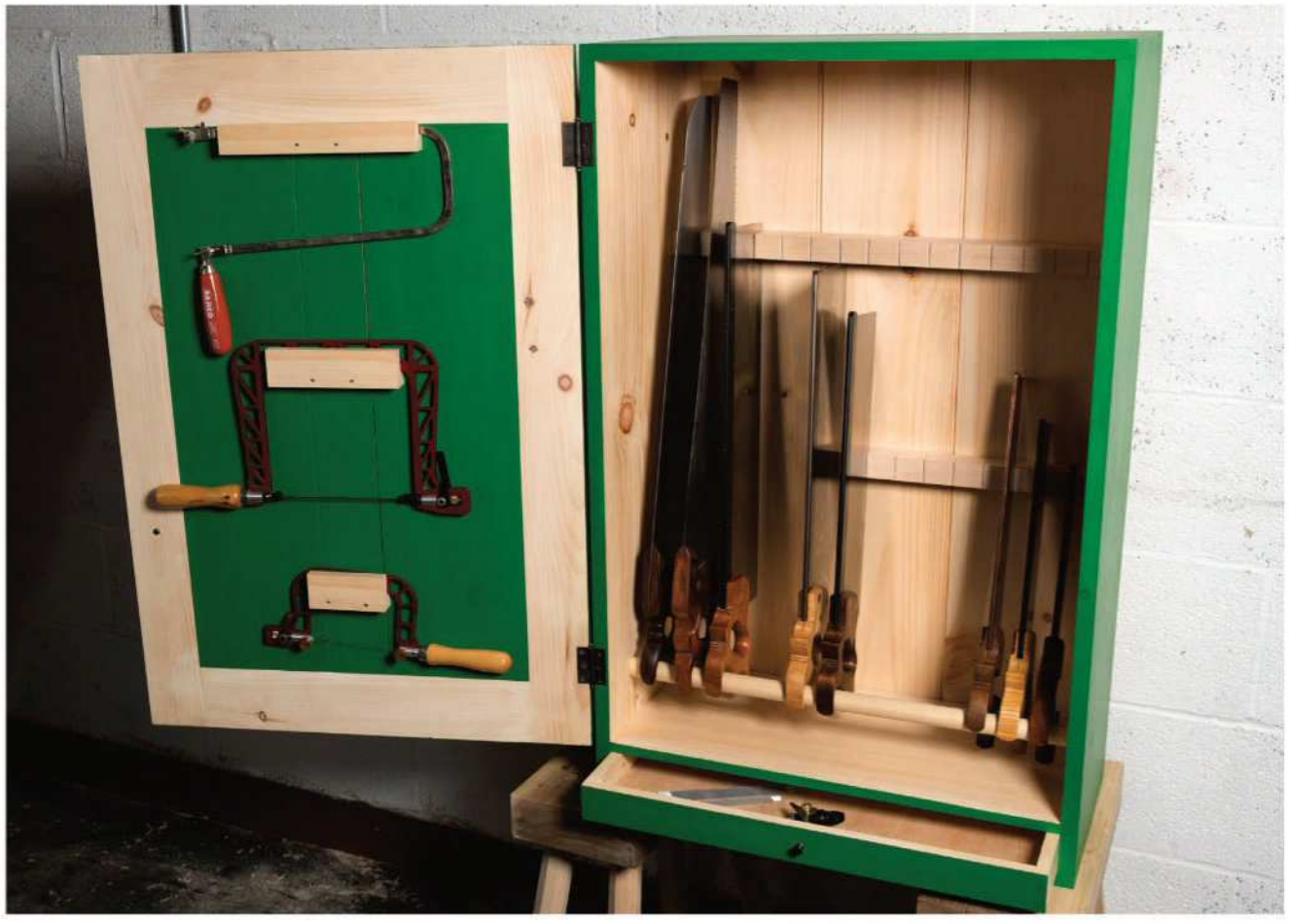
Taking it one more step. *Sometimes I add router joinery templates right into my patterns. I mill 5/8" router bushing slots at joinery locations.*

With a tap and a .250" machinist center punch, locations for holes and plugs are transferred through the pattern holes.

Handmade Saw Cabinet

Use vital hand-tool techniques to build storage for your saw collection.

BY KIERAN BINNIE



Gazing into my Anarchist's Tool Chest and realizing my saw till was bursting at the seams, I had to face a sobering fact: I was in the grip of a backsaw addiction. I had two choices. Either I could trim my collection down to the regulation issue three backsaws – dovetail, carcase and tenon – or I could build a wall-mounted saw cabinet to hold my full collection.

This project was the result of choosing option number two. The bonus? Building the cabinet provided the opportunity to use many of my saws, with an emphasis on dovetail, dado and mortise and tenon joinery.

Materials and Design

I built my saw cabinet out of what is sold in the UK as Canadian yellow pine (*Pinus strobus*, aka Eastern White Pine) as it is lightweight, strong, and dimensionally stable. Other similar softwoods would be appropriate, and hardwoods would also be fine although you may want to beef up the French cleats to account for the extra weight of a hardwood cabinet. The kerfed blocks which capture the saw plates are hard maple, to provide wear resistance, while the rail on which the saw totes rest is a length of 1" hardwood dowel of the sort most timber yards and big box stores sell. You could, of course, turn your own rail if you have a lathe and want some extra practice. See the cut list at the end of this article for the components.

PHOTOS BY AUTHOR, ILLUSTRATIONS BY DANIELLE LOWERY

This design will accommodate 14 saws, including full-sized 28" handsaws; if you want to store a 30" mitre saw then increase the length of the sides. Saw totes can vary in size, and while the rail holds all of my saws so that they do not rest on the partition below you might want to start by laying your saws on a full-sized drawing to make sure that your particular saws will not bottom out on the partition.

Joinery

The casework is joined by through-dovetails at each corner. There are a number of steps before you are ready to dovetail. First, plane a 1/2" wide, 1/4" deep rabbet on the rear edge of the sides and ends to accept the tongue and groove backboards. Next, layout the dado for the partition separating the drawer from the main body of the till. The dado is 1/2" wide, 1/4" deep, and situated 2 3/4" from the bottom edge of the carcase sides.

There are several ways to cut dados, and here is how I do it. Lay out the sides of the dado with a sharp marking knife. Deepen the knife line with a wide chisel (I use a 2" butt chisel) and then pare into the chisel line from the waste side, to provide a v-shaped groove deep enough for the set of your saw to be below the surface of the workpiece. This groove will guide your saw and is known as a "first-class saw cut." Cut the walls of the dado with a fine crosscut saw, gently resting fingers of your off-hand on the toe of the saw to keep it in the cut. Chisel out the majority of the waste and clean up the bottom of the dado with a small router plane, working from both ends to the middle.

Finally, drill a 1" diameter mortise in the sides to accept the rail on which the saw totes will rest. This mortise is 6" from the bottom, and 3" in from the front edge of the cabinet. Clamp both sides together and drill through them at the same time to ensure that the mortise lines up.

Because I cut my dovetails tails first, I also planed a shallow (1/16" deep) rabbet on each end of the tail boards. The dovetails are standard through-dovetails; I used six tails per side, and the tails are on the sides of the casework while the pins are on the ends. The only unusual feature is that the pin at the rear corner is a captured half-pin to account for the rabbet, so lay out a separate baseline for the half-pin. I gang-cut the tailboards and then lay out the pins for each corner.

With the dovetails cut, assemble and glue the four sides together, including the rail. Leave the rail overlength at this stage and allow the excess to protrude through the mortises. Once the glue has cured, fit and glue the partition, making sure the partition is flush to the rabbet at the rear of the casework. Let the glue fixing the partition cure, and then clean up the exterior of the casework with a smoothing plane.

Backboards

The three backboards are joined with tongue and grooves, and are held in place with a combination of cut nails and glue. They should be a friction fit into the carcase, so take your time getting them snug. I started with fitting the two outer boards, and then adjusted the middle board to fit the remaining space. Tongue and groove both edges of the middle board, and just the inner edge of the boards going on each side. A no. 49 plane makes quick work of the tongue and groove.

Once the panels are tongue and grooved and fitting nicely, glue just the long edges of the two outer boards into the rabbets on the case sides. Then nail the boards to the top and bottom of the case and to the rear edge of the partition. I used 4d wrought head nails

Rabbets by hand. *A rabbet or moving fillister plane makes quick work of the rabbets for the casework.*

Saw guide. *For a first-class saw cut, pare a channel into your knife line to guide the saw.*

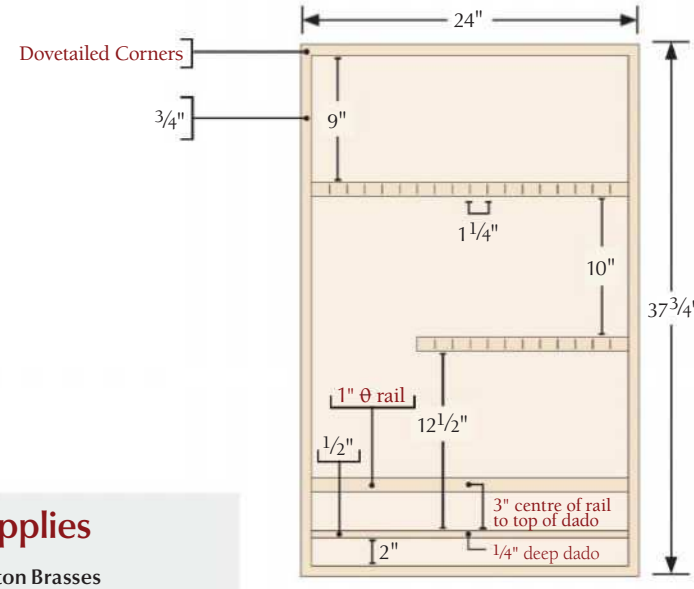
Light pressure. *Gently resting your fingers on the back of the saw keeps it from jumping out of the cut.*

Production work. *Gang cutting the tails makes for efficient dovetailing. Cutting the same side of each tail helps keep a consistent angle, before cutting the opposite side of all of the tails. The captured half pin hides the rabbet on the rear edge of the casework.*

Homemade Saw Cabinet

NO.	ITEM	DIMENSIONS (INCHES) T	W	L
CASEWORK				
❑ 2	sides	3/4	11 1/2	37 3/4
❑ 2	ends	3/4	11 1/2	24
❑ 1	partition	1/2	11	23
❑ 3	backboards	1/2	8*	36 3/4*
❑ 1	rail	1" dia.	-	25
❑ 4	cleats	1	3	24
DRAWER				
❑ 2	drawer sides	1/2	2*	11*
❑ 2	drawer F & B	1/2	2*	22 1/2*
❑ 4	drawer bottom	1/4	10 1/2*	1
DOOR				
❑ 2	rails	3/4	3 1/2	22
❑ 3	stiles	3/4	3	35
❑ 2	panels	3/4	8 1/4*	29*
INTERNAL FITTINGS				
❑ 1	backsaw kerfed block	1 1/4	1 3/4	22 1/2
❑ 1	handsaw kerfed block	1 1/4	1 3/4	15
❑ **	frame saw hangers	1/2	2	**

* Fit to carcase
** Number of frame saw hangers and neccessary length depends on frame saw collection



FRONT PROFILE

Supplies

Horton Brasses
horton-brasses.com

1 Oval knob in dark antique K-40, $8

1 Desk Interior knob in dark antique H-42 1/2", $3.50

* Solid Brass Butt Hinge with Ball Tips in dark antique PB-407B, $22

** Depends on frame saw collection*

from Tools for Working Wood, as these have excellent holding strength and look great. The nails securing the ends of the boards need to be angled slightly so that they pass through the boards and into the ends of the casework; a small bevel is useful for sighting the angle while drilling the pilot hole.

Door

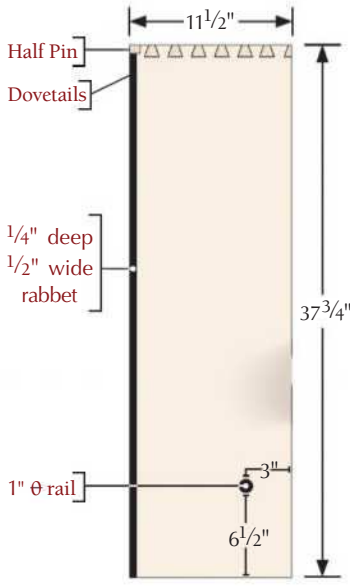
The door is quite standard frame and panel construction. The rails have a 2" long tenon on each end to fit into the stiles, and a 2" deep mortise to accept the tenon of the middle stile. Start with the rails and the two outer stiles. Plough a 1/4" wide, 1/2" deep groove on the inner edge of the four frame components, and then set a mortise gauge to the same spacing – leave this marking gauge set as you will need it for the middle stile and for the panels. The tenons are 2 1/2" wide and have a haunch on the outer edge, sized to fit the groove ploughed on the stile. Use the marking gauge you just set to lay out the tenons on the rails, and then cut the tenons. I use the same "first class saw cut" method described above to guarantee clean tenon shoulders and a good gap-free fit.

Chop the mortises on the stiles (they should be 1/4" wide and 2 1/2" deep) and assemble the four frame components to check for square. I find it helpful to lay the frame on top of the carcase at this point to make sure everything is the right size.

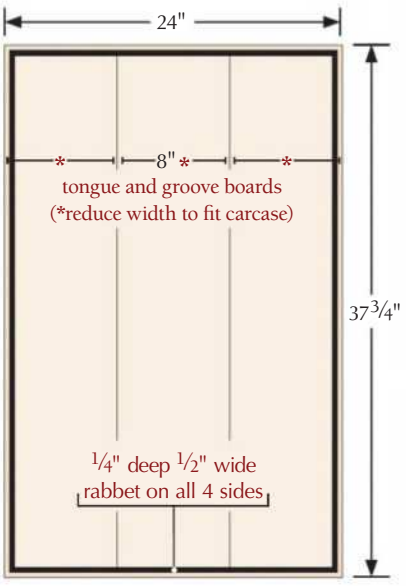
Next up is the middle stile. Use a bar gauge to work out the length of the middle stile and allow for a 2 1/2" long tenon on each end. Plough a 1/4" x 1/2" groove on both of the long edges of this piece and layout the tenon using the same marking gauge settings as you did for the tenons on the rails. The only difference is that there is no haunch on the tenons of the middle stile. Layout the mortices on the rails so that the middle stile bisects the frame into two equal sections. With all the joinery cut,

Drill reference. *A small bevel helps to sight the angle the pilot hole for the cut nails on the backboards.*

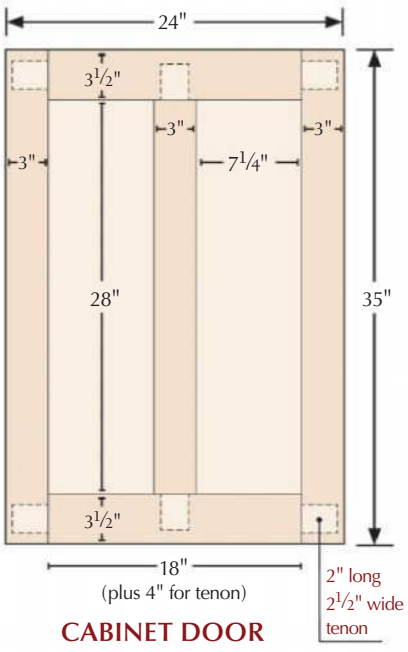
In the groove. *Layout the tenons with a marking gauge set to the dimensions of the groove.*



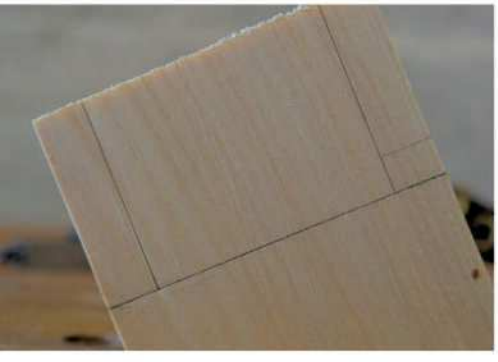
SIDE PROFILE



BACK PROFILE



CABINET DOOR



Haunched tenon. *The layout of the tenon – note the haunch on the right hand side.*

assemble the frame to check for square and measure the spaces for the raised panels (don't follow the cut list for this part of the build – your frame might be a slightly different size to mine).

The raised panels fit into the grooves of the frame on all four sides with a ½" wide ¼" thick tongue. The tongue should be laid out so that the backs of the panels are flush to the back of the frame. This will allow you to hang frame saws on the inside of the door. Use the same marking gauge as for the tenons and mortises to mark out the tongue. The front face of the tongue is created by raising the panels. I used a panel raising plane for this, although in a pinch you could use a jack plane. Once the panel has been raised to the edge of the tongue, flip the panel over and cut the second side of the tongue using a moving fillister plane. A ¼" wide groove cut into a piece of scrap is useful for telling you when the tongue fits, and it is best to err on a slightly loose fit rather than being too tight.

When you come to assemble the door for the final time, glue both rails into one stile then slide in the first panel. Glue the tenons of the middle stile into the rails, and then slide in the second panel before fitting the final stile. The panels float in their grooves to allow for seasonal movement, so make sure that only the tenons and mortises are glued.

Drawer

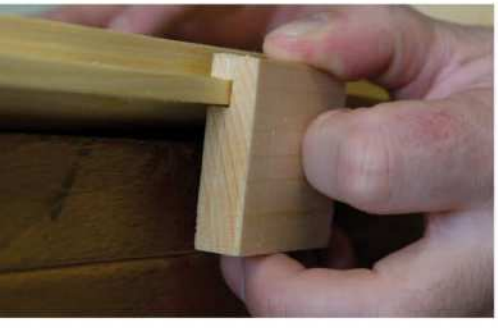
The shallow drawer is big enough to hold a set of saw files, as well as the Veritas file holder. Because I planned to milk paint the saw cabinet, and because this is a piece for the workshop, I used through-dovetails for all corners of the drawer. You could use half-blind dovetails for the front, or even a simple nailed drawer, when it comes to workshop furniture it is all down to preference and the time available for the build. Use the cut list as a guide, but be sure to fit the components to the cabinet on your bench rather than following the numbers slavishly. If you decide to dovetail the drawer then placing the tails on the sides will reduce wracking when pushing and pulling the draw in use.

Internal Fittings

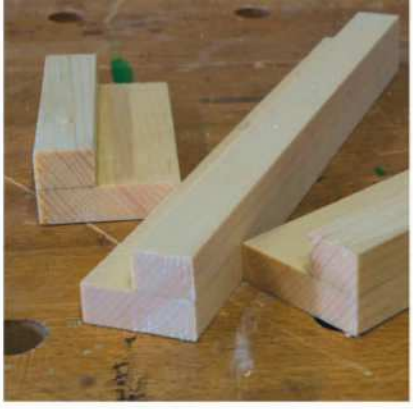
The internal fittings are all simple to make. Start with the kerfed blocks which hold the saw plates. There are two blocks – one extending the full width of the cabinet for handsaws and

Make middle stile to fit. *A bar gauge measures the internal length of the frame for the middle stile.*

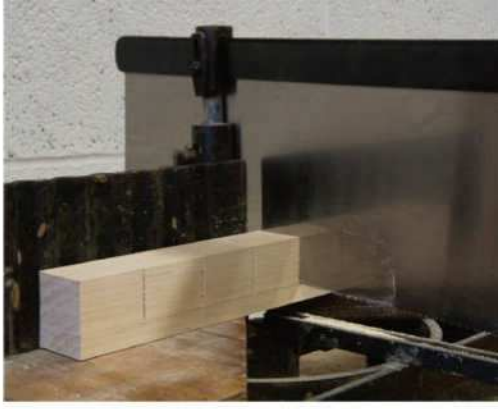
Do it by hand. *Raising the panels.*



Sample mullet. *A mullet the same size as your groove will tell you when the tongue is the correct width.*



Brackets for the frame saws. *These simple tool holders are fast to make and work surprisingly well.*



Quick kerf. *A miter box makes quick work of kerfing the saw holder.*

large backsaws, with a shorter block half the width of the cabinet for smaller backsaws. Depending on the nature of your saw collection you may want to adjust the lengths of these blocks. Lay out the kerfs for the saw holders on 1¼" centers with a pair of dividers and mark their 1¼" depth on the sides of the blocks.

To make the kerfs I used a mitre saw mounted in a mitre box – this ensures neat kerfs which will be wide enough to fit most backsaws. If you don't have a mitre box then a cross-cut backsaw will suffice. Test the fit of your saws and use a cross-cut filed hand saw to widen slots as necessary. Use a chisel to cut a chamfer on each edge of the kerf – this will guide the saw plates into their resting place when you put saws in the completed cabinet. Drill pilot holes through the rear of the blocks, making sure that the screws are spaced between the kerfs, and through the backboards of the cabinet. I used 1¼" No.8 screws to hold the blocks in place, four evenly spaced screws is enough for the short block, and I used six for the full-width block.

Frame saws take up a disproportionate amount of space in my tool-chest, so I decided to mount them on the inside of the door of the saw cabinet. Each hanging bracket is made of two pieces of 2" wide ½" thick stock. Glue the two pieces together so that they overlap by ¾". Once the glue has cured, plane one side flush so that the bracket is an L-shape, and cut the bracket to length based on the size of your frame saw. It is easier to glue and work the brackets when they are larger pieces, so I made two large brackets one of which I cut down to provide hangers for my two smaller frame saws. The brackets are then fixed to the inside of the door with 2d headless cut brads.

Cut nails. *You can see the three rows of cut nails securing the backboards and the brass screws holding the kerfed blocks.*

Finishing Up

Before applying any finish, cut the mortises for the butt hinges and drill holes for the door and drawer pulls. Hinge installation is an article in itself, and I'll defer to Nancy Hiller's excellent advice in the online extras. Once you have fitted the hinges, remove all the hardware and apply your finish of choice. I used five coats of Emerald Green milk paint by General Finishes, applied with a foam brush. Finally, I installed two French cleats on the cabinet to prepare for hanging the cabinet in my shop. **PWM**

Kieran Binnie is a furniture maker and woodwork writer. He is currently co-writing a book about Welsh stick chair maker John Brown for Lost Art Press.

ONLINE EXTRAS

For links to all online extras, go to
- **popularwoodworking.com/oct18**

VIDEO: *Getting Started with Hand Tools*

BLOG: *Read more from the author at overthewireless.com*

ARTICLE: "12 Rules for Tool Chests"

Our products are available online at
- **ShopWoodworking.com**

HARBOR FREIGHT
QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

900 Stores Nationwide • HarborFreight.com M-REG133744_Popular Woodworking

Bauer — SUPER COUPON
15 AMP, 12-1/2" PORTABLE THICKNESS PLANER
Customer Rating ★★★★½

NOW $249.99
SAVE $149 $299.99
COMPARE TO DEWALT $399 MODEL: DW734
ITEM 63445
14669468
LIMIT 5 - Coupon valid through 11/30/18*

PITTSBURGH #1 SELLING JACKS IN AMERICA — SUPER COUPON
RAPID PUMP® 3 TON STEEL HEAVY DUTY LOW PROFILE FLOOR JACK
• Weighs 73 lbs.
Customer Rating ★★★★★

SAVE $70 NOW $79.99
COMPARE TO TEQ $149.99 MODEL: T83001SZ
$97.99
ITEM 61282/62326/61253 shown
14672281
LIMIT 4 - Coupon valid through 11/30/18*

SUPER COUPON
FREE
PITTSBURGH WITH ANY PURCHASE
LIFETIME WARRANTY
1" x 25 FT. TAPE MEASURE
• Thumb Lock
• Rubber Wrapped Case

COMPARE TO KOMELON $6.98 MODEL: L4825HV
ITEM 69030/69080/69031 shown
14659064
Cannot be used with other discounts or prior purchases. Original coupon must be presented. Valid through 11/30/18 while supplies last. Limit 1 FREE GIFT per customer per day.

SUPER COUPON
20% OFF
ANY SINGLE ITEM*
14648207
Limit 1 coupon per customer per day. Save 20% on any 1 item purchased. *Cannot be used with other discount, coupon or any of the following items or brands: Inside Track Club membership, Extended Service Plan, gift card, open box item, 3 day Parking Lot Sale item, compressors, floor jacks, safes, saw mills, storage cabinets, chests or carts, trailers, trencher/backhoe, welders, Admiral, Ames, Bauer, Cobra, CaverPro, Daytona, Earthquake, Fischer, Hercules, Icon, Jupiter, Lynx, Prowler, Predator, Swisher, Vitrex, Voltan, Zenith. Not valid on price purchases. Non-transferable. Original coupon must be presented. Valid through 11/30/18.

HARDY — SUPER COUPON
MECHANIC'S GLOVES
Customer Rating ★★★★★

NOW $3.99
$5.99
COMPARE TO VALEO $11.02 MODEL: 2SS21
SAVE 63%
ITEM 62434, 62426, 62433, 62432, 62429, 64178, 64179, 62428 shown
14676082
LIMIT 5 - Coupon valid through 11/30/18*

CENTRAL PNEUMATIC — SUPER COUPON
Customer Rating ★★★★½
3 GALLON, 100 PSI OIL-FREE AIR COMPRESSORS

A. HOT DOG
ITEM 69269/97080 shown
B. PANCAKE
ITEM 61615/60637 95275 shown
• Air delivery: 0.6 CFM @ 90 PSI 1 CFM @ 40 PSI
SAVE 59%
YOUR CHOICE $39.99
COMPARE TO PORTER-CABLE $98.62 MODEL: PCFP02003
$54.99
14682591
LIMIT 4 - Coupon valid through 11/30/18*

WINDSOR DESIGN — SUPER COUPON
11 PIECE WOOD CARVING SET

NOW $5.99
ITEM 60655/62673 shown
14684038
LIMIT 5 - Coupon valid through 11/30/18*

KRAUSE & BECKER — SUPER COUPON
AIRLESS PAINT SPRAYER KIT
Customer Rating ★★★★½

NOW $169.99
$214.99
COMPARE TO GRACO $299 MODEL: 262900
SAVE $129
ITEM 62915/60600 shown
14685625
LIMIT 5 - Coupon valid through 11/30/18*

WINDSOR DESIGN — SUPER COUPON
DOVETAIL JIG
Customer Rating ★★★½☆

NOW $27.99
SAVE 40%
COMPARE TO GENERAL TOOLS $46.99 MODEL: 861
$34.99 ITEM 34102
14688074
LIMIT 4 - Coupon valid through 11/30/18*

SUPER COUPON
7 FT. 4" x 9 FT. 6" ALL PURPOSE/WEATHER RESISTANT TARP
Customer Rating ★★★★½

NOW $2.99
COMPARE TO BLUE HAWK $9.98 MODEL: BG6X10-Y
SAVE 70%
$4.99
ITEM 69115/69121/69129/69137/69249/877 shown
14691864
LIMIT 5 - Coupon valid through 11/30/18*

PREDATOR — SUPER COUPON
Customer Rating ★★★★★
6.5 HP (212 CC) OHV HORIZONTAL SHAFT GAS ENGINE

NOW $99.99
$119.99
ITEM 60363/69730
ITEM 69727 shown CALIFORNIA ONLY
SAVE $230
COMPARE TO HONDA $329.99 MODEL: GX200UT2QX2
14705340
LIMIT 3 - Coupon valid through 11/30/18*

HaulMaster — SUPER COUPON
STEP STOOL/ WORKING PLATFORM
Customer Rating ★★★★½
• 350 lb. capacity

NOW $19.99
COMPARE TO GPL $51.45 MODEL: H-21
SAVE 61%
$29.99
ITEM 62515/66911 shown
14708326
LIMIT 2 - Coupon valid through 11/30/18*

CENTRAL PNEUMATIC — SUPER COUPON
Customer Rating ★★★★½
18 GAUGE, 2-IN-1 NAILER/STAPLER

WE CARRY A FULL LINE OF NAILS
NOW $15.99
$22.99
ITEM 63156/64269/68019 shown
COMPARE TO PORTER-CABLE $69.98 MODEL: BN200C
SAVE 77%
14714137
LIMIT 4 - Coupon valid through 11/30/18*

CENTRAL MACHINERY — SUPER COUPON
Customer Rating ★★★★½
4" x 36" BELT/ 6" DISC SANDER

NOW $59.99
$74.99
COMPARE TO GENERAL INTERNATIONAL $121 MODEL: 80704
SAVE $61
ITEM 62502/97181 shown
14726725
LIMIT 3 - Coupon valid through 11/30/18*

PITTSBURGH — SUPER COUPON
Customer Rating ★★★★½
LIFETIME WARRANTY
24" CLAMP AND CUT EDGE GUIDE

NOW $7.99
$13.99
COMPARE TO BORA $70.28 MODEL: 54030K
SAVE 88%
ITEM 66126
14727400
LIMIT 5 - Coupon valid through 11/30/18*

CENTRAL MACHINERY — SUPER COUPON
2 HP, 5 MICRON INDUSTRIAL DUST COLLECTOR
• 70 gallon capacity
Customer Rating ★★★★½

NOW $169.99
$199.99
SAVE $155
COMPARE TO SHOP FOX $324.99 MODEL: W1685
ITEM 61790/97869 shown
14740307
LIMIT 3 - Coupon valid through 11/30/18*

drill master — SUPER COUPON
Customer Rating ★★★★½
1/4" SHEET ORBITAL PALM SANDER

NOW $9.99
SAVE 66%
$13.99
COMPARE TO BLACK & DECKER $29.98 MODEL: BDEQS300
ITEM 61509/61311 shown
14740452
LIMIT 6 - Coupon valid through 11/30/18*

CENTRAL MACHINERY — SUPER COUPON
Customer Rating ★★★★½
350 LB. CAPACITY FOLDABLE SAW HORSE

NOW $8.99
$12.99
COMPARE TO STANLEY $17.99 MODEL: STST11200
SAVE 50%
ITEM 61979/60710/69446 shown
14741935
LIMIT 4 - Coupon valid through 11/30/18*

CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON
2.5 HP, 10" INDUSTRIAL TILE/BRICK SAW
Customer Rating ★★★★½

NOW $219.99
$279.99
COMPARE TO KOBALT $429 MODEL: KWS $10-06
SAVE $209
Blade sold separately.
ITEM 62391/69275 shown
14746484
LIMIT 5 - Coupon valid through 11/30/18*

PITTSBURGH — SUPER COUPON
6" DIGITAL CALIPER
Includes two 1.5V SR44 button cell batteries.
Customer Rating ★★★★½
SAE AND METRIC

NOW $9.99
$18.99
COMPARE TO HUSKY $29.97 MODEL: 1467H
SAVE 66%
ITEM 63711/61585/62387/47257 shown
14752910
LIMIT 5 - Coupon valid through 11/30/18*

*Original coupon only. No use on prior purchases after 30 days from original purchase or without original receipt. Valid through 11/30/18.

At Harbor Freight Tools, the "Compare to" price means that the specified comparison, which is an item with the same or similar function, was advertised for sale at or above the "Compare to" price by another national retailer in the U.S. within the past 90 days. Prices advertised by others may vary by location. No other meaning of "Compare to" should be implied. For more information, go to HarborFreight.com or see store associate.

Woodworker's Marketplace

Classified

Books

WE HAVE A WIDE VARIETY of woodworking books - from small projects, to home improvement, to enhancing your woodworking skills, and more! To see our full line of books, please visit our web site at ShopWoodworking.com!

Finishing Supplies & Equipment

BLOXYGEN SAVES LEFTOVER FINISHES - Preserve expensive varnish, paint. www.bloxygen.com or (888) 810-8311.

SHELLAC.NET — WOOD FINISH SUPPLY Large Shellac Flake Selection - Brushes - Dyes BEHLEN Finishing Supplies - Stains - Aerosols RENAISSANCE Wax. 877-245-5611.

Kits & Plans

FULL SIZE FURNITURE LAYOUTS Drawn by Philip C. Lowe. 978-922-0615. 116 Water St, Beverly, MA 01915. www.furnituremakingclasses.com

Schools/Instruction

JOHN C. CAMPBELL FOLK SCHOOL, Brasstown, NC. Courses for all skill levels. Week and weekend classes year-round, taught by nationally known instructors. Friendly, supportive environment. Comfortable, on-campus housing. Delicious meals served three times a day. www.folkschool.org. 800/365-5724.

Seat Weaving Supplies

CHAIR CANE & SPLINT, Shaker tape, fiber & natural rush. Complete line of basketweaving supplies. Royalwood Ltd., 517-WW Woodville Rd, Mansfield, OH 44907. 800-526-1630. www.royalwoodltd.com.

Classified rate is $6.00 per word, 15-word minimum. Order must be accompanied by payment; ads are non-commissionable. Send to: Popular Woodworking Magazine, 10151 Carver Road, Suite 200, Blue Ash, OH 45242 or Don Schroder, d.schroder@verizon.net. Phone: 610-821-4425, Fax: 610-821-7884.

Advertiser's Index

Definition of Terms

To master finishing, you need to understand the basic terminology.

All technical fields have their own vocabulary. You'll have difficulty mastering any technical field without understanding its vocabulary. Here are some of the most commonly used finishing terms and their meanings.

Sealer (sanding sealer) is the first coat of any finish. The first coat penetrates, dries, and seals the pores so the next coat of finish (or any other liquid) has difficulty penetrating into the wood. The sealer coat also locks raised wood fibers in an upright position causing the surface to feel rough. To achieve a smooth final finish, you should sand the sealer coat smooth before applying additional coats. Special sanding sealers are made for lacquer and alkyd varnish that are difficult to sand. Sanding sealers don't clog sandpaper as easily as these finishes.

Finish is a substance that changes from a liquid to a solid after it has been applied to the wood. The purpose of a finish is to protect the wood and enhance its appearance. By adding colorant to a finish (usually called a binder in this situation), you can make a stain, glaze, toner or paint.

Sanding sealers. *These are available for alkyd varnish and lacquer for the purpose of speeding production because these finishes gum up sandpaper; sanding sealer powders when sanded. To understand this product, put the emphasis on "sanding," not on "sealer."*

Washcoat. *A washcoat is a highly thinned finish applied to blotch-prone woods (see top half of birch panel above) to partially seal the pores to reduce the blotching. A washcoat can be made from any finish. Wood conditioner is a washcoat made by thinning oil or varnish. The trick for having success with it is to let it dry thoroughly before applying a stain.*

Film finish is any finish that can be built (by repeated applications) to a hard, thick layer, or layers, on top of the wood. The key requirement for a film finish is that it must dry hard. This is in contrast to so-called "penetrating" finishes, such as oil, which don't dry hard. Alkyd and polyurethane varnish, shellac, lacquer, water-based finish and catalyzed (two-part) finishes are all film finishes.

Washcoat is any finish thinned with two or more parts thinner to partially seal the wood and prevent uneven stain penetration (blotching) on soft woods such as pine and tight-grained hardwoods such as cherry and birch. So-called wood conditioners are oil or varnish washcoats. To be effective these (and all) washcoats have to be allowed to dry thoroughly before a stain is applied. A washcoat can also be used between coloring steps with minimum build to prevent the colors from running together.

Thinner (mineral spirits, naphtha, lacquer thinner, alcohol, water) is any evaporating liquid that can be used to thin a finish, stain, glaze or pore filler to make application easier.

Solvent (mineral spirits, naphtha, lacquer thinner, alcohol, water) is any evaporating liquid that dissolves a dried finish, stain, glaze or pore filler. Often a solvent for a solid substance is also the thinner for that substance in liquid form.

Sheen is the degree of gloss in a dried finish. Most film finishes dry to a gloss sheen unless flatting agents (gloss-reducing solid particles) are added. Semi-gloss, satin, matte and flat varnishes, lacquers, and water-based finishes have had flatting agents added. These finishes must be stirred before use to

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

"To you, it's the perfect lift chair. To me, it's the best sleep chair I've ever had."

— J. Fitzgerald, VA

Sit up, lie down — and anywhere in between!

Easy-to-use remote for massage, heat, recline and lift

We've all had nights when we just can't lie down in bed and sleep, whether it's from heartburn, cardiac problems, hip or back aches – it could be a variety of reasons. Those are the nights we'd give anything for a comfortable chair to sleep in, one that reclines to exactly the right degree, raises feet and legs to precisely the desired level, supports the head and shoulders properly, operates easily even in the dead of night, and sends a hopeful sleeper right off to dreamland.

Our Perfect Sleep Chair® is just the chair to do it all. It's a chair, true – the finest of lift chairs – but this chair is so much more! It's designed to provide total comfort and relaxation not found in other chairs. It can't be beat for comfortable, long-term sitting, TV viewing, relaxed reclining and – yes! – peaceful sleep.

This lift chair puts you safely on your feet!

Our chair's recline technology allows you to pause the chair in an infinite number of positions, including the Trendelenburg position and the zero gravity position where your body experiences a minimum of internal and external stresses. You'll love the other benefits, too: It helps with correct spinal alignment, promotes back pressure relief, and encourages better posture to prevent back and muscle pain.

And there's more! The overstuffed, oversized biscuit style back and unique seat design will cradle you in comfort. Generously filled, wide armrests provide enhanced arm support when sitting or reclining. The high and low heat settings along with the multiple massage settings, can provide a soothing relaxation you might get at a spa – just imagine getting all that in a lift chair! It even has a battery backup in case of a power outage. Shipping charge includes white glove delivery. Professionals will deliver the chair to the exact spot in your home where you want it, unpack it, inspect it, test it, position it, and even carry the packaging away! You get your choice of fabrics and colors – **Call now!**

The Perfect Sleep Chair®

1-888-628-1659

Please mention code 109577 when ordering.

Long Lasting DuraLux Leather

Tan | Chocolate | Burgundy | Black | Blue

DuraLux II Microfiber

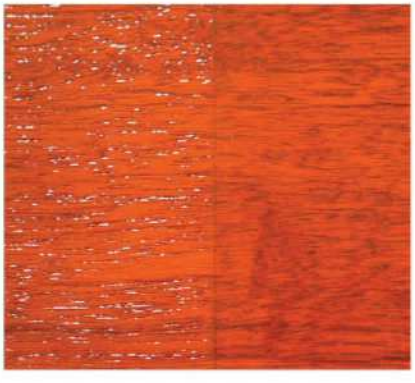
Burgundy | Cashmere | Fern | Chocolate | Indigo

46471

CONTINUED FROM PAGE 58

Sheen. *The degree of gloss a completed finish produces is determined by the sheen of the last coat applied. This is obvious in this example where I applied two coats of satin varnish to the left half of the panel, then one coat of gloss to the left quarter, and two coats of gloss to the right half of the panel, then one coat of satin to the right quarter.*

Glaze. *A glaze is a wonderful decorative product used to produce all sorts of effects, in this case definition and depth. The procedure for doing this is called "glazing," and is always done over a sealed surface so the glaze can be manipulated (partially wiped off) without staining the wood.*



Pore filler. *Filling the pores of large-pored woods such as mahogany and walnut creates a more elegant look, especially in a raking light. The filling can be done directly on the wood to stain and fill in one operation, or over a sealed surface, as I've done here (right half).*

put the flatting agents into suspension.

Stain changes the color of wood. There are two types of colorant used in stains: pigment and dye. Pigment particles are opaque and resemble colored earth. They settle to the bottom of the can and must be stirred into suspension before using. Applied to wood, pigment lodges in recesses, such as pores and sanding scratches, large enough to hold it and remains there after the excess stain is wiped off. Built up on wood, pigment obscures the wood like paint. To glue the pigment particles to the wood, a binder (oil, varnish, lacquer or water-based finish) must be included in the stain. Dye is transparent. It dissolves rather than suspends in the liquid. Once dissolved, dye remains in solution. It can be combined with a binder, or simply dissolved in a liquid and applied.

Glaze is a stain that has been made thick and resistant to flow so it stays where you put it, even on vertical surfaces. Gel stain, for example, makes a good glaze. You can use a glaze to darken or change the color tone of wood after the wood has been sealed. You can leave a glaze in the recesses of carvings, turnings and moldings to give the appearance of age and three-dimensional depth. You can feather out a glaze to highlight certain areas, such as the centers of cabinet doors. Or, using special glazing tools, you can make patterns in a glaze that resemble wood grain or marble. When the glaze is dry, protect it from being scratched off by applying one or more coats of a clear, film finish.

Pore filler is essentially a glaze with silica (fine sand) added to provide bulk. Pore filler is used to produce a mirror-flat effect by filling the pores of porous woods such as quarter-sawn oak, mahogany and walnut before the application of a film finish. Pore filler doesn't take stain well, so pigment should be added before application. You can apply pore filler directly to raw wood to fill and stain in one operation, or you can apply a different colored filler to a sealed (and stained) surface to highlight the pores, as I've done on the right half of the panel (at right).

Toner is finish, usually lacquer, with dye or pigment added and sprayed. To provide better control, thin with up to six parts thinner. Toner adds color in very thin layers without penetrating into the wood. Toner can be used to change or adjust a color after the wood has been sealed.

Shading stain is a toner used to change or adjust the color of certain parts of wood without affecting other parts. Shading stains can be used to blend sapwood to heartwood and to highlight certain parts, such as the centers of cabinet doors, by darkening the surrounding areas.

Rubbing and polishing is the procedure used to level the surface of the final coat of finish and raise or lower the sheen. Various abrasives, including fine sandpaper, steel wool and rubbing compounds, are used. Sandpaper removes dust nibs, orange peel, brush marks and other imperfections in the surface. Steel wool and rubbing compounds (fine abrasive powders in a liquid or paste) raise or lower the sheen.

Bob Flexner is the author of "Flexner on Finishing," "Wood Finishing 101" *and* "Understanding Wood Finishing."

SCIATICA BACK PAIN?

Are radiating pains down the back of your leg, or pain in your lower back or buttocks making it uncomfortable to sit or walk? Millions of people are suffering unnecessarily because they are not aware of this proven treatment.

MagniLife® Leg & Back Pain Relief combines four active ingredients, such as Colocynthis to relieve burning pains and tingling sensations. Although this product is not intended to treat sciatica, it may help with the pain. *"I am absolutely amazed at how it works and how fast it works."* - T Martin. Tablets dissolve under the tongue. *"Those little tablets are like relief in a snap."* - Patsy, CO.

MagniLife® Leg & Back Pain Relief is **sold at Walgreens, CVS, Rite Aid and Walmart**. Order risk free for $19.99 +$5.95 S&H for 125 tablets per bottle. **Get a FREE bottle** when you order two for $39.98 +$5.95 S&H. Send payment to: MagniLife S-PW2, PO Box 6789, McKinney, TX 75071 or call **1-800-730-4173**. Satisfaction guaranteed. Order now at **www.LegBackPain.com**

BURNING FOOT PAIN?

Do you suffer from burning, tingling or stabbing pain in your feet? You should know help is available. Many are suffering from these symptoms and live in pain because they are not aware of this proven treatment.

MagniLife® Pain Relieving Foot Cream contains eucalyptus oil and yellow jasmine, known to relieve tingling, burning, and stabbing pain while also restoring cracked, damaged, and itchy skin. *"It's the ONLY product that helps relieve the burning, and tingling feeling in my feet!"* - *Mable NY.*

MagniLife® Pain Relieving Foot Cream is **sold at Walgreens, CVS, Rite Aid, Kroger, Target and Walmart,** in the footcare and diabetes sections. Order risk free for $19.99 +$5.95 S&H for a 4 oz jar. **Get a FREE jar** when you order two for $39.98 +$5.95 S&H. Simply send payment to: MagniLife NC-PW2, PO Box 6789, McKinney, TX 75071, or call **1-800-730-4173**. Satisfaction guaranteed. Order now at **www.MDFootCream.com**

OVERACTIVE BLADDER?

If you experience minor leaks or a sudden urge to urinate, help is now available. 25 million Americans suffer from incontinence problems, which may lead to a limiting of social interactions to avoid embarrassment.

MagniLife® Bladder Relief contains seven active ingredients, such as Causticum for adult incontinence, and Sepia for the urge to urinate due to overactive bladder. Tablets can be taken along with other medications with no known side effects. *"Love these pills. It is the first thing in a long, long time that is helping me. Thank you!" Margeret S., FL.*

MagniLife® Bladder Relief is **available at Rite Aid,** located in the vitamin section. Order risk free for $19.99 +$5.95 S&H for 125 tablets per bottle. Get a FREE bottle when you order two for $39.98 +$5.95 S&H. Send payment to: MagniLife U-PW2, PO Box 6789, McKinney, TX 75071 or call **1-800-730-4173**. Satisfaction guaranteed. Order now at **www.BladderTablets.com**

SHINGLES PAIN OR ITCH?

Are you suffering from burning or tingling pain or itching even after the shingles rash is gone? Many people are putting up with the discomfort and itching because they are not aware of this new advancement in skin care.

MagniLife® Pain & Itch Relief Gel contains 16 powerful ingredients such as arnica and tea tree oil to deliver fast relief. Although this product is not intended to treat or cure shingles, it can help relieve pain and itching. *"The MagniLife [gel] is the only thing that gave me relief after my case of shingles."* - Michele G., CA.

MagniLife® Pain & Itch Relief Gel is **sold at Rite Aid Pharmacy,** located in the first aid section. Order risk free for $19.99 +$5.95 S&H for a 1.8 oz jar. **Get a FREE jar** when you order two for $39.98 +$5.95 S&H. Send payment to: MagniLife SH-PW2, PO Box 6789, McKinney, TX 75071, or call **1-800-730-4173**. Money back guarantee. Order now at **www.PainfulRashRelief.com**

AGE SPOTS?

Are unsightly brown spots on your face and body making you uncomfortable? Liver spots, also known as age spots, affect the cosmetic surface of the skin and can add years to your appearance. Millions of people live with dark spots and try to cover them with makeup or bleach them with harsh chemicals because they are not aware of this topical treatment that gently and effectively lightens the shade of the skin.

MagniLife® Age Spot Cream uses botanicals, such as licorice root extract to naturally fade age spots, freckles, and other age-associated discolorations, while protecting skin from harmful external factors. *"It is fading my liver spots. This product actually works!!!"* - Patricia C, NJ.

MagniLife® Age Spot Cream can be ordered risk free for $19.99 +$5.95 S&H for a 2 oz jar. **Get a FREE jar** when you order two for $39.98 +$5.95 S&H. Send payment to: MagniLife AC-PW2, PO Box 6789, McKinney, TX 75071, or call **1-800-730-4173**. Satisfaction guaranteed. Order at **www.AgeSpotSolution.com**

FIBROMYALGIA JOINT PAIN?

Are you one of 16 million people suffering from deep muscle pain and tenderness, joint stiffness, difficulty sleeping, or the feeling of little or no energy? You should know relief is available.

MagniLife® Pain & Fatigue Relief combines 11 active ingredients to relieve deep muscle pain and soreness, arthritis pain, aching joints, and back and neck pain. Although this product is not intended to treat fibromyalgia, it may help with the pain and fatigue caused by fibromyalgia. "*These tablets have just been WONDERFUL. I'd recommend them to anyone and everyone!"* - Debra, WV.

MagniLife® Pain & Fatigue Relief is **sold at CVS/pharmacy and Rite Aid Pharmacy**. Order risk free for $19.99 +$5.95 S&H for 125 tablets per bottle. Get a **FREE** bottle when you order two for $39.98 +$5.95 S&H. Send payment to: MagniLife F-PW2, PO Box 6789, McKinney, TX 75071 or call **1-800-730-4173**. Satisfaction guaranteed. Order now at **www.PainFatigue.com**

New Male Potency Formula Makes "The Little Blue Pill" Obsolete

Soaring demand expected for new scientific advance made just for older men. Works on both men's physical ability and their desire in bed.

By Harlan S. Waxman
Health News Syndicate

New York – If you're like the rest of us guys over 50; you probably already know the truth… Prescription ED pills don't work! "Simply getting an erection doesn't fix the problem," says Dr. Bassam Damaj, chief scientific officer at the world famous Innovus Pharma Laboratories.

As we get older, we need more help in bed. Not only does our desire fade; but erections can be soft or feeble, one of the main complaints with prescription pills. Besides, they're expensive… costing as much as $50.00 each

Plus, it does nothing to stimulate your brain to want sex. "I don't care what you take, if you aren't interested in sex, you can't get or keep an erection. It's physiologically impossible," said Dr. Damaj.

MADE JUST FOR MEN OVER 50

But now, for the first time ever, there's a pill made just for older men. It's called Vesele®. A new pill that helps you get an erection by stimulating your body and your brainwaves. So Vesele® can work even when nothing else worked before.

The new men's pill is not a drug. It's something completely different

Because you don't need a prescription for Vesele®, sales are exploding. The maker just can't produce enough of it to keep up with demand. Even doctors are having a tough time getting their hands on it. So what's all the fuss about?

WORKS ON YOUR HEAD AND YOUR BODY

The new formula takes on erectile problems with a whole new twist. It doesn't just address the physical problems of getting older; it works on the mental part of sex too. Unlike the expensive prescriptions, the new pill stimulates your sexual brain chemistry as well. Actually helping you regain the passion and burning desire you had for your partner again. So you will want sex with the hunger and stamina of a 25-year-old.

THE BRAIN/ERECTION CONNECTION

Vesele® takes off where Viagra® only begins. Thanks to a discovery made by 3 Nobel-Prize winning scientists; Vesele® has become the first ever patented supplement to harden you and your libido. So you regain your desire as well as the ability to act on it.

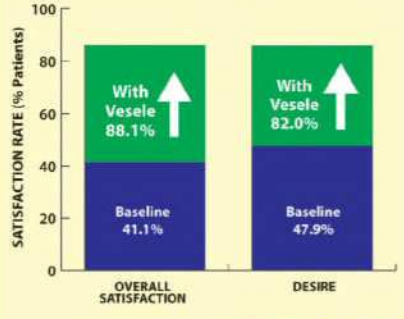
In a 16-week clinical study; scientists from the U.S.A. joined forces to prove Nitric Oxide's effects on the cardio vascular system. They showed that Nitric Oxide could not only increase your ability to get an erection, it would also work on your brainwaves to stimulate your desire for sex. The results were remarkable and published in the world's most respected medical journals.

THE SCIENCE OF SEX

The study asked men, 45 to 65 years old to take the main ingredient in Vesele® once a day. Then they were instructed not to change the way they eat or exercise but to take Vesele® twice a day. What happened next was remarkable. Virtually every man in the study who took Vesele® twice a day reported a huge difference in their desire for sex. In layman's terms, they were horny again. They also experienced harder erections that lasted for almost 20 minutes. The placebo controlled group (who received sugar pills) mostly saw no difference.

AN UNEXPECTED BONUS: The study results even showed an impressive increase in the energy, brain-power and memory of the participants.

JAW-DROPPING CLINICAL PROOF



	Vesele	Baseline
Overall Satisfaction	88.1%	41.4%
Frequency of sex	79.5%	44.9%
Desire for sex	82%	47.9%
Hardness during sex	85.7%	36.2%
Duration of erection	79.5%	35%
Ability to satisfy	83.3%	44.1%

SUPPLY LIMITED BY OVERWHELMING DEMAND

"Once we saw the results we knew we had a game-changer," said Dr. Damaj. "We get hundreds of calls a day from people begging us for a bottle. It's been crazy. We try to meet the crushing demand for Vesele®."

VESELE® PASSED THE TEST

"As an expert in the development of sexual dysfunction, I've studied the effectiveness of Nitric Oxide on the body and the brain. I'm impressed by the way it increases cerebral and penile blood flow. The result is evident in the creation of Vesele®. It's sure-fire proof that the mind/body connection is unbeatable when achieving and maintaining an erection and the results are remarkable" said Dr. Damaj. *(His findings are illustrated in the chart at left.)*

New men's pill overwhelms your senses with sexual desire as well as firmer, long-lasting erections. There's never been anything like it before.

HERE'S WHAT MEN ARE SAYING

- **I'm ready to go sexually and mentally.**
- **More frequent erections at night and in the morning.**
- **I have seen a change in sexual desire.**
- **Typically take 1 each morning and 1 each night. Great Stamina, Great Results!**
- **An increased intensity in orgasms.**
- **My focus (mental) has really improved… Huge improvement.**
- **Amazing orgasms!**
- **I feel more confident in bed**

HOW TO GET VESELE®

This is the first official public release of Vesele® since its news release. In order to get the word out about Vesele®, Innovus Pharma is offering special introductory discounts to all who call.

A special phone hotline has been set up for readers in your area; to take advantage of special discounts during this ordering opportunity. Special discounts will be available starting today at 6:00am. The discounts will automatically be applied to all callers. The Special TOLL-FREE Hotline number is 1-800-322-7503 and will be open 24-hours a day.

Only 300 bottles of Vesele® are currently available in your region. Consumers who miss out on our current product inventory will have to wait until more become available. But this could take weeks. The maker advises your best chance is to call 1-800-322-7503 early.

ADVERTISEMENT

Leading Acid Reflux Pill Becomes an Anti-Aging Phenomenon

Clinical studies show breakthrough acid reflux treatment also helps maintain vital health and helps protect users from the serious conditions that accompany aging such as fatigue and poor cardiovascular health

by David Waxman
Seattle Washington:

A clinical study on a leading acid reflux pill shows that its key ingredient relieves digestive symptoms while suppressing the inflammation that contributes to premature aging in men and women.

And, if consumer sales are any indication of a product's effectiveness, this 'acid reflux pill turned anti-aging phenomenon' is nothing short of a miracle.

Sold under the brand name AloeCure, it was already backed by clinical data documenting its ability to provide all day and night relief from heartburn, acid reflux, constipation, irritable bowel, gas, bloating, and more.

But soon doctors started reporting some incredible results…

"With AloeCure, my patients started reporting less joint pain, more energy, better sleep, stronger immune systems… even less stress and better skin, hair, and nails" explains Dr. Liza Leal; a leading integrative health specialist and company spokesperson.

AloeCure contains an active ingredient that helps improve digestion by acting as a natural acid-buffer that improves the pH balance of your stomach.

Scientists now believe that this acid imbalance is what contributes to painful inflammation throughout the rest of the body.

The daily allowance of AloeCure has shown to calm this inflammation which is why AloeCure is so effective.

Relieving other stressful symptoms related to GI health like pain, bloating, fatigue, cramping, constipation, diarrhea, heartburn, and nausea.

Now, backed with new clinical studies, AloeCure is being recommended by doctors everywhere to help improve digestion, calm painful inflammation, soothe joint pain, and even reduce the appearance of wrinkles – helping patients to look and feel decades younger.

FIX YOUR GUT & FIGHT INFLAMMATION

Since hitting the market, sales for AloeCure have taken off and there are some very good reasons why.

To start, the clinical studies have been impressive. Participants taking the active ingredient in AloeCure saw a stunning 100% improvement in digestive symptoms, which includes fast and lasting relief from reflux.

Users also experienced higher energy levels and endurance, relief from chronic discomfort and better sleep. Some even reported healthier looking skin, hair, and nails.

A healthy gut is the key to a reducing swelling and inflammation that can wreak havoc on the human body. Doctors say this is why AloeCure works on so many aspects of your health.

AloeCure's active ingredient is made from the healing compound found in Aloe vera. It is both safe and healthy. There are also no known side effects.

Scientists believe that it helps improve digestive and immune health by acting as a natural acid-buffer that improves the pH balance of your stomach.

Research has shown that this acid imbalance contributes to painful inflammation throughout your entire body and is why AloeCure seems to be so effective.

EXCITING RESULTS FROM PATIENTS

To date over 5 million bottles of AloeCure have been sold, and the community seeking non-pharma therapy for their GI health continues to grow.

According to Dr. Leal, her patients are absolutely thrilled with their results and are often shocked by how fast it works.

"For the first time in years, they are free from concerns about their digestion and almost every other aspect of their health," says Dr. Leal, "and I recommend it to everyone who wants to improve GI health without resorting to drugs, surgery, or OTC medications."

"I was always in 'indigestion hell.' Doctors put me on all sorts of antacid remedies. Nothing worked. Dr. Leal recommended I try AloeCure. And something remarkable happened… Not only were all the issues I had with my stomach gone - completely gone – but I felt less joint pain and I was able to actually sleep through the night."

With so much positive feedback, it's easy to see why the community of believers is growing and sales for the new pill are soaring.

THE SCIENCE BEHIND ALOECURE

AloeCure is a pill that's taken just once daily. The pill is small. Easy to swallow. There are no harmful side effects and it does not require a prescription.

The active ingredient is a rare Aloe Vera component known as acemannan.

Made from of 100% organic Aloe Vera, AloeCure uses a proprietary process that results in the highest quality, most bio-available levels of acemannan known to exist.

According to Dr. Leal and several of her colleagues, improving the pH balance of your stomach and restoring gut health is the key to revitalizing your entire body.

When your digestive system isn't healthy, it causes unwanted stress on your immune system, which results in inflammation in the rest of the body.

The recommended daily allowance of acemannan in AloeCure has been proven to support digestive health, and calm painful inflammation without side effects or drugs.

This would explain why so many users are experiencing impressive results so quickly.

REVITALIZE YOUR ENTIRE BODY

With daily use, AloeCure helps users look and feel decades younger and defend against some of the painful inflammation that accompanies aging and can make life hard.

By buffering stomach acid and restoring gut health, AloeCure calms painful inflammation and will help improve digestion… soothe aching joints… reduce the appearance of wrinkles and help restore hair and nails … manage cholesterol and oxidative stress… and improve sleep and brain function… without side effects or expense.

Readers can now reclaim their energy, vitality, and youth regardless of age or current level of health.

One AloeCure Capsule Daily

- **Helps End Digestion Nightmares**
- **Helps Calm Painful Inflammation**
- **Soothes Stiff & Aching Joints**
- **Reduces appearance of Wrinkles & Increases Elasticity**
- **Manages Cholesterol & Oxidative Stress**
- **Supports Healthy Immune System**
- **Improves Sleep & Brain Function**

HOW TO GET ALOECURE

This is the official nationwide release of the new AloeCure pill in the United States. And so, the company is offering our readers up to 3 FREE bottles with their order.

This special give-away is available for the next 48-hours only. All you have to do is call **TOLL-FREE 1-800-748-5760** and provide the operator with the Free Bottle Approval Code: AC100. The company will do the rest.

Important: Due to AloeCure's recent media exposure, phone lines are often busy. If you call and do not immediately get through, please be patient and call back. Those who miss the 48-hour deadline may lose out on this free bottle offer.

Goodbye, Ego! Hello, Humility!

Whenever I admire a fellow woodworker's finished piece of furniture, I never ask how they did this or that because, quite simply, I am afraid they are going to tell me. Listening to someone describe how they accomplished a difficult or clever woodworking feat is, for me, like listening to someone recount their dream: I just keep waiting for the part where they tell me they woke up and it's over.

This sounds horrible, I know. The problem, however, is that more often than not, I simply can't follow what they're saying, despite being a woodworker for 10 years and having been taught by amazing, accomplished teachers at Cerritos College in Norwalk, California.

What I discovered as I progressed through those classes is that I have notable problems with spatial visualization. This means that I cannot mentally visualize advanced concepts or techniques or objects in three dimensions. Consequently, a woodworker may as well be speaking in Mandarin when they try to explain anything complicated to me because I just can't see it in my mind. Unfortunately the confused look on my face is often mistaken for intense interest, spurring the maker on to greater detail.

This limitation was not evident in the early weeks of my first class, Intro to Woodworking. In fact, as a journalist, I was in my element with note taking while my teacher told us about the properties of wood and the jobs of the machines. And the math! Finally, the haunting question of my youth — "When will I ever need to multiply or divide fractions in real life?"— was answered: When I am 53 and take up woodworking!

But my problem became apparent rather quickly when we moved into the shop for the working part of Intro to Woodworking. I was flummoxed, for example, when the teacher asked, "In which direction should you feed the wood into the bit on the router table?" I couldn't picture it until it was my own wood and just me at the router table. Then I could manually turn the (unplugged) router bit and see it against the wood to understand what feeding it against the rotation of the cutter meant.

As I took more advanced classes with increasingly sophisticated plans, I became a slower woodworker and people would teasingly accuse me of overthinking things. No, I was merely trying to think. I didn't produce sloppy work but it could take me a comparatively enormous amount of time to achieve what others could simply dash off in the shop.

This experience has rattled my self-image, but the takedown of my ego has been cushioned by the knowledge that I have done fairly well in life with my career and other pursuits. This, in turn, leads me to think about all the young kids in school for whom learning doesn't come naturally for one reason or another. What must it be like to start off in life knowing that you are a "slow" learner compared to your friends? Especially when you have no other measure of achievement... because you are five.

Woodworking is a hobby for me. Despite being a slow learner, I love it and I have the option of walking away from it — something you can't do when you are a child who needs to learn how to read and write and do math. While it is commonly understood that woodworking is always a humbling endeavor, I have noticed that some of us are more constantly humbled by it than others. Thus I have gained deep empathy for all kids who struggle mightily to learn.

And yet sometimes when I come home from school, and my non-woodworking husband asks me how my day went, I will get all revved up as I explain the technical travails that I encountered. A glazed look will come into his eyes and in the ultimate irony, I am oblivious to it until he stops me with, "Marci! I don't know what you're talking about!" Ah, I understand.

Marci Crestani is the co-author with Brian Miller of The Art of Coloring Wood: A Woodworker's Guide to Understanding Dyes and Chemicals.

PHOTO: MARC CARTER

You asked....we answered!
Introducing the newest member of our family...

Woodpeckers®

18" & 26" Precision Woodworking Squares

These former ***OneTIME Tool*** ® squares have now joined the regular ***Woodpeckers*** ® tool line.

Just like our famous smaller squares, this large square design features a precision machined one-piece blade. Unlike a typical framing square, we've added a lip to rest on the edge of the stock. The thick base formed by the cheeks gives you a square that can stand on its own when checking cabinet sides. They're also ideal for setting up track saw systems. Each square is individually checked for accuracy with computerized optical imagery.

We're adding four versions to our existing line. Joining our 6", 8" and 12" squares are 18" and 26" sizes along with their metric equivalents.

We've doubled our manufacturing facility to make more of our great tools available right when you need them. The large Precision Woodworking Squares are just the start… watch for more permanent product conversions over the coming months.

UNMATCHED ACCURACY
LIFETIME Woodpeckers GUARANTEE
EST. 1988

MADE IN USA

Woodpeckers, Inc.
STRONGSVILLE, OHIO
800.752.0725
woodpeck.com

CARD #52 or go to PWFREEINFO.COM