7 Layout Solutions Just an Arc Away

Milwaukee Ratcheting Driver

POPULAR
Woodworking
MAGAZINE

October 2013 ■ #206

Shaker Blanket Chest
Ohio-built with a Southern Accent

Get the Hang of Any Handsaw
Learn This Secret Before You Buy

HVLP Explained
History in a Vacuum

Dutch Toolbox
Quick to Build & Built to Travel

17th-century Bookstand
Transform Scrap to Art with Easy Carving

65 Years in the Making
Toshio Odate Fulfills a Lifelong Ambition

fw media
US $5.99
10
0 74470 01355 6
Display until October 14, 2013

popularwoodworking.com

Grizzly Industrial®

PURVEYORS OF FINE MACHINERY®, SINCE 1983!

- OVER A MILLION SQUARE FEET PACKED TO THE RAFTERS WITH MACHINERY & TOOLS
- 2 OVERSEAS QUALITY CONTROL OFFICES STAFFED WITH QUALIFIED GRIZZLY ENGINEERS
- HUGE PARTS FACILITY WITH OVER 1 MILLION PARTS IN STOCK AT ALL TIMES
- 24 HOUR ORDERING BY PHONE OR ONLINE • MOST ORDERS SHIP THE SAME DAY

30TH ANNIVERSARY SPECIAL EDITION 14" DELUXE BANDSAW

- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 14" sq.
- Table tilt: 45° R, 15° L
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 205 lbs.

CAST IRON WHEELS

MADE IN TAIWAN

CSA C US 252923

G0555LANV
INTRODUCTORY PRICE
REG. ~~$545.00~~ $445.00

$79 shipping

30TH ANNIVERSARY SPECIAL EDITION 17" BANDSAW

- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 17" sq.
- Table tilt: 45° R, 10° L
- Cutting capacity/throat: 16¼"
- Max. cutting height: 12⅛"
- Blade size: 131½" L (⅛"–1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick release blade tension lever
- Approx. shipping weight: 342 lbs.

INCLUDES DELUXE EXTRUDED ALUMINUM FENCE, MITER GAUGE & ½" BLADE

MADE IN TAIWAN

G0513ANV
INTRODUCTORY PRICE
REG. ~~$895.00~~ $795.00

$99 shipping

10" LEFT-TILTING CONTRACTOR-STYLE TABLE SAW *with Riving Knife*

- Motor: 1½ HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings
- Table size: 25¼" x 40" • Arbor: ⅝"
- Arbor speed: 4000 RPM
- Capacity: 3⅛" @ 90°, 2¼" @ 45°
- Rip capacity: 30" R, 12" L
- Approx. shipping weight: 221 lbs.

MADE IN TAIWAN

FREE 10" CARBIDE-TIPPED BLADE

CSA C US 175370

MADE IN ISO 9001 FACTORY!

G0732 ~~$795.00~~ SALE $695.00

$99 shipping

10" HYBRID TABLE SAW *with Riving Knife*

- Motor: 2 HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings measures 27" x 40" • Arbor: ⅝" • Arbor speed: 3850 RPM • Capacity: 3⅛" @ 90°, 2³⁄₁₆" @ 45° • Rip capacity: 30" R, 12" L • Quick change riving knife • Cast iron trunnions • Approx. shipping weight: 404 lbs.

CSA C US 232857

BEAUTIFUL WHITE COLOR!

INCLUDES BOTH REGULAR & DADO BLADE INSERTS

G0715P ONLY $795.00

$99 shipping

10" LEFT-TILTING TABLE SAWS *with Riving Knife & Cast Iron Router Table*

- Motor: 3 HP or 5 HP, 240V, single-phase
- Precision-ground cast iron table size with wings: 27" x 48"
- Arbor: ⅝"
- Cutting capacity: 25⅝" R, 8" L
- Max. depth of cut: 3" @ 90°, 2⅛" @ 45°
- Approx. shipping weight: 546 lbs.

MADE IN TAIWAN

See our website for Reviews & Awards grizzly.com

G1023RLW 3 HP ONLY $1350.00
G1023RLWX 5 HP ONLY $1395.00

$150 shipping

10" CABINET TABLE SAW *with Riving Knife & Extension Rails*

- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table
- Table size with extension: 27" x 74¾"
- Arbor: ⅝" • Arbor speed: 4300 RPM
- Max. depth of cut: 3⅛" @ 90°, 2³⁄₁₆" @ 45°
- Max. rip capacity: 50" • Max. dado width: ¹³⁄₁₆"
- Approx. shipping weight: 572 lbs.

See our website for Reviews & Awards grizzly.com

FREE 10" CARBIDE-TIPPED BLADE

3 HP LEESON® MOTOR!

Good Magazine TOP VALUE APPROVED 2009

CSA C US 232857

$150 shipping

G0691 ~~$1425.00~~ SALE $1375.00

ULTIMATE 14" BANDSAW

- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 14" sq.
- Table tilt: 45° R, 15° L
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

CSA C US 252923

MADE IN TAIWAN

See our website for Reviews & Awards grizzly.com

G0555P ~~$525.00~~ SALE $495.00

$79 shipping

19" HEAVY-DUTY BANDSAWS

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision-ground cast iron table size: 26¾" x 19"
- Table tilt: 45° R, 5° L
- Cutting capacity/throat: 18¼"
- Max. cutting height: 12"
- Blade size: 143" L (⅛"–1¼" W)
- Blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 460 lbs.

EXTREME SERIES

CSA C US 252923 (G0514X ONLY)

DELUXE RE-SAW FENCE INCLUDED

MADE IN TAIWAN

G0514X
~~$1495.00~~ SALE $1395.00
ALSO AVAILABLE **G0514XF** W/ FOOT BRAKE **ONLY $1395.00**

$99 shipping

15649R

PRICING CODE 13POP
MENTION THIS CODE WHEN PLACING YOUR ORDER

1-800-523-4777

3 GREAT SHOWROOMS! BELLINGHAM, WA • MUNCY, PA • SPRINGFIELD, MO

TECHNICAL SERVICE: 570-546-9663
FAX: 800-438-5901

Summer Sale

Starts April 1st - Ends September 21st

PLEASE GO TO GRIZZLY.COM® TO SEE ALL SALE PRICES

FREE CATALOG

764 PAGES OF HIGH QUALITY TOOLS AND MACHINERY AT INCREDIBLE PRICES

12" JOINTER/PLANER COMBINATION MACHINES

- Motor: 5 HP, 220V, single-phase
- Jointer table size: 14" x 59½"
- Cutterhead dia.: 3⅛"
- Cutterhead speed: 5034 RPM
- Max. jointer depth of cut: ⅛"
- Max. width of cut: 12"
- Planer feed rate: 22 FPM
- Max. planer depth of cut: ⅛"
- Max. planer cutting height: 8"
- Planer table size: 12¼" x 23⅛"
- Approx. shipping weight: 734 lbs.

MADE IN TAIWAN

CARBIDE INSERT SPIRAL CUTTERHEAD!

NEW END-MOUNTED FENCE

Reviews & Awards

G0634XP ONLY $2295.00

ALSO AVAILABLE IN GRIZZLY GREEN

G0633 JOINTER/PLANER ONLY $1995.00

G0634Z SPIRAL CUTTERHEAD MODEL ONLY $2595.00

$150 shipping

CYCLONE DUST COLLECTOR

- Motor: 1½ HP, 110V/220V, single-phase, TEFC, 3450 RPM
- Air suction capacity: 775 CFM
- Static pressure at rated CFM: 1.08"
- Intake port: 6" with included 5" optional port
- Impeller: 13½"
- Height: 65½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

MADE IN TAIWAN

ONLY 65½" TALL!

BEAUTIFUL WHITE COLOR!

PLEATED FILTER IS PROTECTED BY A STEEL CAGE

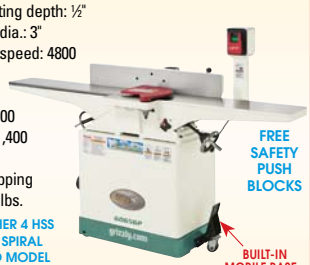
FULLY MOBILE WITH BUILT-IN CASTERS

G0703P ONLY $795.00

$79 shipping

8" JOINTERS

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision-ground cast iron table size: 9" x 72½"
- Max. depth of cut: ⅛"
- Max. rabbeting depth: ½"
- Cutterhead dia.: 3"
- Cutterhead speed: 4800 RPM
- Cuts per minute: 20,000 (G0656P), 21,400 (G0656PX)
- Approx. shipping weight: 500 lbs.



FREE SAFETY PUSH BLOCKS

CHOOSE EITHER 4 HSS KNIVES OR SPIRAL CUTTERHEAD MODEL

BUILT-IN MOBILE BASE

4 KNIFE CUTTERHEAD

G0656P ONLY $825.00

SPIRAL CUTTERHEAD

G0656PX ONLY $1225.00

$150 shipping

12" X 60" SHORT BED JOINTER

with Spiral Cutterhead

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron table size: 13" x 60"
- Fence: 5⅜" x 31¼"
- Cutterhead dia.: 3¾"
- Cutterhead speed: 4950 RPM
- Bevel jointing: 45°, 90°, 135°
- Max. depth of cut: ⅛"
- Approx. shipping weight: 832 lbs.

PARALLELOGRAM TABLE ADJUSTMENT

FREE SAFETY PUSH BLOCKS

MADE IN ISO 9001 FACTORY!

G0706 ONLY $2495.00

$179 shipping

15" PLANERS

- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table size: 15" x 20"
- Min. stock thickness: 3/16"
- Min. stock length: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 & 30 FPM
- Cutterhead speed: 4800 RPM
- Approx. shipping weight: 660 lbs.

CHOOSE EITHER 3 KNIFE OR SPIRAL CUTTERHEAD MODEL

BUILT-IN MOBILE BASE

G0453P ~~$1095.00~~ SALE $1050.00

WITH SPIRAL CUTTERHEAD

G0453PX ONLY $1695.00

$150 shipping

18" OPEN END DRUM SANDER

- Sanding motor: 1½ HP, 110V, single-phase, 15A
- Drum surface speed: 4000 FPM
- Conveyor feed rate: Variable, 2–12 FPM
- Max. stock dimensions: 36" W x 4½" H
- Min. board length: 6"
- Min. board thickness: ⅛"
- Sanding drum size: 4"
- 2½" dust collection port
- Overall size: 35" W x 50" H x 24" D
- Approx. shipping weight: 328 lbs.

G0458 ~~$895.00~~ SALE $850.00

$99 shipping

15" DISC SANDER *with Stand*

- Motor: 1½ HP, 220V, single-phase, 1720 RPM
- Cast iron sanding disc size: 15"
- Cast iron table size: 12" x 20"
- Table tilt: +15° to –45°
- Floor to table height: 37"
- Dust port: 2½"
- Approx. shipping weight: 232 lbs.

MADE IN TAIWAN

INCLUDES MITER GAUGE

FEATURES BUILT-IN MOTOR BRAKE & STORAGE CABINET WITH SHELF

G0719 ~~$875.00~~ SALE $825.00

$79 shipping

3 HP DUST COLLECTOR

- Motor: 3 HP, 240V, single-phase, 12A
- Blower/impeller: 12¾" balanced cast aluminum
- Airflow capacity: 2320 CFM
- Max. static pressure: 16.9"
- Sound rating: 87dB
- 7" inlet has removable "Y" fitting with three 4" inlets
- Canister filter size (dia. x depth): 19⅝" x 23⅝" (2)
- Bag capacity: 11.4 cubic feet
- Overall dimensions: 57⅞" long x 32" wide x 71" high
- Approx. shipping weight: 232 lbs.
- CSA certified

C US 247570

G0562ZP

~~$675.00~~ SALE $625.00

$79 shipping

FREE BROKERAGE RATES ON MACHINERY ORDERS TO CANADA! PLEASE VISIT GRIZZLY.COM® FOR DETAILS

FOLLOW US ON:

grizzly.com®

OVER 15,000 PRODUCTS ONLINE!

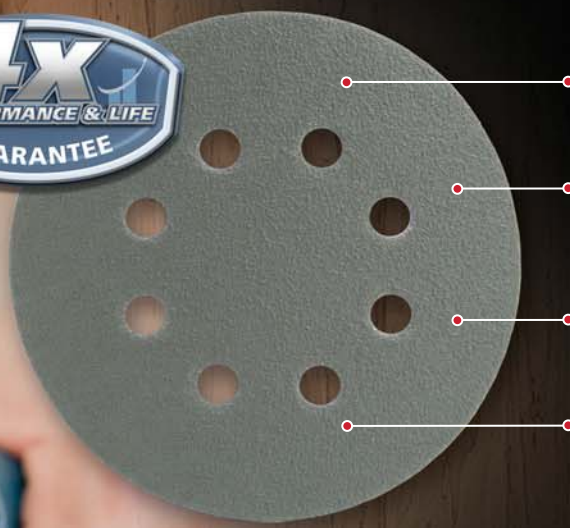
VIEW VIDEOS AT GRIZZLY.COM

PayPal VISA MasterCard AMERICAN EXPRESS DISCOVER NOVUS Bill Me Later

FILM BACK DISCS

What Makes Our Discs So Special?

4X PERFORMANCE & LIFE GUARANTEE



FILM:
Extremely durable plastic film backing provides 4 times longer life

GRAIN:
High performance grain cuts 4 times faster, increasing productivity

ANTI-CLOG:
Coating resists material build-up on the abrasive surface

RESIN BONDING:
Advance resin bonding system for increased durability & performance

Unlike traditional paper discs, Shopsmith's Film Back Discs resist tearing and edge wear providing 4X longer life.

The samples below demonstrate the durability of Film Back Discs compared to paper discs of a typical brand.

**Each disc tested in a controlled environment with the same surface type, speed, and time.*

Start Using Shopsmith Abrasives & Avoid Results Like These!

WWW.SHOPSMITHABRASIVES.COM

Available at LOWE'S *and Participating Hardware Stores.*

CARD #55 or go to PWFREEINFO.COM

CONTENTS

FEATURES

COVER PHOTO BY AL PARRISH; BOOKSTAND PHOTO BY PETER FOLLANSBEE;
TOOL CHEST & SAW PHOTOS BY CHRISTOPHER SCHWARZ; ODATE PHOTO BY LAURE OLENDER

Popular Woodworking Magazine presents

NEW AND NOTABLE

Knew Concepts Coping Saw

The strongest, most rigid Coping Saw on the market today!

The blade is tensioned with a cam lever that makes the blade so taut it "sings" when plucked. Incredibly maneuverable, you'll make turns tighter than ever before. The steel blade hooks index in eight 45 degree positions for a full 360 degree rotation. And the hooks are spring loaded to prevent inadvertent rotation. Machined from 3/16" thick 6061-T6 aluminum. Super lightweight at 8 ounces. 6½" deep throat.

Visit knewconcepts.com

CARD #60 or go to PWFREEINFO.COM

Easy Chuck™ Your Next Chuck

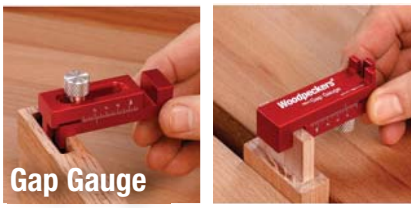
30 second jaw changes with the NEW Easy Chuck's SNAP-LOCK TECHNOLOGY (SLT).

Simply disengage each jaw from the chuck with the included Jaw Key and it slides right out. Then grab your next jaw and slide it effortlessly into the chuck and listen for the audible 'Snap' that confirms your jaw is locked and ready. No wrenches. No screws. No fuss. Jaw changes are a snap with Snap-Lock Technology (patent pending).

Visit woodturning.com
Or call (866) 963-0294

CARD #39 or go to PWFREEINFO.COM

Woodpeckers OneTime Tools



What are our OneTime Tools?

They're the tools we make just once in short production runs. And once they're gone, they're gone. The process is simple: We build a couple of the tools for demonstration then open a 14 to 21-day window for woodworkers to order. Once those orders are filled, we move on to another OneTime Tool.

Don't miss your chance at these unique tools! Join Woodpeckers eCLUB and get automatic notifications when each new OneTime Tool is released. You won't be disappointed!

Visit woodpeck.com
Or call (800) 752-0725

CARD #52 or go to PWFREEINFO.COM

Oliver Machinery IntelliCarve

Carving Made Easy!

The 1013 intelliCarve automatic carving machine is capable of producing 2D and 3D carvings. It's super easy to use and lets you to get started right away. Make beautiful lithophanes from your favorite digital photos or 3D carvings from the included library of drawings. There is no need to learn complicated CAD/CAM software programs. The 1013 intelliCarve comes complete with everything you need to get started, including carving bits and the patented i-Picture software.

Visit olivermachinery.net
Or call (800) 559-5065

CARD #94 or go to PWFREEINFO.COM

JDS Company High-Performance Air Filtration Systems

Filtration for any shop!

All JDS Air-Tech HP air filtration units have powerful motors, radio frequency remote controls, and the most efficient filters on the market. Trapping 99% of 5 micron dust particles and 91% of 1 micron dust particles, these units will gently circulate the air in your woodshop and create a cleaner and healthier environment. JDS air filtration consultants can help you decide which unit is best for your needs.

Visit jdstools.com
Or call (800) 480-7269

CARD #87 or go to PWFREEINFO.COM

Big Gator Tools V-Drill Guide

Drill Straight – Every Time!
PTEN 2013 Innovation Awards Winner

V-DrillGuides are offered in Standard and Metric sizes. Guides are made from special heat-treated steel for durability and longevity. Precision ground base to assure stability and accurate perpendicular alignment of drill bits on flat surfaces. The "V-groove" allows for alignment of drill bits on round and square cornered materials. Lifetime Warranty and 100% Made in USA.

Visit biggatortools.com
Or call (888) 428-6748

CARD #62 or go to PWFREEINFO.COM

2013 New Woodworking Tools & Products for Your Shop

Sells Safety Eye Muffs

Combines Eye & Hearing Protection

- Simple design makes them comfortable and convenient to wear
- Can be worn like regular ear muffs
- Replacement lenses, with smoke and amber tints available
- Adjustable to fit all sizes
- Can be worn over reading glasses
- Hard hat compatible
- Great for woodworking with the clear lens
- Great for the gun range with the amber tint
- Great for lawn mowing or at the racetrack with the smoke tint

Visit SellsSafety.com

CARD #83 or go to PWFREEINFO.COM

Oliver Machinery 6" Jointer

A Class Above!

The 4220 6" Jointer is the right choice for any cabinet shop or home workshop. Just like the larger models, nothing was spared in the design and construction of this great tool. It features a large precision ground 7" x 66" table, helical carbide insert cutterhead, heavy cast iron dampening base. Front mounted hand wheel controls give easy and precise table adjustments. Finally, an aluminum cutterhead guard and locking switch ensure safety.

Visit olivermachinery.net
Or call (800) 559-5065

CARD #94 or go to PWFREEINFO.COM

Perfect Match Stain Marker

Makes Touchups Fast & Easy!

The 'Perfect Match Stain Marker' is a marker that can be filled with your own water-, oil- or lacquer-based stain.

The simple design and ease-of-use makes the marker a perfect tool for woodworkers, cabinetmakers and finishers. The 'Perfect Match Stain Marker' can be used for touch-ups, highlighting and any task where stain is applied to wood. It also makes a great promotional item to give to customers after a job is completed.

Visit perfectmatchstainmarker.com
Or call (866) 962-7537

CARD #75 or go to PWFREEINFO.COM

Shopbot Handibot™ Smart Tool

An innovative, portable power tool run from apps on smartphones, tablets or PCs.

The Handibot smart tool brings push-button CNC technology to jobsites and DIY projects!

- Work directly on tables, floors, ceilings and walls, wherever cutting, drilling, carving, or other machining is needed
- Get the precision and power of robotics and digital control
- Loaded with software apps for the jobs you need to do, Handibot goes to work with a squeeze of a button

Visit handibot.com
Or call (888) 680-4466

CARD #44 or go to PWFREEINFO.COM

General Tools Crown King

Cut Crown Molding Seamlessly

The new Crown King (880) streamlines the production of crown molding, saving time and money by eliminating trial and error and complex processes and calculations. Unlike other crown molding jigs on the market, the Crown King requires no assembly: In combination with a miter saw, users can produce seamless, precise interior and exterior corner joints with the three most common crown molding spring angles (38, 45 and 52 degrees).

Visit generaltools.com
Or call (800) 697-8665

CARD #69 or go to PWFREEINFO.COM

JessEm Clear Cut™ Stock Guides

Safer, Smoother Routing

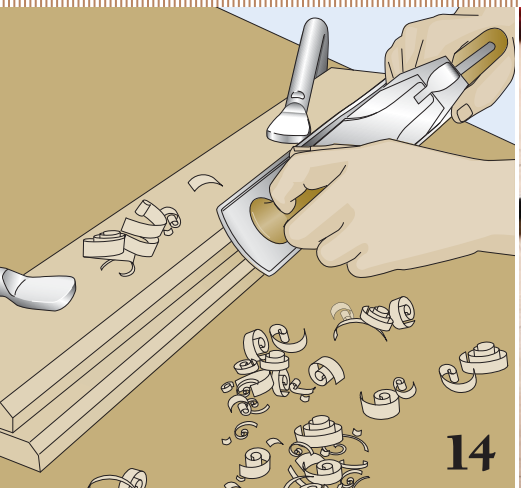
Feather boards are a great tool for holding your stock on a router table and preventing kickback, but they do have their limitations. Now there is an option with no limitations. Introducing our Clear-Cut™ Stock Guides, the unique guide rollers on the stock guides are mounted on a 5 degree angle effectively steering your stock toward the fence. You will achieve safer, smoother, more precise cuts as your work is always held in position.

Visit jessem.com
Or call (800) 436-6799

CARD #65 or go to PWFREEINFO.COM

CONTENTS

OCTOBER 2013



REGULARS

POPULAR WOODWORKING MAGAZINE

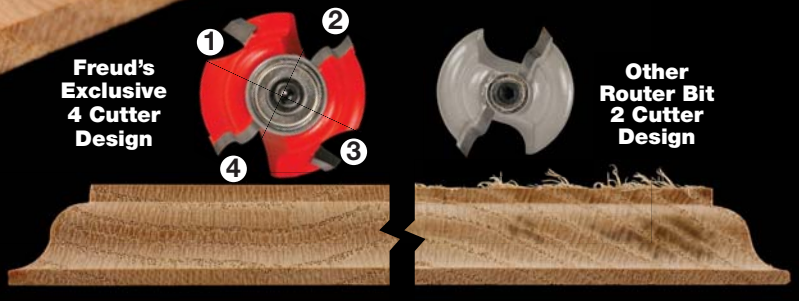
Number 206, October 2013. *Popular Woodworking Magazine* (ISSN 0884-8823,USPS 752-250) is published 7 times a year, February, April, June, August, October, November and December, which may include an occasional special, combined or expanded issue that may count as two issues, by F+W Media, Inc. Editorial and advertising offices are located at 8469 Blue Ash Road, Suite #100, Cincinnati, OH 45236. 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 •

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.

ILLUSTRATION BY MARY JANE FAVORITE; COMPASS & FLOAT PHOTOS BY AL PARRISH; BORING PHOTO BY ADAM CHERUBINI

What's The Secret To Flawless Edge Profiles With NO REWORK?

Freud's Quadra-Cut™ 4 Cutter Design Router Bits



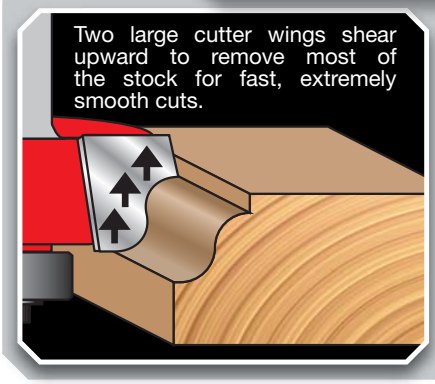
SCAN WITH MOBILE DEVICE

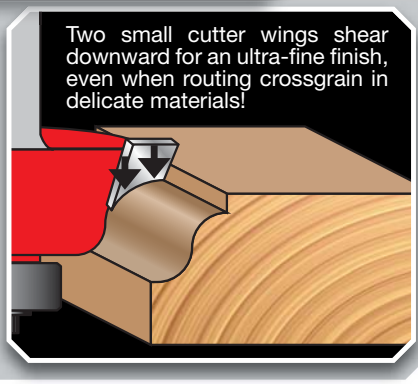
Watch Demo Now!

U.S. Patent No. 8,899,252

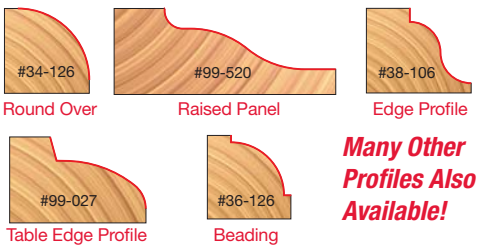
For A Smooth Sanded Finish... ...Without The Rework!

How It Works!





Freud's Most Popular Quadra-Cut™ Profiles



Many Other Profiles Also Available!

Available in Select 1/4" Shank Profiles!

Ideal for Any Project that Requires a Flawless Finish!

freud®

For more information visit: www.freudtools.com/Quadra-Cut

Red router bits are a registered trademark of Freud America, Inc. (US) 1-800-472-7307

CARD #67 or go to PWFREEINFO.COM

Centuries of Experience

As we posted the notice for the job vacated by Steve Shanesy's retirement, I was apprehensive. After all, whomever took Steve's job would have quite a career to emulate; Steve was with the magazine for almost two decades as editor, then publisher, then senior editor (after he decided it was time to slow down just a little bit).

Our ideal candidate would have chops as a professional furniture maker and teacher, video experience, the ability to write and edit, web site management skills, experience with Adobe's Creative Suite…and live close enough to work in Cincinnati.

So while I was delighted to receive Charles "Chuck" Bender's resume, I had a niggling fear – because the stipulation that the candidate be based in our Cincinnati office was inviolable; Chuck lived and worked outside Philadelphia. But he assured me that both he and his wife, Lorraine, were excited by the prospect of a move to the Queen City (which may be due to Graeter's ice cream).

We couldn't ask for a better senior editor. Chuck has 30+ years' experience building fine furniture, with pieces in many museums and private collections. He's a well-known woodworking teacher and video host and has an excellent reputation on all fronts. Plus we – and you – are already familiar with his work, because he's long been a contributor to *Popular Woodworking Magazine*.

Add Chuck's years in the shop to those of Robert W. Lang (executive editor) and Glen D. Huey (managing editor), and our full-time editorial staff offers more than 90 years of professional woodworking experience.

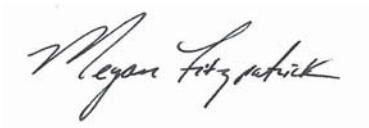
Bob began his career 40-odd years ago constructing speaker cabinets for sound systems. He's worked in several high-end cabinet shops (where he built everything from coffered ceilings to massive boardroom tables), and wrote articles for several other woodworking magazines (not to mention his many books) before joining our staff. But his best stories date to his stint as the lead scenic artist at SeaWorld in Aurora, Ohio…which is now closed (he swears it wasn't his fault).

Glen grew up in the home-building industry, but when he got tired of working in the cold, he moved inside and began supplying architectural woodworking for the same before becoming a full-time furniture maker with his own shop. He's been a professional woodworker for more than three decades.

Add to that for every issue the many years' experience of the featured craftsmen and craftswomen, and on average, we offer several centuries of woodworking knowledge.

And me? Well, I've only sold one piece; I'm not and likely never will be a professional woodworker. My job (and my distinct privilege) is to learn from my co-workers and authors everything I possibly can about the craft, and to ensure that we get the words and images right so that you, too, enjoy the benefit of the collective wisdom we have to offer.

Thanks in large part to the experience and skills of our current editors and contributors, as well as those who've come before, I am a better woodworker – and I know you are, too. **PWM**



POPULAR WOODWORKING MAGAZINE

OCTOBER 2013, VOL. 33, NO. 5
popularwoodworking.com
EDITORIAL OFFICES 513-531-2690

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

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

BACK ISSUES are available. Call 800-258-0929 for pricing or visit shopwoodworking.com. Send check or money order to: *Popular Woodworking Magazine* Back Issues, F+W Media Products, 700 E. State St., Iola, WI 54990. Please specify publication, month and year.

CARD #56 or go to PWFREEINFO.COM

CARD #20 or go to PWFREEINFO.COM

Three Planes to Flatten a Workbench?

I've just completed a new workbench for my shop. I found a great deal on white oak and used it for the top. Now that it's built I need to get it flat. I have been a power-tool woodworker most of my life, but I am interested in learning more about hand tools.

I would like to take a shot at flattening my benchtop by hand, so I'm using this as an excuse to purchase a new handplane to give it a go. Can I get my top flat using only a jointer plane, or do I really need the jointer along with a jack and smooth plane?

Wade Holloway
Runaway Bay, Texas

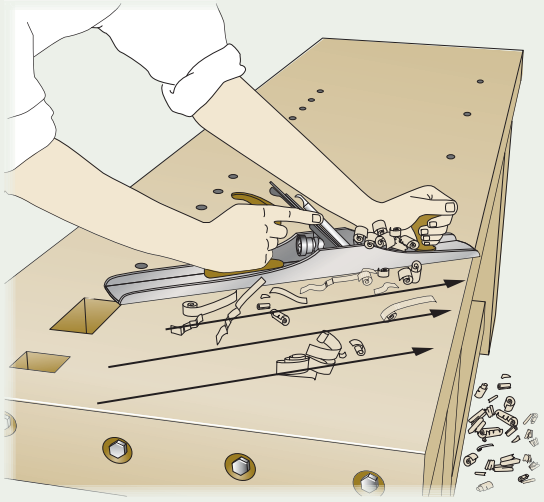
Wade,

You can flatten your bench with only a jointer plane (in fact, it's unlikely, unless your benchtop is badly out of flat, that you would need the ranker cut of a jack plane).

First, cut a small chamfer on both long edges of the top to avoid spelching. Then, plane across the grain to bring down any high spots. Next, work down the top diagonally in one direction, then back up the top diagonally in the other direction.

To finish the job, reduce the plane's depth of cut and, working with the grain, plane the entire top until you get full-length shavings on each pass. (You can go over the top with smooth plane afterward if you want, but it isn't necessary.)

Megan Fitzpatrick, editor



Laminated Steel in Japanese Chisels

In my former life as a tool-and-die maker and manufacturing engineer, I gained considerable knowledge about metals, proper applications and heat treatment. In my opinion, the "Japanese Chisels" article in the February 2013 issue (#202) contains some interesting information and raises a question.

Wilbur Pan writes, "Because the back of the chisel is made entirely of the hard-steel layer, flattening the back would be quite an ordeal." A few years ago, I bought several Japanese chisels. Looking them over carefully, I was curious about just how much tool steel was applied to the cutting edge. (This is easily tested with fairly light pressure from a carbide-tipped scribe.)

I was surprised to discover that the hard area on my chisel extended only about 3/32" up from the edge. Beyond there the steel was soft, so expected life of this tool is very short. Is this a common problem with Japanese chisels?

Randall Thompson
Grand Junction, Colorado

Randall,

To draw any broad conclusions about Japanese chisels from testing a single tool is not wise. What you found is, in my experience, not typical of most good-quality Japanese chisels.

If you look at the side of a Japanese chisel, you should be able to see the steel-lamination line extending back toward the handle end of the blade. That's an easy test to see if the entire back of the chisel is made with hard, high-carbon steel. In addition, if the chisels were made with high-carbon steel only at the tip, you should be able to see a lamination line across the back of the chisel.

Your test showed that the tip of the chisel was harder, but my bet is that if the actual Rockwell hardness of the hard back layer was measured over its entire length, it would be in the typical range of most Japanese chisels.

Also, it's not uncommon for the tip of a new chisel to be hardened more than the body of the chisel. A common observation about chisels, both Japanese and Western, is that out of the box the tip might have issues with chipping due to overhardening. Once you work past that bit, usually about an 1/8" or so, the chisel becomes fairly well behaved.

Wilbur Pan, contributor

What About the Glue Line?

Do you ever think it's acceptable to glue up two boards to make a thicker board? More specifically: I have the lumber I need to build a sugar chest, but I don't have enough thick stock for the legs (I need 8/4 material). Not having a hardwood dealer near my shop – the closest is about a two-hour drive – I'm tempted to glue up two pieces of 4/4 stock to use for the turned legs. I suspect this might not be a great idea, especially with figured wood. But maybe I can match the grain somehow. I just wanted to see what you thought.

Bill Brown
Forest, Virginia

Bill,

It's nearly impossibile to join two boards without showing a glue line, especially in a turned foot. While your glue line might be minimal, the wood grain is the bigger

CONTINUED ON PAGE 12

ILLUSTRATION BY MARY JANE FAVORITE

New Scandi Plus workbenches + free accessories worth over $100

Perfect for discerning woodworkers!

- Advanced Swedish design
- 100% European Beech
- Double row of round ¾" bench dogs working from both vises
- Includes 4 bench dogs with side springs that remain at the height required or drop flush into the dog hole

1425 SCANDI PLUS $949

57"x23", 117 ibs

1825 SCANDI PLUS $1099

73"x23", 138 ibs

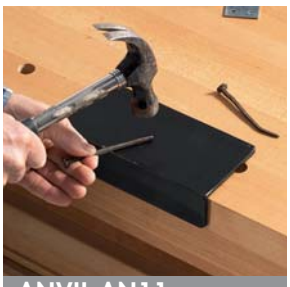
SM07 Optional storage cabinets

SM03

FREE ACCESSORIES • FREE ACCESSORIES • FREE ACCESSORIES

HOLDFAST ST11

Instant rock solid clamping in any dog hole or leg



ANVIL AN11

Self locking steel plate protects your bench

JAW CUSHIONS JC11

Rubberised cork self adhesive pads protect your vise

WOODCRAFT®

For a free catalog or to find your local Woodcraft Store, visit woodcraft.com or call 800-225-1153

Offer available in Sept or while stocks last

SJÖBERGS
workbenches – made in sweden

Visit sjobergs.se for full details of range and specifications

CARD #49 or go to PWFREEINFO.COM

CONTINUED FROM PAGE 10

problem. Figured grain makes the task all that much harder to accomplish.

I might consider this approach if paint was my finish of choice. I would not, however, consider joining two boards to make one thick piece of stock if I planned to stain the finished piece.

Another option is to purchase material from an online lumber retailer such as Steve Wall Lumber or Irion Lumber, or from an auction web site. That would save you the drive and give you more shop time.

Glen D. Huey, managing editor

Best Blade to Cut Plastic

Using a table saw, can an acrylic plastic sheet be cut with a saw blade that has tungsten-carbide tips without damaging either the blade or the plastic?

Martin Woodman
Roodepoort, South Africa

Martin,

Triple-chip blades are the best blades to use for cutting acrylic. The edge will show some tooth marks, but the top and bottom shouldn't chip out. Keep the piece moving as you cut to avoid melting the edges. If you go too slowly, melted plastic pieces can clog the gullets between the teeth.

Robert W. Lang, executive editor

Radial-arm Saw Advice

Perhaps you can offer your views on radial-arm saws for hobby woodworkers. I found a book written in the 1960s that extols the virtues of these saws.

The radial-arm saw seems versatile in the hands of a user who keeps his wits about him. Crosscuts, miters, bevels, compound cuts, dados and rips can all be tackled with a radial-arm saw. Yet, in this age of separate dedicated power tools, it's fair to say that these saws are out of favor. There are many used saws out there to be had. Is the tool a dead letter? Or is it something a new generation of workers should consider?

Mike Woodard
Indianapolis, Indiana

Mike,

A big problem with radial-arm saws is the inability to keep them accurately set. Unlike today's miter saws, older radial-arm saws are nearly impossible to keep set for a perfect 90° cut. Once the saw is adjusted for a different angle, getting it back to cut square is a problem – keep your framing square handy.

Also, most radial-arm saws have induction motors instead of universal motors, so they are more powerful. That, coupled with the rotation of the blade and the position of the carriage (above the work), makes it easy for the beam to flex and the saw carriage to "jump" or "walk over" your workpiece. That's how most of the injuries associated with radial-arm saws occur.

One last thought is that the footprint on these saws is quite large compared to newer miter saws. All in all, I would purchase a good-quality compound miter saw before turning to a radial-arm saw. I think in the end, you'll be farther ahead.

Glen D. Huey, managing editor

Perfect Blade for Keys

I'm using miter keys to decorate the corners on small boxes. My 8" circular-saw blade leaves a V-groove that shows in the finished box. I need a flat groove. What blade should I purchase?

John Kimber
Livermore, California

John,

You need an 8" rip blade instead of a combination or crosscut blade. Rip blades are generally ground with flat-top teeth, unlike other blades with an alternate top bevel. **PWM**

Chuck Bender, senior editor

ONLINE EXTRAS

Letters & Comments

At popularwoodworking.com/letters you'll find reader questions and comments, as well as our editors' responses.

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 e-mail to popwood@fwmedia.com, or by mail to 8469 Blue Ash Road, Suite 100, Cincinnati, OH 45236.

PHOTO BY ROBERT W. LANG

Highly Recommended

Routers are made in different sizes for a good reason. Some tasks call for a monster, but many good things can be accomplished with a small router. For those duties, the Bosch Colt (PR20EVSK) is hard to beat. The lightweight format combines versatilty, power and ease of use.

We have several Colts in the magazine shop and in our home shops. After years of regular use for forming edges, trimming patterns and making mortises, the Colt has yet to let us down.

— Robert W. Lang

POPULAR WOODWORKING MAGAZINE

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* and *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, *8469 Blue Ash Road, Suite 100, Cincinnati, OH 45236. Or send an e-mail 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 e-mail 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 200
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.

THE WINNER:

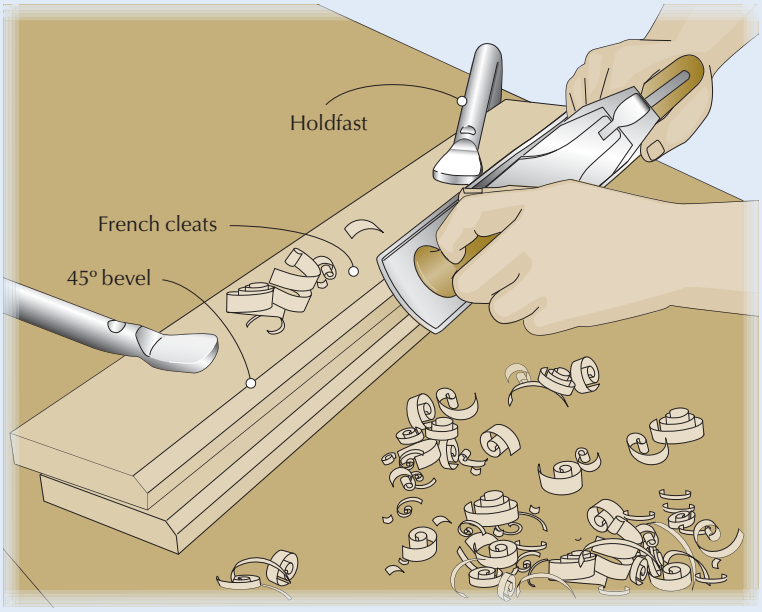
Perfect Bevels with a Jointer Plane

When making French cleats using a handplane, getting a consistent beveled edge can be problematic, particularly as the bevel approaches 45° and the plane gets "tippy." Also, it's difficult to get a good bevel established – starting on the small corner of the stock can be awkward.

I found it's best to bevel the two pieces at the same time; the exact angle is less important than having complementary angles. I clamp the two pieces one on top of the other and offset the pair by the thickness of the stock. This creates the perfect setup for a 45° angle.

The plane is much easier to start because it rides on two points to establish the bevel. With a good beginning, it's easy to follow through while maintaining the angle. When the bevels all meet you know you have a completed the task.

To plane the full thickness of the wood, it's best to raise the work off the bench (a 1/4" spacer will suffice). This allows the plane's corner to ride on the benchtop and you don't need to perform a balancing act.



If you need to bevel to a different angle, simply adjust the offset of the two workpieces and the angle can easily be changed.

Also, if you need to bevel a single piece, this technique works well with the addition of a fillister plane. Simply scribe the angle on the end of the piece, strike a rabbet with your fillister that coincides with the angle you want, then use the same technique to plane your angle.

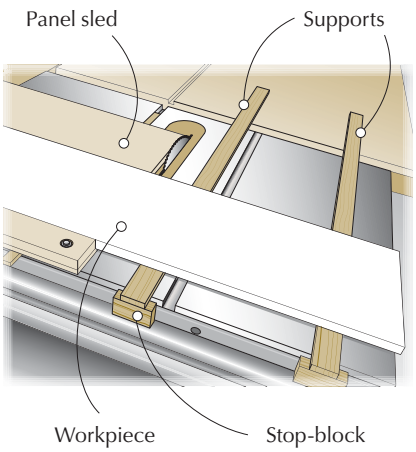
Joshua Pierce
Burlington, Vermont

Panel-cutting Companion Curbs Table Saw Tear-out

When using my homemade table saw panel-cutting sled, I used to get tear-out or a chipped end as the cutoff dropped onto the tabletop as I reached the end of the cut.

To get around the problem, I made two identical supports that I position to the offcut side. The supports are built with material that is the same thickness as my panel cutter, and stop blocks at the back end of each support are added to catch on the rip-fence rail. Now as I make cuts, the offcuts remain at the same level and no tear-out occurs.

My first idea was to use a single wide support, but I soon realized that two supports would be adjustable according to the length of the waste. And better yet, the narrow pieces are much easier to store. I simply hook them at the far end of the rip-fence rail.



Serge Duclos
Delson, Quebec

Moxon Vise Made Easy

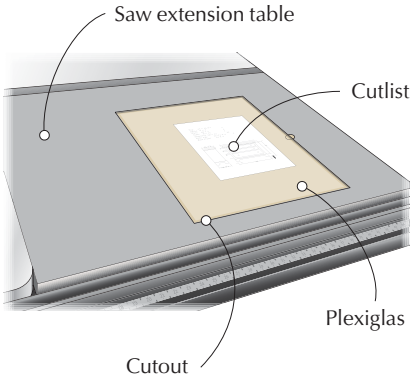
There has been a renewed interest in Moxon-style vises. The traditional vise consists of two horizontal chops and two wooden screw clamps to hold the workpiece in the jaws.

My shop-made vise can be built in an afternoon. It's 26" wide x 4" tall and the jaw capacity is 3"; as designed, it can handle a vertical board up to 20" wide. I modified 8" wooden handscrews for pressure, cutting off and discarding the rear handle, screw threads and nuts.

Drill two 1 3/4"-diameter holes through the vise jaws to slip the remaining threaded rod through. Attach two wooden clamp bodies to each vise jaw as shown at right. (Three drilled and countersunk screws do the job.)

I attach a couple of plates to the jaw

ILLUSTRATIONS BY MARY JANE FAVORITE



Keep Track of Cutlists

I was recently in North Carolina at my father's shop where I was reminded of a neat feature that we had added to his table saw.

Cutlists always seem to have a way of getting moved around, buried under tools or blown off the workbench. A great way to keep them accessible is to cut a recess into your table saw outfeed table, then fit the area with a piece of Plexiglas.

Your cutlists, or drawings for that matter, slip under the plastic and are in clear view. No longer will they get lost or blown away.

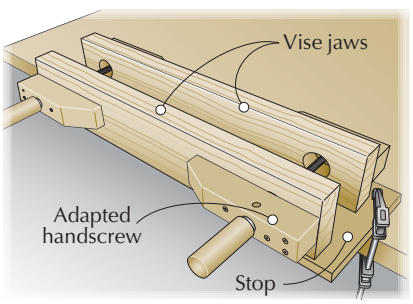
Christopher Adkins,
Duluth, Georgia

---

that rests on the table or bench. A stop screwed to the underside of the plate helps locate the assembly right at the bench edge, and it provides a solid clamp area for the F-style clamps.

You can make the vise taller or wider if need be, or substitute larger screw clamps to increase its jaw capacity.

John Stahr
Chicago, Illinois

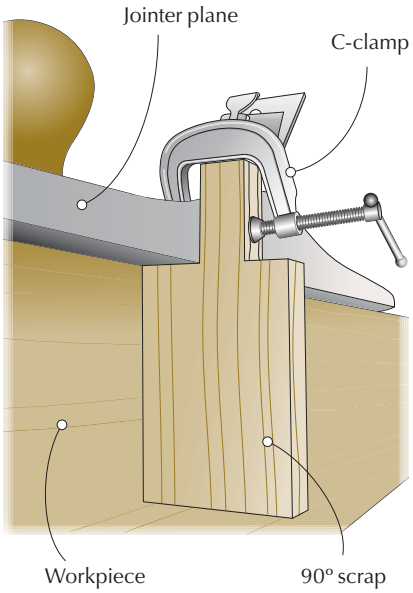


A Fence from Scrap Results in Dead-accurate Jointer Work

It takes practice when using a jointer plane to master the skills needed to accurately joint edges for a panel glue-up. I've discovered a simple jig that helps develop those skills while planing edges that are ready to rub together.

This jig can be made from a scrap in just minutes. Simply cut a notch on a piece of scrap as shown in the drawing below. Make sure the angle is 90°.

Use a small C-clamp to attach the fence just in front of or at the throat of a sharp jointer plane – whichever gets the board closer to the center of the sole of the plane. Adjust the plane iron to cut a square edge, and plane the edge until you get one or two full-width, full-length shavings.



The resulting joint is slightly sprung or slightly concave. (That's a good thing.) And it makes for extremely thin glue lines when the boards are joined.

This shop-made fence is also riding against more of the board than most commercial jointer-plane fences. The larger bearing surface helps to better keeps your tool parallel as you travel down the length of the board.

Brent Turner
Indianapolis, Indiana

Miniature Run Remover

There are times when having a small, super-sharp scraper in the shop is beneficial, especially when finishing.

For years I have used a single-edge razor blade in this capacity. It works great to smooth raised grain or to remove dust that may have settled into the finish. I also use the blade to shave off runs when they happen.

To use this "miniature scraper," hold the blade with its top angled toward you then lightly drag it across the dried coat of finish. Goodbye, runs. **PWM**

Dan Martin
Galena, Ohio

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

TRICKS ONLINE: *We post tricks from the past and film videos of some Tricks of the Trade in use in our shop. They're available online, free. Visit popularwoodworking.com/tricks to read and watch.*

Our products are available online at:

- **ShopWoodworking.com**

Cash and prizes for your tricks and tips!

Each issue we publish woodworking tips from our readers. Next issue's winner receives a $250 gift certificate from Lee Valley Tools, good for any item in the catalog or on the web site (leevalley.com). (The tools pictured below are for illustration only, and are not part of the prize.)

Runners-up each receive a check for $50 to $100. When submitting a trick, include your mailing address and phone number. All accepted entries become the property of *Popular Woodworking Magazine*. Send your trick by e-mail to popwoodtricks@fwmedia.com, or mail it to Tricks of the Trade, *Popular Woodworking Magazine*, 8469 Blue Ash Road, Suite 100, Cincinnati, OH 45236.

Liogier Floats

Old machines are revived to produce new joinery and plane-making tools.

Until a few years ago, floats were one of the least-known traditional tools in woodworking. Planemaker Larry Williams made them, and he worked with Lie-Nielsen when it introduced a line of these unique shaving tools a few years ago.

Across the Atlantic, French rasp maker Noel Liogier had the necessary machinery, sitting unused after being put away by his grandfather decades before. The Liogier firm made tools in the 1950s for filing down lead used in auto-body repair, which use essentially the same tooth pattern as a good float for woodworking joinery.

Woodworking floats aren't a familiar form in France, but Liogier's English-speaking customers suggested he make them. So the machinery was dusted off and put back in service, and Liogier floats are now available directly from the manufacturer's web site.

I've been using both the crank- and straight-handled Liogier floats for a few weeks now, comparing them to both the Lie-Nielsen floats reviewed in our December 2006 issue (#159) and the Iwasaki carving files reviewed in November 2009 (issue #179).

As with the other floats, the Liogier tools have rows of teeth that cross the body of the tool; imagine a saw with an 1"-thick blade and you'll be looking at the business end of a float. Typically, the tool is pushed across a flat surface. Each tooth acts much like a scraper, making the surface smoother and flatter.

Many hands make light work, and floats are efficient, easy to use and leave a very smooth surface behind. The feedback from the tool is excellent, and with a light touch it is easy to keep a float in full contact with a flat surface.

When trimming tenons with other tools, it is easy to either taper the tenon in length or create a curved surface. Tenon tweaking is where floats really shine, and the tools work well on both long-grain and end-grain surfaces.

Floats also excel at adjusting the size of mortises. They are usually configured to cut on the push stroke though pull stroke versions are available. At present, Liogier offers one float with either a straight or a cranked handle, though additional sizes are being developed.

The Liogier floats are a bit thinner and more flexible than the Lie-Nielsen tools, and have nine teeth per inch compared to eight. While the Liogier cut is a bit less aggressive, the tools are efficient at what they do. And they leave an excellent surface behind. The price is also less than the Lie-Nielsen by about $20 at the current Euro-to-dollar exchange rate (international shipping charges could cut into those savings).

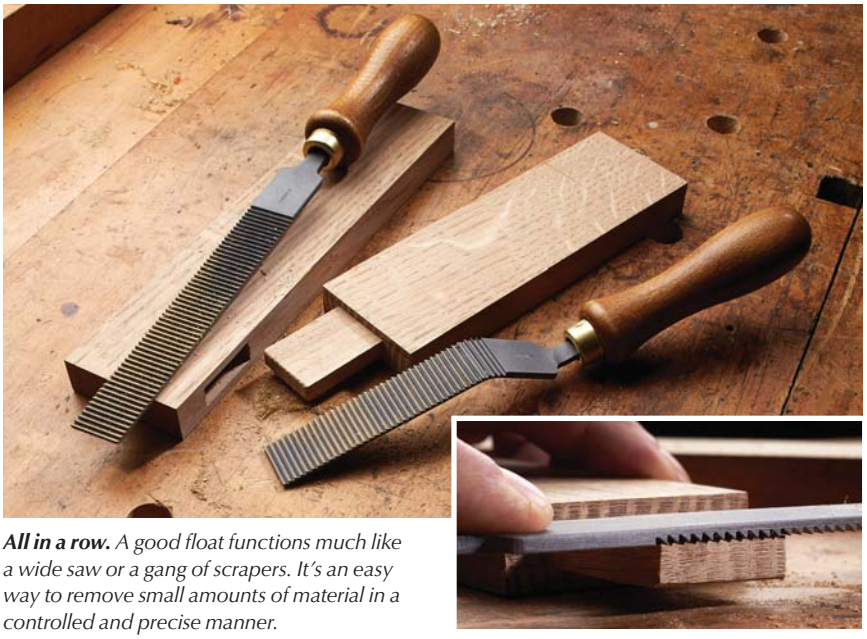
Liogier floats cost about $20 more than an equivalent Iwasaki milled-tooth flat carving file. The teeth in the floats go straight across the blade and aren't as grabby at the start of a stroke as the arced teeth of the Iwasaki files. Also, the Liogier teeth go all the way to the edge, whereas the Iwasaki file teeth go to almost the edge.

These floats can be sharpened by the user; the angle of the teeth matches the angle of a common saw file. They come sharp enough to use initially, but performance can be improved with a quick touch-up. It took me about 10 minutes to go over the teeth on a new 7" blade.

Liogier floats come equipped with a hardwood handle, and are a nice addition to any serious took kit.

— Robert W. Lang

CONTINUED ON PAGE 18



All in a row. *A good float functions much like a wide saw or a gang of scrapers. It's an easy way to remove small amounts of material in a controlled and precise manner.*

Liogier Floats

Liogier ▪ liogier-france.com

Street price ▪ $50-$55

▪ **VIDEO** *Look inside the Liogier workshop to see how the company's rasps are made.*

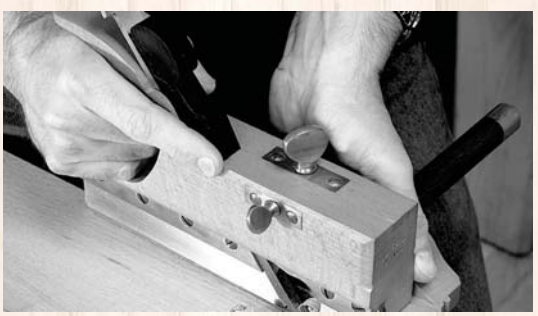
PHOTOS BY AL PARRISH

DON'T DELAY! REGISTER

WOODWORKING In America OCTOBER 18 - 20, 2013

JOIN THE WORLD'S BEST WOODWORKERS for a weekend packed with skill-building sessions, aisles of top toolmakers, and social events where you can talk shop with legendary craftspeople.

- **SHARPEN YOUR HAND- AND POWER-TOOL SKILLS** in more than 35 sessions on inlay, joinery, dovetails, carving, turning, marquetry and more.
- **GET INSPIRED BY NEARLY TWO DOZEN WOODWORKING EXPERTS** including Peter Follansbee, Ejler Hjorth-Westh, Ron Hock, Thomas Lie-Nielsen and Konrad Sauer.
- **STOCK UP ON TOOLS AND SUPPLIES WHEN YOU SHOP** the WIA Marketplace, where you'll find more than 50 top hand tool and power tool makers.



LEARN MORE AND REGISTER NOW

WWW.WOODWORKINGINAMERICA.COM

SPONSORED BY

SHOP Woodworking

BOSCH Invented for life

GORILLA GLUE

CONTINUED FROM PAGE 16

Milwaukee '10IN1' Ratchet Multi-bit Driver

Screwdrivers are more of a necessary evil in the shop than a tool about which to get excited. In today's world you need to be prepared for a multitude of head styles. Standard, Phillips, square-drive (known as "Robertson" north of Lake Erie), Torx and Allen heads all might appear at any time. If you want to be prepared for all sizes and variations you could easily have a dozen tools.

The new "10IN1" tool from Milwaukee is a good alternative to a drawer full of drivers, and at a good price. The handle has a soft over-molded grip for comfort, and the reversing lever is close at hand without much chance of switching it accidentally. Within the handle is space to store six bits for different situations – a nice solution if you climb a ladder thinking Phillips and find square-drive when you get to the top.

The chrome-plated, rust-resistant bits are held firmly, but slide out of the handle with a slight push from the front end. At the other end of the tool, the bits are held by a magnetic holder. (Standard ball-detent end bits also fit.) The 3½"-long bits fit in narrow spaces where a magnetic bit holder in a cordless drill won't.

There are a number of configurations of this tool with various combinations of bits. There is also a non-ratcheting version that costs less, and allows bits to be pushed completely through the carrier for easy removal – the bit in hand pushes the bit you want out the front of the handle as it fills the vacated slot.

If you want to get rid of that drawer full of odd screwdrivers and replace them with one tool (or maybe two) for all those tasks, the Milwaukee 10IN1 (48-22-2301) will do that for you.

— RWL

Ratchet Screwdriver

Milwaukee Tool ▪ milwaukeetool.com or 800-729-3878

Street price ▪ from $23

▪ **ONLINE ARTICLE** *Learn the dynamics of using screws to fasten wood.*

Price correct at time of publication.

JET 719200 Variable-speed Wood Lathe

Jet's hefty new wood lathe is a solid performer. And whether you are turning legs or spindles for a chair or you want to turn a special piece of lumber into a bowl or vase, a solidly built lathe yields better results.

With a heavy cast bed, this 12" x 21" lathe weighs in at more than 30 pounds heavier than Jet's other comparable variable-speed lathe. The extra weight provides a solid feel when turning at any speed.

The ways are wide and smooth, giving the tool rest and tailstock plenty of locking surface and stability.

It took a little effort to get used to the controls being on the right-hand side of the lathe, but the variable-speed control and reversing switch makes speed adjustments a breeze. The digital speed display is also easy to read.

Adjusting the belt on the step pulley is a little awkward at first – the tension release for the motor looks more like a locking handle than a lever. But once the tension is disengaged, the motor adjusts smoothly.

The headstock pulley cover could open a little wider for my taste, but the belt adjusts easily once you have released the tension.

The real power of a lathe is what's important. I installed some 8/4 cherry and put the machine through its paces. The 1-horsepower motor performed well at most speeds, stalling only on the largest motor pulley with the variable speed turned all the way down.

Tool racks mount to both ends of the lathe – but with the drift pin in the headstock rack, it is impossible to open the belt-adjustment door.

The 719200 is well-thought out with some nice features. It offers the flexibility to turn a variety of projects without having to compensate for your lathe. **PWM**

— Chuck Bender

Jet 719200 Wood Lathe

Jet Tools ▪ jettools.com or 800-274-6848

Street price ▪ $799

▪ **BLOG** *Get an up-close look at how the Jet 719200 lathe is powered.*

Price correct at time of publication.

Two GREAT Lead based Paint Strippers!

Made from soybeans!

100% Biodegradable • Easy Clean Up • Removes MULTIPLE layers

These two great lead based paint strippers are a great addition to your store for your customers. They contain no methylene chloride, are not alkaline based strippers and each cleans up easy with a degreaser or water. Unlike traditional strippers, SOY•Gel and LEAD OUT let your customers work without the odor indoors or outdoors for a guaranteed safe restoration process!

SOY • Gel

Paint & Urethane Remover™

SOY•Gel is designed to remove multiple layers of virtually any type of coating. Gel formulated for easy use on horizontal and vertical surfaces. During the removal of lead based paint, lead becomes encapsulated in the gel, preventing air born lead particles, allowing for safe and easy disposal. Our tried and true paint stripper SOY•Gel is a customer favourite for any restoration job!

Restored antique kitchen cabinet

Multiple layers of old varnish removed

** sold in quarts, gallons, 2.5 gallons, and 5 gallons

Franmar's LEAD OUT™

Lead Paint Remediator/Remover

Franmar's LEAD OUT is a new exciting lead based paint remover that renders lead paint nonhazardous for safe removal. LEAD OUT uses a special patented system that reacts with lead at the molecular level to alter the lead compound to a nonhazardous compound permanently. The result is a simple and affordable way to safely remove lead-paint.

Lead paint removed from an early 1900's home in Chicago

Heavy metal paint bridge restoration

** sold in quarts, gallons, 2 gallons, 5 gallons

FRANMAR Chemical®

Call Today!

800-538-5069 www.franmar.com

CARD #85 or go to PWFREEINFO.COM

Sketching Strategies

As with woodworking skills, design and drawing skills take practice.

For many woodworkers, design seems like a leap into the unknown. It's one thing to teach our hands to saw to a curved line; it's quite another to summon our eye to conjure a fair curve.

It's easy to imagine hand skills as a series of tasks we master step by step, yet design somehow seems like squishy ground. But ask yourself this simple question: "Did I take up woodworking as a creative outlet?" If the answer is yes, what's holding you back? Why stop short of the most rewarding part of our craft?

Here's a little secret: Hand skills don't appear out of thin air. They are only possible because we possess inherent ability, and combine that ability with technique and practice – in much the same way we possess inherent design ability just waiting to sprout. Sketching is one proven method to nurture your designer's eye and unlock your hidden potential.

Sketch first. *You have to draw before you can saw.*

It All Begins with a Sketch

A common excuse I hear is, "But I can't draw!" Nonsense. In the first grade you learned to draw letters and numbers that allowed you to express ideas and stories. Think of sketching as a way to tell a story with objects in space instead of words. Don't think of sketching as a fine art (or fine drafting) exercise, but as a visual way to shape an idea and help your mind sort through possibilities.

Sketching taps into two powerful abilities that lie at the heart of design. One is what artists sometimes call "flow" or the ability to zero in. Sketching helps us shed distractions and bring our minds into an intense focus. Second, sketching is key to visualization. You can only design what you can see and those chicken scratches flowing from your pencil become building blocks for your designer's eye.

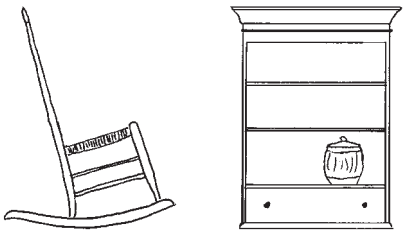
Keep it Low-tech to Start

I sketch using an old-fashioned pencil and paper – but not because I'm technically challenged. My reason is that hand drawing creates a clean connection to my inner eye. Somehow my brain responds to the image unfolding from the tip of my pencil and the feedback of graphite rubbing against paper. My drawing kit includes a drawing pad with paper that has a bit of tooth to it, a straightedge, a pair of dividers and a black pencil that leaves a good strong line without smearing.

The key to successful sketching is to minimize distractions and keep it simple. If you are new to sketching, don't complicate matters by attempting to draw in perspective or think you need to see a finished design roll from your pencil. Begin with a few key steps that build one upon the other.

Application

Start by drawing the signature view of the project. For a rocking chair, handplane or boat hull, the signature view is the side profile; for a case piece it's often the front view or façade. Begin by roughing in the overall form on just that one signature view, setting aside



On view. *Limit your initial sketch to the most prominent view. For a rocker, it's the side profile. Most case pieces, however, are defined by the façade.*

CONTINUED ON PAGE 22

PHOTOS & ILLUSTRATIONS BY THE AUTHOR

Your Source for Solid Wood Components

www.woodenlegs.com

866-963-5576

OSBORNE Wood Products, Inc.

CARD #36 or go to PWFREEINFO.COM

No wonder they're called "miracle holdfasts"!!

GRAMERCY HOLDFASTS

Steel Construction Lasts A Lifetime!

You'll call them "miracle holdfasts" too when you see how rugged, durable holdfasts shrug off the most difficult of work holding tasks... And install easily in nearly any bench or work surface. Biggest miracle of all is the price! Produced to meet the needs of woodworkers, and craftsfolk everywhere, Gramercy Holdfasts are low in cost... Gives you more for your money. You can install economical Gramercy holdfasts in every room in your home... Just drill a ¾" hole and whack them into place!

GRAMERCY TOOLS COMPANY OF AMERICA
Brooklyn, U.S.A.

Manufacturers of: Holdfasts — Saw Vises — Rasps
Backsaws — Turning Saws — Finishing Brushes — Hammers

Try Gramercy Holdfasts at our Brooklyn dealership, or online at...

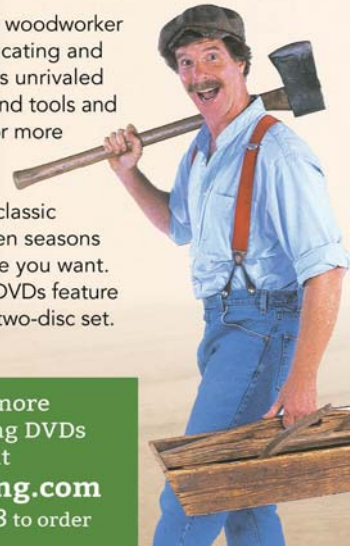
www.toolsforworkingwood.com

CARD #45 or go to PWFREEINFO.COM

WATCH CLASSIC "Woodwright's Shop" episodes *any time you want!*

Charismatic and innovative, woodworker Roy Underhill has been educating and entertaining people with his unrivaled knowledge of traditional hand tools and woodworking techniques for more than 30 years.

Now you can enjoy all the classic episodes from more than ten seasons of his hit PBS show any time you want. The "Woodwright's Shop" DVDs feature a complete season in each two-disc set.



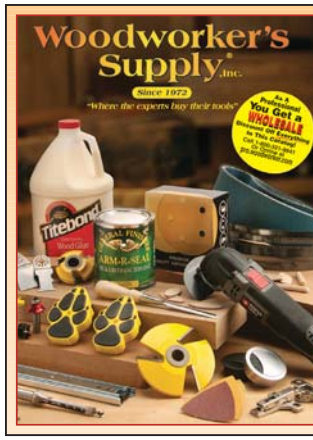
These and many more Popular Woodworking DVDs are available at **ShopWoodworking.com** or call (855) 840-5118 to order

Custom Branding Irons

Distinctive marking for your craft

P: 586.484.7713 · www.branding-irons.biz

CARD #93 or go to PWFREEINFO.COM



If you are in a woodworking business... this could be the most valuable tool in your office.℠

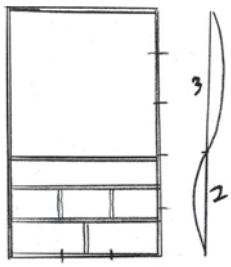
Please call
1-800-321-9841
for your 750 page catalog AND mention code pw0113

FREE to woodworking businesses.

Visit us at pro.woodworker.com/pw0113

CARD #54 or go to PWFREEINFO.COM

CONTINUED FROM PAGE 20

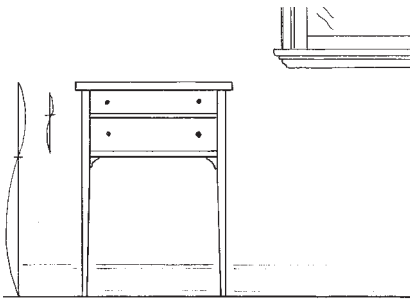


Vertical divisions. *This sketch for a hanging tool rack is divided vertically to make space for storing handsaws at the top and small cubbies on the bottom.*

the other views for the time being. Questions about other views such as details of the side and top may answer themselves once the front view takes shape. Bring the other views in as the story unfolds.

To establish the boundaries of the façade, I like to use a rectangle based on simple ratios to block in a form. By that I mean a simple rectangle such as 1:2, 2:3, 1:1, or 3:5 (ratio between heights to width). These simple shapes have been used since antiquity to undergird a design and were held to be aesthetically pleasing.

But more important, with a little practice these simple rectangles are easy to visualize internally. You can close your eyes and picture a square (1:1 ratio) in your mind or a double square (2:1 ratio), so these simple shapes give the mind something to latch onto. This rectangle will correspond to functional dimensions. For example a sideboard is often 40" high to fit our human frame but the width might be 60" to fit the wall space it's intended to fill. In that case, the simple rectangle that defines the form would be a 2:3.



Scale. *Add something familiar to give a sense of scale. This baseboard and window in the background gives a sense of how this small table will mesh in the room setting.*

IDEAS FROM THE MORGUE

The word morgue might conjure up some creepy images, but it's also a term to describe a collection of ideas, pictures, articles or material for future use. I have a library of furniture reference books, but in addition I keep a morgue, a thick binder full of clippings from magazines. It's packed with images and ideas I find inspiring and might never locate again if I had to sort through an ocean of old magazines.

This, along with my library, is a helpful resource in the early stages of the design process. I like to take a backward look at what's been done before. Always asking the question, "What have we learned?"

I look for ideas that excite me as well as investigate the best joinery practices. This backward look fills my imagination with possibilities – sort of a pre-study to inform and inspire the eye before moving forward. — GW

Inspiration files. *Although I have more furniture books than most libraries, this binder is a handy treasure chest packed with clippings, patterns and inspirational photos.*

Once the overall boundaries of the façade are established, organize it vertically. We're telling a visual story so it helps establish the major divisions from bottom to top, creating a story with a beginning, middle and ending. In practical terms this means establishing the major parts that divide the vertical space such as the base, open space below a case and drawer or shelf space.

When the vertical space is organized, it's much easier to flesh out details such as the thickness of legs, shelves or drawer details. This is also a good time to introduce curves or give a hint of a carving or inlay detail. This façade view is key to establishing the scale and proportions of many of the elements that will follow.

Here's a quick tip: A sense of scale on a small drawing can be a tricky thing to imagine. Sometimes I add in a lamp or vase (to scale, of course) that might rest on the top, or a bit of the interior architecture such as a chair rail or window from the background. This will help you imagine how your design occupies space.

Once the façade begins to take shape, move on to the side view. Just remember that as the design begins to gel in your inner eye, you may revisit ground you already covered again and again, gradually zeroing in on your finished design. **PWM**

George is the author of two design DVDs (Lie-Nielsen Toolworks) and co-author with Jim Tolpin of "By Hand & Eye" (Lost Art Press).

ONLINE EXTRAS

For links to all these online extras, go to:

- **popularwoodworking.com/oct13**

BLOG: *Read more from George R. Walker on his Design Matters blog.*

IN OUR STORE: *"By Hand & Eye," a new book by George R. Walker and Jim Tolpin.*

Our products are available online at:

- **ShopWoodworking.com**

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.

Store your stuff in style. *This blanket chest is based on a 19th-century example from a southwest Ohio Shaker community, but the dovetail layout shows the influence of Southern furniture. In typical fashion, the till lid doubles as a chest lid stay.*

LEAD PHOTOS BY AL PARRISH; STEP PHOTOS BY CHRISTOPHER SCHWARZ & THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG

Shaker Blanket Chest

BY MEGAN FITZPATRICK

This piece from White Water Village shows a Southern influence.

Atypical for Shaker blanket chests, this piece (a near replica of an extant example built at Union Village and now at the White Water Shaker Village) has half-blind dovetails on all corners. The layout – side boards with tails at the front, pins at the back – has more in common with a typical sugar chest than with most Shaker blanket chests, which are usually either through-dovetailed or rabbetted and nailed.

So it seems the influence of Southern furniture made it across the Ohio River – at least on this piece.

This chest is a fairly simple build; the bulk of the work is in cutting the 44 half-blind joints on the carcase, after which the 24 through-dovetails for the plinth are a stroll in the park (with the possible exception of cutting the miter on the integral moulding). The most difficult step is keeping the three till parts properly aligned while gluing up the carcase (but get a friend to help and it's easy).

I was lucky; I got my hands on several beautiful pieces of wide, 4/4 walnut for the one-board front and back of my chest (I also scored a gorgeous 5/4 piece for the one-board top). But to get the width needed for the ends, I had to glue up panels.

You'll note that I'm not mentioning many exact measurements for my build – and this is one reason I've stated this piece is a "near-replica." The cutlist on page 27 gives the dimensions of the original blanket chest; mine is ever-so-slightly smaller, because after processing the lumber for the carcase, the front board was just shy of the $17\frac{3}{16}$" width of the original. I wasn't about to go searching for another wide piece; this one was simply too beautiful not to use. And I didn't for even a second consider scabbing on the "missing" $\frac{1}{4}$", nor did I fret if the thickness of my workpieces was "off" by $\frac{1}{16}$".

Half-blinds galore. *I'm usually a tails-first dovetailer. After marking out and cutting the tails, I remove the bulk of the waste with a coping saw. Then, I split the remaining waste in half and chop it out, working toward the middle from both sides until I can't split it any more and the chisel drops into my baseline. (Ideally, I've done a good job with the coping saw so that my first chop is at the baseline.) After transferring the layout to the pin board, I overcut the sockets with the dovetail saw to make waste removal easier in the corners.*

> "Do your work as though you had a thousand years to live and as if you were to die tomorrow."
>
> —*Mother Ann Lee (1736-1784), Founder of the Shakers*

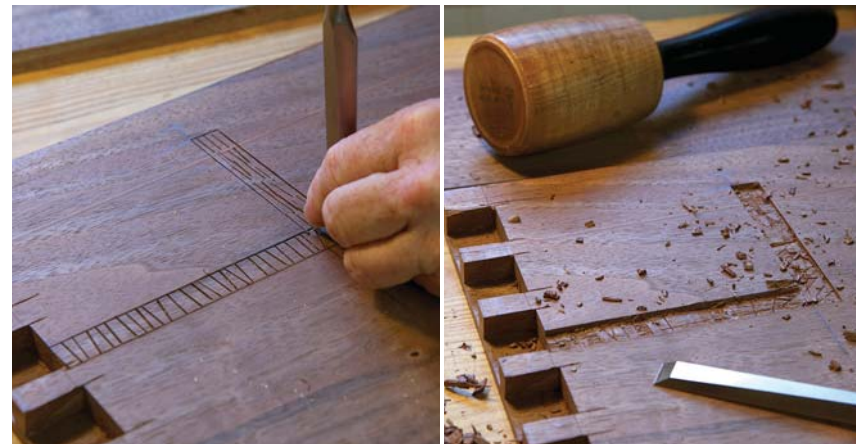
I suggest you use the same approach for this and most period builds, in the spirit of the original makers. Let the nice wood you have available tell you what size – within reason – the finished project will be, then adjust the dimensions of all your workpieces accordingly instead of slavishly following a cutlist.

Start with the Carcase

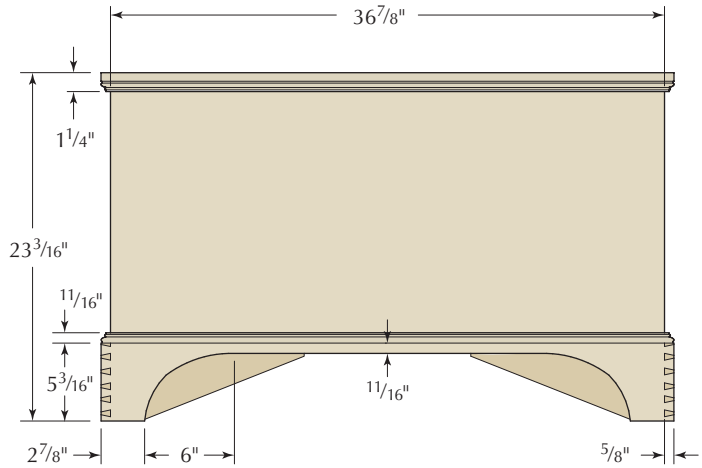
The front is a pin board at both ends, the sides have tails at the front corner but pins at the back corner, and the back has tails at both ends. So while the two side pieces are the same length as one another, the front and back differ in length by twice the depth of the pin sockets in my case.

So first, process your carcase pieces using your preferred approach (I turn to machines for the heavy work then use bench planes to remove the machine marks). Then, lay out and cut the dovetails. Here, I replicated the design on the original, with 11 joints on each corner at a 1:6 slope.

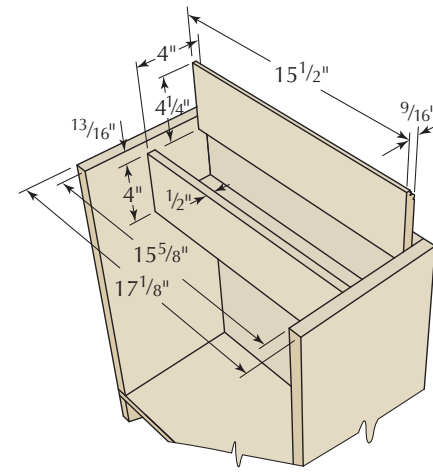
With the carcase joinery complete, dry-fit to make sure the piece goes together square, then knock it apart. Do not get ahead of yourself and rush to glue up; you still need to fit the till. (I don't know about you, but a successful dry-fit makes me want to immediately lunge for the glue bottle; I stuck several notes around my bench and on the front workpiece to remind myself not to.)



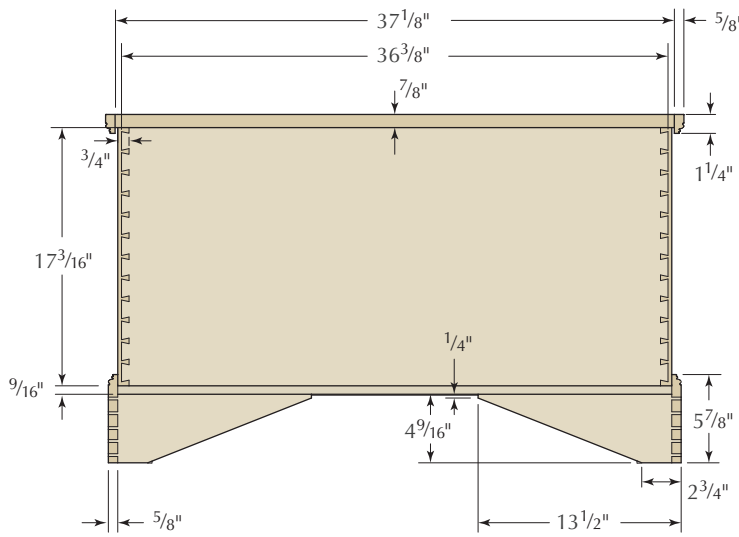
Dados & grooves. *Mark the locations for the till front and bottom, then knife in the edges. Use a chisel (bevel side toward the waste of course) to deepen your knife lines, then make a series of across-the-grain cuts into the waste. Chisel out the waste and repeat until you reach 1/4" depth (or slightly less). You can use a router plane to clean up the bottom if you like – but no one will ever see it.*



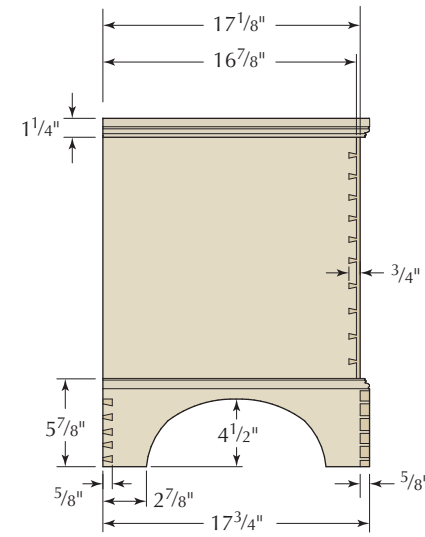
FRONT



TILL DETAIL



BACK



SIDE

Pinch sticks. *My usual pinch sticks are too long to fit across the chest's depth, so I cobbled together a set with two offcuts, a binder clip and some blue tape, sticky side out (then wrapped with a piece of tape sticky side in to keep things nice and neat).*

Shaker Blanket Chest

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Front	3/4	17 3/16	36 7/8	Walnut
❑ 1	Back	3/4	17 3/16	36 3/8	Walnut
❑ 2	Sides	3/4	17 3/16	16 7/8	Walnut
❑ 1	Bottom	9/16	17 1/8	36 7/8	Poplar
❑ 1	Chest lid	7/8	17 1/4	37 1/8	Walnut
❑ 1	Till bottom	1/2	3 1/2	16 1/8*	Walnut
❑ 1	Till front	1/2	4	16 1/8*	Walnut
❑ 1	Till lid	1/2	4 1/4	16 1/8*	Walnut
❑ 1	Plinth front	5/8	5 7/8	38 1/8	Walnut
❑ 2	Plinth sides	5/8	5 7/8	17 3/4	Walnut
❑ 2	Plinth backs	5/8	4 9/16	13 1/2	Walnut
❑ 1	Lid moulding	5/8	1 1/4	80**	Walnut

*Includes 1/4" at both ends **Includes extra for miters

Till Work

The chest carcase forms the ends and back of the till, so there are but three pieces to cut: the bottom, front and top. The front is 1/2" wider than the bottom, and extends past it so they meet flush at the exposed long edges, in effect forming a butt joint between the two (though they are not actually joined). I milled the three pieces to thickness and width, but left them overlong.

After pulling the thickness from the till front and bottom, mark on the interior of the carcase front and back the location and extents of the two dados for the till front and the two grooves for the bottom, then chop them out with a chisel to a depth of about 1/4".

Now dry-fit the carcase again and determine the distance between the joints' floors. (I find pinch sticks to be more accurate than trying to read a tape on an interior measurement.)

Cut the bottom and front to that length, minus a hair if you'd like to make the glue-up easier.

But you're not ready to glue up yet – there's still the till lid to go.

That lid edge is moulded; you can replicate the original moulding as I did (a pattern for both the till and chest lid moulding is on page 30; simply scale it down for the till stock), design your own or choose a profile that matches your router bits if you prefer that route. After cutting a series of rabbets and grooves on the table saw for the bulk of the waste removal, then planing chamfers to guide the moulding planes, I used No. 2 hollow and round planes to shape the profile for the lid moulding.

If your plane irons are sharp and you do a good job of removing all the flats, you shouldn't need to sand much.

After you're satisfied with the look of the moulding, cut the lid to the same length as the till front and bottom. Now determine the length it needs to be to fit between the sides yet still swing freely. (I again turned to my pinch sticks for this "measurement.")

To make the integral hinge for the till lid, saw stopped cuts at both ends (start from the moulded edge), leaving about 3/8" or so of material at the unmoulded edge from which to form round tenons. I marked out and made most of each cut at the table saw, stopping short of the full length to accommodate the blade radius. I finished off the crosscut with a panel saw, then made the short rip cut on each end with a backsaw.

I marked out the round tenons by lightly tapping a 1/4" Forstner bit on the end of each, about 1/8" in from the

Rabbet first. *Save yourself a lot of time (and get better results) by cutting rabbets and grooves to remove as much waste as possible before using hollows and rounds to shape a moulding profile. I cut these at the table saw.*

Moulding planes. *The rabbets and grooves will help to guide the moulding planes as you shape the profile. A light touch is key when using these traditional tools.*

back edge, then used a flush-cut saw to cut the perimeter around the tenon where it meets the lid before trimming the tenon to round with a chisel. (The tenons needn't be perfectly circular.)

With all the till pieces cut, knock the back off your carcase and insert the till bottom and front into their mortises. Set the lid in place atop the till and mark the hole location (you may want a shop helper to hold things in place while you do this). To mark the location on the other side, I set the carcase back in place and marked the round tenon location there as well. (While you could use various measuring devices for all this, I find it more accurate and quicker to work from the actual workpieces.)

Now knock everything apart for the last time and drill 1/4" holes for the round tenons – an operation I elected to perform at the drill press so my hole was straight and I could set a depth stop.

Make sure your round tenons fit in their holes. It's OK if they're a little loose; if they're too tight, trim off excess material with a chisel or knife.

As a final check before glue-up, you may want to dry-fit one of the two right carcase corners, insert all the till pieces in their respective mortises, then open the till lid to make sure it will clear the carcase side. If it doesn't swing clear, round over or chamfer the back edge of the till lid until it does.

Make sure you smooth plane or sand the till parts before moving on – it will be difficult to get a nice surface on these pieces once the carcase is together.

Square to round. *A flush-cut saw makes neat work of cutting a circle around the tenon base. Work your way around the tenon using a chisel to remove the flats until you have something close to a cylinder.*

WHITE WATER RESTORATION EFFORTS

Meeting house. *The 1827 brick meeting house – the only extant brick example in any Shaker community – has undergone significant structural work since our first visit in 2009. The trusses, joists and more were brought up to code so the building is safe for visitors, and the 1950s windows have all been replaced with period reproductions in walnut to match the originals, a job that cost $36,000.*

White Water Shaker Village, in the southwest corner of Ohio about 25 miles from downtown Cincinnati, has 20 or so extant buildings remaining of what was at its height a 1,400-acre community that was active from 1823-1916. Today, it comprises the largest collection of Shaker buildings still standing in Ohio.

When we first visited in 2009, restoration efforts had just begun on the "North Family" site to erase the changes wrought in the years during which the buildings were privately owned – including such travesties as a gaping maw in a ceiling that was ripped out to get a hot tub up to the second floor.

Today, the buildings that were part of this little-known Shaker community are owned by the Hamilton County Park District, which has granted a long-term lease of the North Family site to a group of dedicated volunteers, Friends of White Water Shaker Village, that includes craftspeople and scholars who are committed to restoring the structures and opening the site as a museum.

The first building that will be completed is the meeting house (also the first structure built on the site); it's the only remaining Shaker brick structure of its kind. Despite the unique construction, it features the usual twin entrances and staircases to the second floor (one entrance and staircase for women, the other for men) that still has some of the iconic peg rails intact. The open first floor, with no support posts to break up the space, provided ample room for the singing and dancing that typified Shaker meetings; that space is made structurally possible by an incredible truss and hanger system in the attic (restored by volunteer Ken Frederick).

Now that significant structural work has been completed on the building to bring it up to modern code, and 30 replica windows with period glass as well as many feet

of missing wainscoting have been installed, volunteers Joe Grittani (vice president of the Friends) and Dave Coleman are hard at work replacing the poplar flooring that was torn out on the second floor. Next, they will reframe the missing second-floor walls in their original locations after which the rewiring can be completed, then plaster will be applied. They'll also rebuild the original staircase to the attic.

With the Meeting House work complete, Dave, Joe and other volunteers will move on to the adjacent brick dwelling. While it won't require as much structural work as the Meeting House in order to be safe for visitors, the structure does need to be completely rewired, parts of the floor are missing and the plaster walls are in need of repair, along with other comparatively minor fixes.

But the structure that Joe is most excited about working on is the Milk House – a curious gem unlike any other he's seen. The frame building atop a brick and stone foundation has no stream running through it as would a typical spring house, but there's a pump outside that directed water through a pipe into troughs around three of the walls on the lower floor. "We think that when community members walked by, they pumped the pump a few times," he says. Overflow was directed through a pipe out the back, perhaps into a watering trough for livestock in the field behind. "The Milk House is going to require a ground-up rebuild, but I want to make sure that one is saved," Joe says.

But the efforts must go well beyond building restoration – and in fact, that's the most expensive and time-consuming part of the entire effort. "In order to open, we have to have handicapped-accessible restrooms and parking areas, exterior lighting and walkways, and a septic system," says Joe, all which all-told will cost around $250,000. "We have some of that in hand, but nowhere near enough." Once that infrastructure work is done and paid for, Joe is confident that the rest of the work can be achieved through volunteer work, donated materials and smaller fundraising efforts.

The blanket chest shown in this article is but a very small part of the effort. The wood for the build was donated by Lost Art Press, much of the time building it was my own, and the magazine is donating the completed project to the future museum. The Friends may choose to auction it off, or use it as a display in the museum when it opens.

Your help is needed, too, whether it be time or money (and any donations are tax deductible).

For more information on the restoration efforts, the history of the White Water Shaker Village and to help, visit whitewatervillage.org.

— MF

No spring. *Unlike a spring house that would have water running through it, the Milk House at White Water has a pump outside that directed water through a pipe into troughs inside. Presumably, cool water was pumped into the structure by passers-by.*

Wainscoting. *Volunteers Joe Grittani and Dave Coleman made and installed replication poplar wainscoting to replace the many missing sections on the first floor of the meeting house. At the back of the picture, you can see original panels; the unpainted sections are new. Notice, too, the open ceiling; all the plaster had to come down to rip out old wiring and to install joist hangers that support 100 pounds per square foot.*

Flooring. *By the time this is printed, Joe and Dave will be finished installing custom-milled poplar planks that match the original flooring. The plan is to wash the old floor then use the dirty water to "stain" the new floor so that they more closely match.*

Get the Glue

I prefer liquid hide glue (warmed in a soothing, warm-water bath), which gives me about 30-45 minutes of open time and cleans up easily with water. Why? Because just in case things go south, the hide glue is reversible with water and heat (also a handy attribute should a repair ever be needed).

Most carcases can be knocked together sans helper, but for this one, a few extra hands are useful to keep the till pieces in their mortises as you seat the dovetails.

Because you've by now done several dry-fits, you've no doubt realized that the dovetail layout dictates the back (a tail board at both ends) goes on last. Smear glue in the front's sockets, seat the two sides, then put the till pieces in place. You can put a bit of glue in the mortises for the till bottom and front to keep things from potentially rattling around, but it's not strictly necessary. Do not, of course, let glue get into the round mortises for the till lid.

Now put glue in the sockets on the back end of the side boards, and knock the back in place while making sure the till parts seat simultaneously in their housings.

Check for square (again, I find pinch sticks easier for this than a tape measure), make any adjustments needed, then clamp it together…or not, if your dovetails all seat perfectly and your carcase is square with no mechanical aids (I hope to someday be that perfect). Now go enjoy a 24-hour break while the glue cures. Or start working on bottom, plinth and lid while you wait.

The bottom on the extant Shaker chest is simply one board of $^{9}/_{16}$"-thick poplar that's nailed on. I couldn't find a piece of poplar that wide, and the original has a split right down the middle, so I decided on a two-board bottom with a tongue-and-groove joint down the middle.

To dress it up a bit, I also cut a bead on the grooved board – which should have gone on the tongue board so as not to weaken the grooved piece, but my $^{3}/_{16}$" beading plane couldn't seat above the tongue on the thin board. (While I perhaps shouldn't admit my considered fudging, you may run into the same difficulty if you decide on a bead, so ….)

Use clout nails to secure the bottom in place, then trim the edges as necessary so that the bottom fits flush to the case sides all around.

More Moulding Work

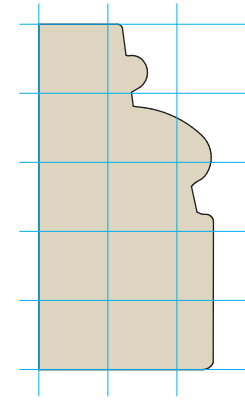
As on the till lid, both the applied lid moulding and the integral plinth moulding were cut using hollows and rounds. That means finding two straight-grained pieces of stock that are at least 75" in length, and for the plinth, 6" wide. (Note that on the plinth, much of the wood will eventually be cut away, so it's OK if there are knots and such across the width, as long as they're in the waste area.) For the best results on hand-cut moulding, you want everything to be from one continuous piece so that the profile flows cleanly from end to end. And when you fit the pieces, you'll want as little waste as possible at the miters (which also holds true for router-cut mouldings, though it's more a grain-match consideration than one of profile shape with machined pieces).

The moulding profile on both of these pieces is the same, and it's the same as that on the till lid, only larger. Again, cut rabbets and grooves both to remove the bulk of the waste and to guide your moulding planes, then cut a 45° chamfer on the edges to be rounded over. For these mouldings, I used No. 4 and No. 8 hollows and rounds.

Set the lid moulding aside when you're done and work on the plinth. On it, you'll cut through-dovetails at all four corners, with a miter joint at the top front corners where the moulding meets.

Note that the front of the plinth is a tail board, and the sides get pins at the front and tails at the back. But for now, concentrate on one front corner. Cut the plinth pieces to length, but don't leave much extra for the joinery; again, the pieces should go together with as little waste at the moulded edge as possible, so that minor variations from your plane work aren't noticeable.

Obligatory glue-up picture. *My carcase was slightly out of square at the top; a long clamp from corner to corner fixed it.*



LID MOULDING PROFILE
Grid = $^{1}/_{4}$" squares

SUPPLIES

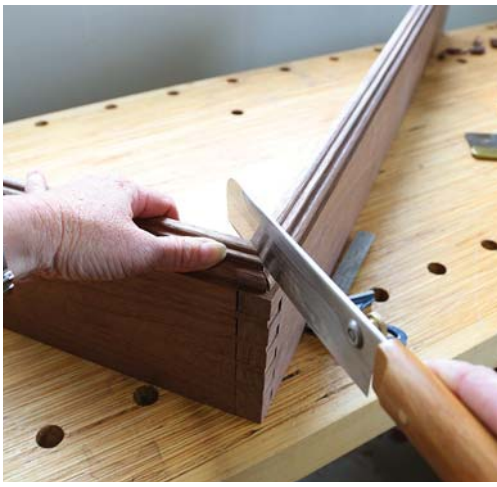
Horton Brasses
horton-brasses.com or 800-754-9127

2 ■ brass butt hinges, antique finish
#PB-409

1 ■ half-mortise chest lock
#CL2

Call for prices.

In the groove. *After getting it set up, a Stanley No. 45 combination plane makes quick work of the groove for the tongue-and-grooved bottom.*



Fussy fit. *Once the dovetail just under the moulding is fully seated, stop trimming the miter. It can't close up any more.*

On the original, there is a half-tail at the bottom and top of the layout, so I replicated that. The top edge of the top tail is a 90° cut – not a 1:6 slope as on the rest – so the tail nestles under the bottom of the moulding (see "Fussy fit" at right). Cut the joints and remove the waste, but leave the moulded edge at full length until the dovetails are done.

Now mark a 45° angle to define the miter angle on each piece (I used a 6" adjustable square and a marking knife, and nicked across the high points on the moulding) then cut straight down on the waste side of your line. The closer you get to the finish cut the less remaining work there is to do – but don't get overconfident; better to fuss with the final fit a few times than overcut here and have a resultant gap in your miter.

Knock the joints together as far as they'll go, make sure the boards are 90° to one another, then use a flush-cut saw to cut straight down between the two miters to remove just a sliver of material. Knock the joints more tightly together, check the fit, then cut again (and again) as necessary. The saw will bind in the cut – and that's a good thing – it means the joint is tight. Adjust right and left with the saw as necessary to bring everything together tightly at 45°.

With the first corner dry-fit, mark the baseline on the other end and repeat.

Refer to the Back illustration on page 26 and note that the front and sides of the plinth are nailed around the carcase; the narrower back pieces sit under the carcase bottom. Cut them to length, and complete the plinth joinery (tails on the back pieces, pins on the sides).

Now knock everything apart, and lay out then cut the curves on the front and sides. Leave the back pieces square until after the plinth is applied; that makes it easier to glue and clamp it in place. The angles are easy to cut afterward with a jigsaw or panel saw.

Glue up the plinth while wrapping it around the carcase (this will help make sure they fit flush to one another). Be gentle while knocking the plinth together; with the curves cut, there is little material remaining so the pieces can easily snap. Nail it in place on the front and sides, and glue the back pieces to the carcase bottom. Add glue blocks at all four corners.

Lid, Hardware & Finish

Cut your lid panel to size (about 1/8" wider and longer than the carcase to allow it to easily open and close), and smooth plane or sand the inside to a finished state; once you apply the moulding, it will be darn near impossible to get into the corners.

Rip the lid moulding from its motherboard, smooth the saw cut as necessary, then fit and cut the miters. Apply glue to the front piece, and a few inches back along each side piece to force movement to the back, then nail the moulding in place with cut nails.

I installed a half-mortise lock similar to the one on the original piece – though I'm not sure that lock was installed by the Shakers (it could have been if this chest was in an elder's room; if not, the lock was likely added by a later owner). The hinges are two 2½"-long butt hinges; on the original, the two hinges were each only about 1" long, which seemed too small (though they fit the mortises perfectly, so they were not likely replacements). The hardware I used is from Horton Brasses; if you order the same, be sure to request slot screws instead of the standard Phillips screws the company supplies (if you want period-correct heads). And yes, my screws are all clocked.

The finish is three coats of shop-made oil/varnish blend, rubbed out with #600-grit sandpaper after each of the first two coats was dry.

This near-reproduction is destined for White Water Shaker Village, as a companion to its inspiration. And if all goes as planned, you may be able to see it in place in 2015. For more on the historic site, see "White Water Restoration Efforts." **PWM**

Megan is editor of this magazine. She can be reached at megan.fitzpatrick@fwmedia.com or 513-531-2690 x11348.

ONLINE EXTRAS

For links to all online extras, go to:
■ **popularwoodworking.com/oct13**

ARTICLE: *Read about our first visit to White Water Shaker Village in 2009.*

BLOG: *See more photographs from our recent visit to the historic site.*

IN OUR STORE: *"Pleasant Hill Shaker Furniture," by Kerry Pierce.*

Our products are available online at:
■ **ShopWoodworking.com**

Choose wisely. *While you can get used to most any saw and do good work, select a saw that helps channel your energy properly and you'll do good work more easily.*

Hang with a Saw Maker

BY ANDREW LUNN

Discover what really matters when choosing a handsaw.

You don't have to be a saw maker to think about saws like one. Some of the most important decisions made when making a saw get surprisingly little attention from those who buy them.

Take hang angle, for example – that's the angle formed between a saw's grip and its toothline. I don't think hang angle is discussed as much as it should be or in sufficient depth. Some explanations of it just plain miss the mark. Far more attention is given to how hang angle has evolved historically.

That's interesting, but what about hang angle as it pertains to you right now making things in your shop? How much do you really know about it? Do you understand it well enough that you could determine a saw's hang angle if you were told to calculate it from scratch?

The truth is, it takes little to make a saw that is functional. The earliest saws were little more than rocks with serrated edges. The real artistry in saws is in their refinement. The ultimate test of any saw is not whether or not it functions, but how well it functions.

You can (and should) evaluate that simply by using a saw. But the better you understand saws, the better you will understand what you are experiencing when you use them. You'll know why they feel the way they do.

Let's examine hang angle from the saw maker's perspective.

Understanding Hang Angle

Simply put, hang angle is the deepest piece of architectural geometry a saw possesses. When you push a saw, the force travels in the direction the grip is facing. That angle has a profound effect on how well a saw cuts. If the grip is angled downward too steeply, the teeth at the toe do not have enough energy behind them, and teeth farther back

PHOTOS BY CHRISTOPHER SCHWARZ

are pushed down into the wood instead of forward through it. The teeth at the rear will stick or perhaps even jam in the work if the angle is severe enough.

If, on the other hand, the grip is at too shallow an angle, the energy you apply will not be balanced behind the saw's cutting action. Getting the energy directly behind the saw's teeth is not the same as putting it behind the saw's cutting action. More on that momentarily. The net effect of a saw with too shallow a hang angle is a saw that feels strangely disconnected from the sawyer and that lacks power.

In either case, the saw does not cut its best by simply pushing the handle forward. The sawyer will instinctively apply different types of body English to correct for the poor geometry.

For example, when the grip is angled too shallowly, you'll find you rock your wrist forward with each stroke to create a more aggressive cutting action at the toe. When the grip is pointed downward too steeply, you will find you subtly keep track of the pressure you apply at different points along each stroke in order to keep the saw from jamming.

Even if you don't consciously realize it, your skill and attention are being diverted from the work itself in order to overcome the saw's shortcomings.

You could posit a general rule from this: lack of thought when making a tool results in distraction when using a tool.

To remedy either hang angle problem, the solution is the same. The force applied to the saw must be balanced behind the cutting action of the teeth. What exactly does that mean, though?

> "Write without pay until somebody offers to pay you. If nobody offers within three years, sawing wood is what you were intended for."
>
> *—Mark Twain (1835-1910), American humorist*

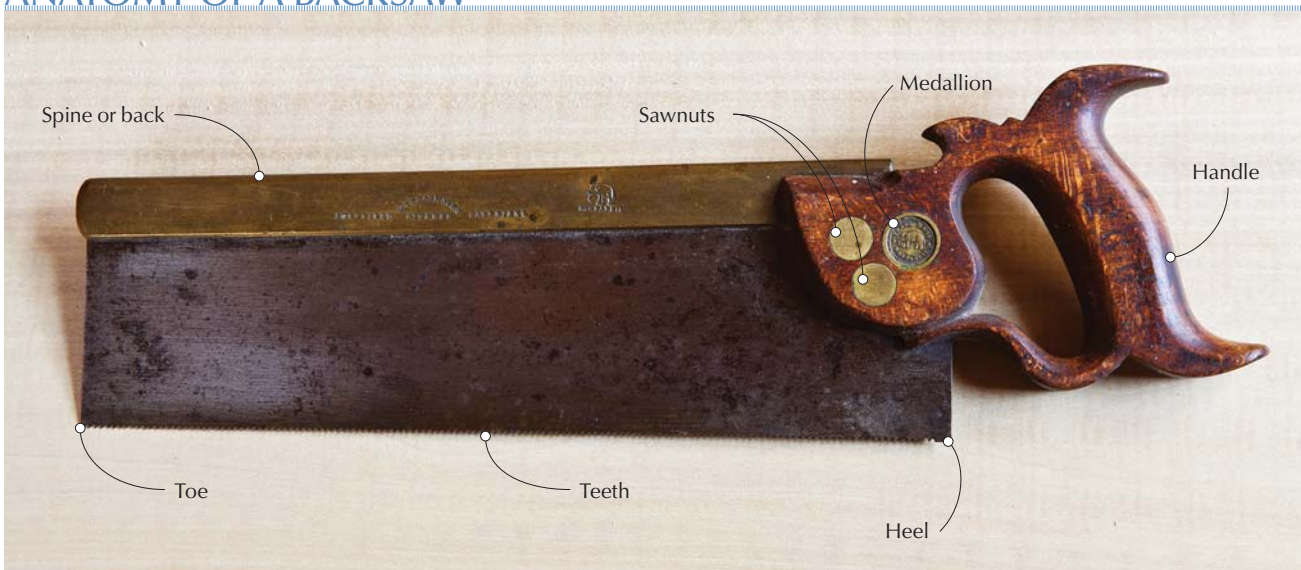
A Saw's Cutting Action

As saw teeth move forward through wood, they also descend through it. The blade moves in both directions at once. You might suppose that the only reason the blade descends through the wood is because wood is removed as the blade is pushed forward – that downward movement is nothing but a by-product of wood removal. But that isn't entirely true.

The teeth do remove wood when pushed forward, yes, but they are not just pushed forward. The saw is pushed at an angle that channels the energy both forward and slightly downward. Downward pressure propels the teeth into the wood more aggressively than

No compensation. *A good hang angle allows you to concentrate on your work without the distraction of compensating for your tool.*

ANATOMY OF A BACKSAW



Sweet spot. *The correct cutting trajectory is the perfect balance of forward and downward pressure.*

if the teeth were pushed only from behind. So the downward movement is in fact part of the cutting action. The cutting action is compound. Balancing the energy supplied to the saw behind the cutting action is a matter of finding the trajectory that provides just the right mixture of forward and downward pressure.

Every saw has a sweet spot behind which the energy you supply can be balanced – it is applied neither too steeply nor too shallowly. No body English is required. Saws that are the most comfortable and that cut the most effortlessly are precisely the ones that seem to "know" what to do with the force applied to them. All you have to do is push.

Sometimes you will hear people say that a saw should not require any downward pressure to use; that applying downward pressure is required only if the saw is dull; and that the only downward pressure required to use a saw should be provided by the weight of the saw itself.

In fact, all handsaws and backsaws require some measure of downward pressure. Insisting that the weight of the saw be the lone source of downward pressure is arbitrary – if you get it from there, you may as well get it from elsewhere. The weight of the saw is not even the best place from which to get the downward pressure required – the weight presses straight down.

A saw configured to get all its downward pressure from a heavy back feels like you are pushing and steering something from behind to which the handle is not entirely connected.

It isn't about how sharp the teeth are – the sharpest teeth still won't bite as aggressively without some downward pressure. It's like having a razor-sharp carving tool and expecting it to cut without actually being pushed into the wood. Or expecting to push a wooden handplane from behind without getting any weight down over it. A saw can cut under the impetus of its own weight, but that is not even close to the best way to design or use a saw.

It is far more advantageous to account for downward pressure in the hang angle itself – so that simply pushing the handle forward not only pushes the teeth forward, but pushes them forward and slightly down.

Find the Balance Point

This is not quite the end of it, though – let's look a little deeper.

If you think for a moment about the finest saws you have ever used, the facility with which they cut is not in fact characterized by a sheer lack of resistance. There is a low-grade resistance present that is perpetually generated and overcome as the saw is in motion. The ease with which the saw overcomes this resistance becomes your perception of how effortless the saw is to use.

The idea is to use hang angle to find the point at which the saw is ever so slightly challenged. This is another way of describing the balancing point we were talking about a moment ago. This small amount of resistance gives the saw just the right amount of feedback from the wood. This feedback, in turn, makes the saw feel solid and cohesive.

You can sense the parts of the saw to which your hand is not literally connected. When you can sense the integrity of the tool like this, your thoughts are able to reach through it to the work. The tool feels more responsive.

So hang angle does much more than propel the saw through the wood – it affects everything from how effortless the saw feels to use, to how cohesive it feels, to how responsive it feels. It establishes a direct line of communication from the user through the saw to the work. There is nothing more important than hang angle.

So how do you "calculate" hang

High & low. *Notice the difference between these two hang angles. The one on the right has a hang angle that is far too shallow; it directs your energy up away from the saw's teeth. I suspect that is why this vintage saw is in such good condition – nobody liked using it.*

angle? It's geometry, but you don't need any numbers. Prescribed notions about numerical values for it aren't that meaningful. There are too many variables in motion. You are much better off just "calculating" it by feel and by eye. How do you do that? It's easier than it sounds. There's really no substitute for experience and careful observation. Study every saw you come across. Decide what you think about its geometry and cutting action. With a little practice, you can become very good indeed at sensing how well or poorly a saw will cut.

"Calculating" hang angle for a saw you are designing is really just the reverse of evaluating the hang angle of an existing saw. You simply combine the blade and handle at an angle that you might otherwise admire if you found it on an existing saw.

The really interesting part is that there is no single right answer – the sweet spot is not a pinpoint; it's more of a range. The saw will feel a little different depending on where you land within that range. Relatively small degrees by which a handle is rotated can make a big difference in how a saw functions and feels.

It doesn't take much for a saw to develop its own personality and feel. Imbuing each saw with its own touch of personality is what making saws by hand is all about.

Two very different hang angles. *All of the variables in motion make each type of saw something of a separate art.*

Blade Shape Matters

Let's look at a handful of variables that get factored intuitively when "calculating" hang angle. The orientation of the grip to the blade is only part of the story. The shape of the blade matters too.

The longer the blade, the lower the hang angle must be – meaning the shallower the trajectory needs to be. The energy supplied needs to get behind the cutting action all the way down at the toe of the saw. Otherwise it is like taking a grip made for a shorter saw and trying to push a longer saw with it. The teeth at the toe will cut, but they won't have much leverage behind them. Also, as mentioned earlier, you run the risk of jamming the teeth into the wood farther back along the blade closer to the handle.

The taller the blade, the steeper the hang angle must be. If the hang angle is too shallow, the force you apply is too high and doesn't get sufficiently behind the teeth – it's like using a handle oriented to an imaginary toothline buried somewhere within the field of the blade. The teeth will cut, of course – saw teeth will cut so long as they are pushed forward; but the force you are applying to the saw won't feel connected to those teeth. Nor will it do a very good job of pushing them forward. The teeth at the toe of the saw will tend to dig in and grab. This is because the force is too high – it's a force that would cause the saw to topple forward if it could, like a bicycle rider about to go over the handlebars.

Grip placement. *Notice how, with these taller and longer blades, the handles have a curious "jog" along their upper edge, so that the upper edge of the blade is supported while the grip is placed lower.*

Some blades are tall enough that it is not possible to get a really good hang angle without lowering the placement of the grip. Grip placement is important for all saws – you just don't notice it as much with saws whose blades aren't tall because the relative vertical compactness of these saws fosters good grip placement in the first place. With tall saws, if the grip is left high, you either wind up with that toppling effect described above, or you wind up with the force being aimed too steeply downward.

Trying to dial in the hang

angle on a saw whose grip is too high is like trying to answer a test question that has no right answer. The solution is to alter the handle design to lower the grip on the handle itself. You see this commonly with handsaw handles.

Inclined (or Raked) Blades

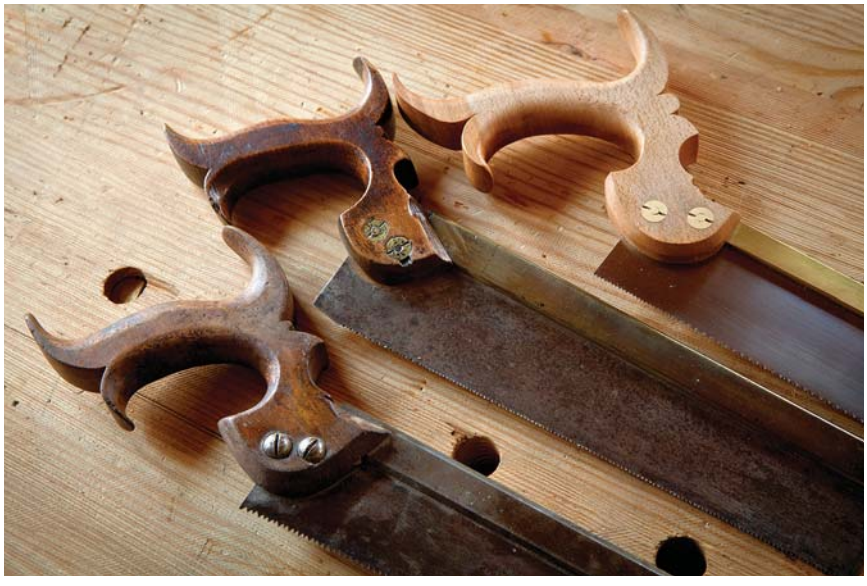
One last variable warrants attention when discussing hang angle: Not all backsaw blades are rectangular. Some are inclined, or raked, from toe to heel, so they are taller at the heel than at the toe. Because hang angle is the relation of the grip to the tooth line, you can manipulate hang angle by altering the tooth line as well as the handle. If you leave the handle alone and incline, or rake, the blade, that is the equivalent of having rotated the grip up higher.

Consider two saws on which the hang angles are the same, but one blade is raked while the other is not. On the one hand, they are identical. But on the other, the saw with the raked blade is more compact; its grip sits lower in relation to the saw's weight.

This is important, because a more compact saw will feel more cohesive and responsive.

This is why it's not entirely meaningful to compare only numerical values of hang angle. It matters how the blade is shaped and how the grip is oriented.

Blade rake. *This is one reason that numbers don't matter. These saws have the same numerical hang angle, but they won't feel identical in use. The saw with the raked blade is more compact.*



Fundamental character. *Blade rake is like hang angle – there is no single correct value for it. A saw maker's decisions become a saw's fundamental character. All three of these saws are quite nice, and each is a little different.*

Hang angle is not just about geometry; it's about how a saw feels.

If a more compact design is preferable, why not dramatically rake all saw blades and rotate the grip down as low as possible? Manipulating the blade is like a lot of things: It is good in moderation. Overdoing it will result in a saw that doesn't feel balanced. A grip too low in relation to the saw's weight will not feel as connected to that weight as a grip left up a little higher.

Conclusion

Admittedly, there is a lot more to thinking like a saw maker than I can possibly squeeze into an article of this scope. But I hope this at least gives you food for thought the next time you try a new saw or contemplate one you already own.

Hang angle is immeasurably important. A thoughtful saw maker gives a lot of thought to matters such as this. He or she anticipates the saw in use and designs a saw that reveals its true worth when used. Trust me – the thoughtful maker thinks about the thoughts of the saw user.

But just the same, a thoughtful saw user can gaze back through the saw at the thoughts of the maker. Your experience as a sawyer will deepen for doing so. It would be hard to imagine a better place to start than with hang angle. **PWM**

Andrew is a toolmaker and artist in central Ohio; he's currently at work on a book tentatively titled "Art of the Saw: Making, Sharpening & Use" (from Lost Art Press in 2014).

ONLINE EXTRAS

For links to all online extras, go to:
- **popularwoodworking.com/oct13**

ARTICLE: *Read "Understanding Western Backsaws," by Christopher Schwarz.*

BLOG: *Christopher Schwarz teaches you "How to Saw."*

IN OUR STORE: *"Handsaw Essentials," by Christopher Schwarz, a collection of 15 years of his articles and blogs on the subject.*

TO BUY: *"Super-tune a Handsaw," a DVD by Matt Cianci.*

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

Joined (& Adorned) Bookstand

BY PETER FOLLANSBEE

Simple carvings transform scraps into a 17th-century-style work of art.

Scraps, offcuts, shorts and odds and ends are bits of wood that accumulate around the shops of most woodworkers I know. Reminiscent of Donald Hall's book, "String Too Short to Be Saved," they are a lignin guilt trip, collecting dust and taking up space.

Mine lean in piles along the walls of the shop. They are found under the benches, stored in boxes and tucked in corners. Tool handles? I have ash, hickory and yew at the ready for chisels to scythes. Applied turnings for chests of drawers? That section of straight-

Few tools, big impact. *Discover how with just a few gouges and a punch you can give your work an extraordinary look.*

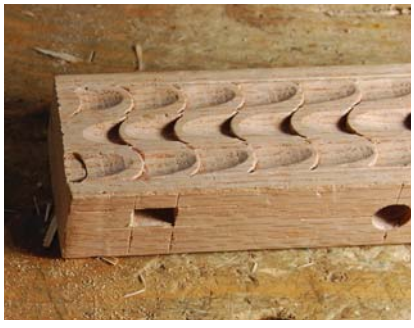
grained maple rescued from the firewood pile is perfect. On and on it goes, until one day it's housecleaning time and I sort them all again.

As I get older, I feel a greater responsibility to turn these sections of old trees into something that lasts. I've seen, I guess, too much wood go into too many chippers.

As a result, I added a new form to my repertoire that uses some of my small sections of straight-grained hardwood.

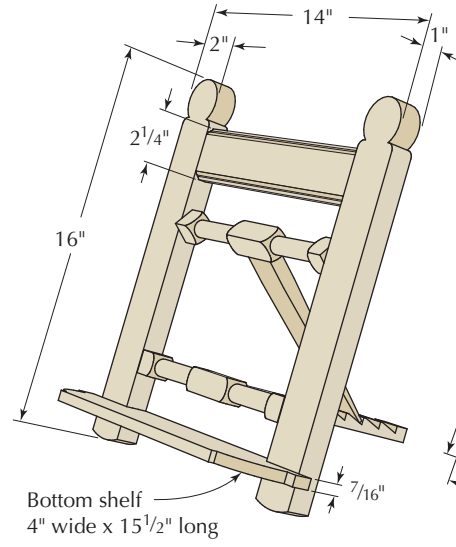
This joined bookstand is based only on a photograph of a 17th-century example; I have never seen the original. I based its proportions on a turned example that I studied and measured many years ago.

I forget what the carving pattern was on the original, so I chose to carve two simple, repeating patterns that I use for introductory carving lessons – these techniques are well within reach of the complete beginner. Very few gouges are necessary to cut these designs, and once you get the two moves down, no flat surface is safe. You'll be carving everything in sight.

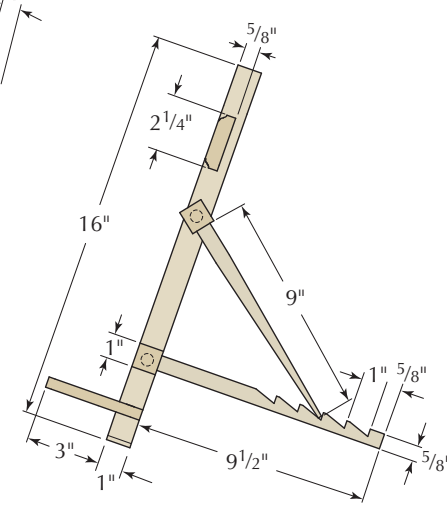


Mortise types. *The mortises for the shelf and crosspieces are bored. For the shelf, work is completed using a paring chisel.*

Flush at the front. *With thinner stock, a barefaced tenon allows for thicker mortise walls and tenons, and the face of the workpiece can be flush at the front.*



3D VIEW



SECTION

Start with the Stiles

I start by riving and planing the stock. (You can substitute sawn stock if you have no riven wood.) The stand is composed of two stiles, one crest rail and a shelf. Between the stiles are two crosspieces, each fit with parts that form the ratchet mechanism that adjusts to the perfect reading angle.

After dressing the stock, I carve the design. I'd rather carve first, then chop and bore for the joints. That way, I'm not pounding the carving gouge on a surface that has a mortise cut below. (You can do it either way, but this has become my default approach.)

I am reluctant to include measurements for the pieces that make up my bookstand – the idea is to build it using scraps found in your shop. But I am also aware of the need for basic sizes with which you can get started. To that end, the stiles on the stand shown here are 1" thick x 2" wide x 16" long. Before moving on, carve the stile faces, including the pinwheel design at the tops. See "Decoration by Gouge" at right.

With your carving complete, chop a 5/16"-wide mortise for the crest rail, about 1 1/2" deep. Lay this out so the tenon is stepped down from the top edge of the rail. Move 3/8" down from the shoulder of the flat part of the finial, then make your mortise about 1 1/2" long. This keeps the joint from showing at the top of the rail/stile juncture.

The mortise for the shelf is trickier. I wanted the shelf thin to keep the bookstand from becoming too heavy and awkward, so I decided its thickness should be 7/16". For structural stability I chose a 7/16" x 5/16" tenon size, matching both the shelf thickness and the mortise width of the top rail. I set the depth at 3/4". Chopping the mortise for these tenons seemed fraught with peril. There is no room to pry. So I chose to bore the bulk of it out, then clean it up with a paring chisel.

The mortises for the rotating crosspieces are bored, not chopped. Find the centerline, and mark 2" down from the edge of the top rail, and the same distance up from the top of the shelf. For accuracy, I use a 1/2"-diameter auger bit to bore my holes.

For added design on the stiles, I saw then chisel a flat round finial at the top end. Pinwheel carvings make this detail stand out on the completed bookstand.

A Braided Crest Rail

The crest rail is 5/8" x 2 1/4", and is 10" long, plus the length needed for the tenons. For carving details, see "Create a Braid Pattern" on page 41.

The crest rail has barefaced tenons

> "That is a good book which is opened with expectation and closed with profit."
>
> —*A. Bronson Alcott (1799-1888), educator, social reformer*

PHOTOS BY THE AUTHOR; ILLUSTRATION BY ROBERT W. LANG FROM MODELS BY GLEN D. HUEY

DECORATION BY GOUGE

The pattern on the stiles is just one motif, repeated ad infinitum all over the face of the stiles. In the example shown here, I've cut three rows of the same motif, but in alternating directions. (The carved pinwheel design uses the same technique applied in a circular pattern.) The results give the impression of depth to a carving that, as you'll see, is quite shallow.

Making waves. *Chips behind the grooves are easily removed. Make sure you have the gouge pointed in the right direction to keep the wave flowing.*

Use a marking gauge to lay out a right and left margin. Select a gouge that's about one-third the width of the total carved area. Hold the gouge plumb to strike straight down into the oak; position the gouge tight against the layout line and with its cutting edge perpendicular to the marked line. Give it a good whack with your mallet.

Make a complete row of these incised gouge cuts down the stile's length while keeping the gouge orientation the same; the gouge does not change position or angle. Set the spacing, which is generally about 1" apart, by eye and resist the urge to lay them out using a rule. It's more fun.

There are a couple of ways to grip a carving gouge as you carve the motif. In one grip, you hold the tool firmly near the bottom end of the handle, and brace your forearms against your torso to steady the gouge as you strike it with the mallet.

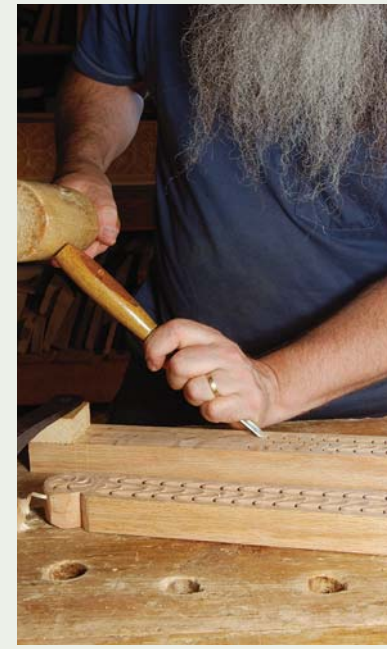
An alternate posture is to grip the tool with your fingers on the back of the gouge and thumb on the front, right down near the cutting edge. In this case, rest your fingertips on the board you're carving to help steady the gouge.

The next step is to chop out just behind the incised cuts you've just made to remove small chips. Keep the gouge aimed the exact same way, but tilt the handle down about 45°. Hold the gouge by the tool, not the handle, and let the heel of your off hand rest on the stock to provide some stability. Give the gouge a knock with the mallet, and drive it toward the incised cut.

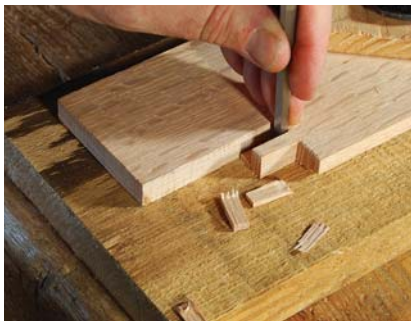
Repeat the same steps at each incised gouge cut. Practice indicates how hard to hit the gouge and how much to angle the tool. Finally, a bit of a lateral wiggle at the end helps cut the chip free. Laterally moving the gouge against the cut line helps clear things cleanly, so resist the urge to flick the tool upward at the end to get the last shred of the wood fibers removed. — PF

A handle grip. *Hold the tool near the bottom end of the handle and brace your forearms against your torso to steady the gouge as you strike it with the mallet.*

An alternate posture. *Grip the tool near the cutting edge with your fingers on the back of the gouge and thumb on the front. With this grip, rest your fingertips on the board you're carving to steady the gouge.*



Dig a little deeper. *As you drive forward, the gouge cuts deeper until it comes right up to the incised cut to pop out its chip. Voilà!*



Detailed joinery. *To get the shelf to slide past the front of the stiles, a little extra work is required. It looks complicated, but it's not.*

– there is no rear shoulder. Lay out the 5/16"-thick x 1 1/2"-long tenon so its back face is flush with the back face of the rail. Remove the front waste to create the tenons. Test your fit. These joints are drawbored and fastened with tapered oak pins.

Joinery Conundrum

The shelf joinery presented a puzzle. In the photograph, I couldn't see the joinery used, so I decided to make it up. With the shelf's thickness at 7/16", how would I join it to the stiles and have it overlap the front face of the bookstand's frame? I decided to adapt a tenon found on joined work in the Plymouth Colony and elsewhere in the 17th century. For lack of a better term, furniture historians have called this a "lipped" tenon, a phrase coined by Robert Blair St. George in "The Wrought Covenant."

The shelf extends about 3" in front of the frame, so mark a line this distance from the shelf's front edge, then mark out the tenon placement and thickness based off this line. The shoulder-to-shoulder dimension matches that on the top rail, but the ends of the shelf run beyond the stiles by about 3/4".

Mark the curves on each end with a compass (whatever looks right to your eye), saw a series of kerfs in the waste, then split and saw off the waste and fair the curves with a chisel or gouge.

Now saw down the struck tenon lines with a ripsaw, and chisel out the bits between the tenon and the overhang. The rear shoulders are sawn off. Clean up the end grain with a sharp chisel. The tenons are then trimmed to length.

Rounds & Ratchets

The two turned crosspieces are 1"-square sections. Chop the 3/4"-deep x 1 1/2"-long mortises for the ratchet mechanisms in both pieces before turning them. With the pieces mounted at the lathe, turn the tenons and the round areas between the squared sections.

The good news is these are the easiest tenons of your career – they have to be slightly undersized. It's OK if you're a bit aggressive in your turning. That's how the ratchet parts swing to adjust the angle of the bookstand.

The ratchet mechanism parts are also oak. There are notches in the lower arm, and the upper arm tapers to engage those notches. Prepare your pieces to length, width and thickness. Cut the tenons for both arms before moving on.

The 3/4"-long tenons are the full width of the stock. I cut them just as I do for any joinery work; the front shoulders are undercut and the rear shoulders are cut slightly behind the line. And these get drawbored, too.

First, cut the notches. Lay them out so they are half the thickness of the stock and about 1" apart. The first step is to saw down to a marking-gauge line with a tenon saw.

Now comes the part that requires some thought because it is easy to chop the notches in the wrong direction. Visualize how the piece fits into the bookstand, then make sure that the stock is removed from the correct side of the saw cut.

To chop these, I first use a chisel, bevel down, to waste out the wood, then flip the chisel to pare the final surface of the notch more cleanly. I also shave a slight bevel on the edge of the notches.

The upper ratchet arm taper is easy enough, and there are many ways to do it. You can use a hatchet, plane, spokeshave or just about any cutting tool. Test-fit the end into the notches you cut to see that it fits all the way down to the bottom of the notch.

Once you have these two pieces completed, you can pin them into the crosspieces. Drive your tapered hardwood pins into your offset holes to secure the parts together, then trim the pins front and back.

Joined Bookstand

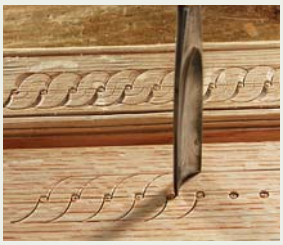
NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑ 2	Stiles	1	2	16	Oak	
❑ 1	Crest rail	5/8	2 1/4	13	Oak	1 1/2" tenon both ends
❑ 1	Shelf	7/16	4	15 1/2	Oak	
❑ 2	Crosspieces	1	1	10 15/16	Oak	
❑ 1	Upper ratchet arm	5/8	1 1/2	9 3/4	Oak	3/4" tenon one end
❑ 1	Notched ratchet arm	5/8	1 1/2	10 1/4	Oak	3/4" tenon one end

Simple lathe work. *Tenons for the ratchet arms are cut, then the rounding begins. Your skew may become your best friend.*

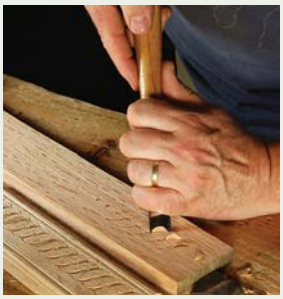
Bevel down? *Holding the chisel with its bevel down allows you to cut without digging in.*

CREATE A BRAID PATTERN

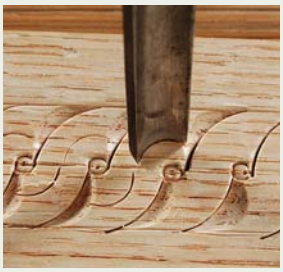
Step-off marking. *A compass makes quick work when laying out the braid design.*



Braid beginning. *The width of your gouge determines the amount of slope in your braid.*



Hand power. *You do not always need a mallet when carving. Here my two hands work together to guide my chisel.*



Find your center. *Additional detail is added by using a smaller gouge to create lines that are centered between the earlier cuts.*

That's nice. *The carving work on the top rail looks great when completed. A few gouge cuts results in a lot of detail.*

The braid pattern across the top rail uses the same cutting technique as used on the stiles, but requires some careful layout and planning. Strike the margins and a horizontal centerline along your board, then walk off the spacing with a compass. With a nailset used as a punch, strike each mark.

Line up one end of the gouge's cutting edge to the left of the punched dot and tilt the tool until the other end of its edge hits the bottom margin. This is the "angle" of the braid. Strike the gouge firmly with a mallet to set all the cuts to the left of all the punched marks. Flip the gouge around so it is now tilting in the other direction, and with its corner hitting the right side of the punched dot, strike all the marks going from the punched mark up to the outer margin.

Next, remove a chip from just behind the gouge cut. You can do this by tilting the handle of the gouge and striking it with your mallet, as was done before. An alternative is to drive the tool using hand pressure as shown at far left. My left hand braces the tool with my fingers gripped around its shank; my thumb is extended up the handle for stability. The heel of my hand rests on the bench (it would rest on the workpiece were it wider).

My right hand takes the place of the mallet. The handle's end is in the palm of my hand and I've extended my forefinger down the handle toward my left hand. My right forearm is braced against my body and the movement to drive the gouge comes from leaning my whole upper body into the gouge. My left hand, in addition to steadying the tool, acts like a brake, limiting the gouge's momentum. Work down the line one way, then up the second line to complete the step.

A smaller, more steeply curved gouge adds to the design. Strike incised lines to act as centerlines running down the braid. No chip removal this time, just the initial incised lines.

The final cuts in the design are made using the first gouge. Continue the arc of the first cut until it connects with the incised cut directly in front. This makes the braid appear to be woven in and out. This can be just an incised cut, or you can remove the chip as well. — PF

Coming Together

To assemble your bookstand, set one stile on edge with its mortises facing up. Fit the top rail into its mortise and slip the two crosspieces in place. For the shelf, I glue both halves of the joints before slipping the tenons into the mortises. Because the shelf extends beyond the stiles, you might need to prop the stile up on some scraps to be able to drive it all the way home in its mortise.

Position the second stile to the ends of the crest, crosspieces and shelf, then drive these joints together.

The top rail gets pinned and the crosspieces should swing freely. (I also installed a couple of pins in the shelf to hold books open.) Lastly, trim any protruding pins before you move the bookstand to your finish room.

If you stop at one bookstand, you'll have learned a couple of great carving techniques that can be again used on your future projects. If you catch the "bug" and build more than one bookstand, a clean shop is surely in your future. **PWM**

Peter is the joiner at Plimoth Plantation and co-author of "Make a Joint Stool from a Tree."

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

BLOG: *Learn more from the author about 17th-century joined furniture, green wood and hand tools.*

ARTICLE: *Discover the techniques to become better at drawboring your joints.*

IN OUR STORE: *Learn to rive oak in "The Best Oak Money Can't Buy."*

TO BUY: *"Make a Joint Stool from a Tree: An Introduction to 17th-century Joinery."*

Our products are available online at:

- **ShopWoodworking.com**

Dutch Tool Chest

BY CHRISTOPHER SCHWARZ

This traditional traveling chest is faster and easier to build than a floor chest.

Large or small. *To safeguard your tools, both versions of the Dutch tool chest feature fall-fronts with a resourceful and simple locking mechanism.*

Not everyone has the time, materials or skills to build a full-scale traditional floor chest, which can have as many as 100 dovetails and banks of precisely fit sliding trays.

And while I'm a fan of my large English tool chest, I've always been intrigued by the Dutch form, which I first spied in Jim Tolpin's "The Toolbox Book" (Taunton) years ago. And after studying an authentic Dutch example owned by Roy Underhill, I decided to build a pair of these chests, try them out and see how they worked.

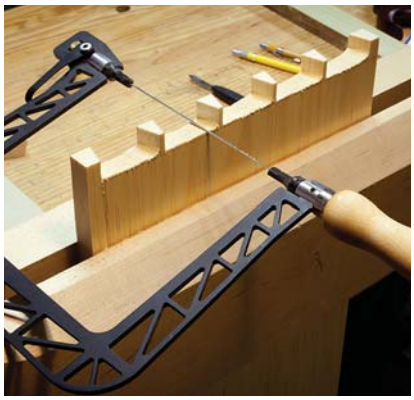
The Dutch chests turned out to be a surprise at every turn. They are simple to build – each took me only two days of shop time, compared to the 40 to 60 hours needed to build a full-size English chest. They required much less material. And, most surprising of all, they were great chests both for the shop and on the road.

Now I won't lie to you, these Dutch chests aren't as sturdy or as good-looking as a quality floor chest. But they are stout enough. And if you are short on time, materials or skills, they might just be the option you are looking for.

Built for Speed

These Dutch chests – one small and one large – are built identically. The only difference is the

PHOTOS BY THE AUTHOR, ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S MODEL



Five easy pieces. *I think five tails on each side will be enough to hold the bottom, even with 100 pounds of stuff in the chest. Cut the joint however you please. I first gang-cut the tails on the sides and cut the pins second.*

Can't miss. *With a batten clamped to the work, even the longest dados (and sliding dovetails) are easy to cut with a handsaw or – shown here – a panel saw.*

Flat, smooth & fit. *A router plane ensures that the bottom surface of the dado is flat. Be sure to remove the bulk of the waste with a chisel. Router planes take small bites.*

large chest has an extra lower compartment. If you have a lot of tools – and I mean a lot – then build the large one. Otherwise, build the small one; it holds plenty.

Made from dimensional pine, the sides of the chest are 1x12s. These are dovetailed to the bottom board. The shelves are dadoed into the sides and then nailed with cut nails through the outside for good measure.

The front and back pieces are all attached to the carcase with screws and glue – if you use a dry softwood, then the wood won't move much in service and wood movement won't be a problem.

The lid is attached to the carcase with strap hinges and falls at a 30° angle. Some written accounts say this angle is to keep rain off the chest; others tout the angled lid as a place to do some paperwork on the job.

The fall-front is the most unusual part of the chest and bears some explanation. The fall-front has two battens that lip behind the bottom lip of the carcase – kind of like a primitive hinge. The front is held in place by a sliding piece of wood that threads through the carcase, through catches on the fall-front and back into a notch in the bottom of the chest.

The result is that when the lid is closed and locked, the fall-front cannot be removed. It's a clever precursor to the locking mechanism of machinists' tool chests.

Start with the Hard Part

After cutting the chest's sides and bottom to length, begin the joinery by dovetailing the sides to the bottom. Cut the tails on the sides and the pins on the bottom – this will make the chest stronger overall – even if the glue fails.

After cutting the tails on the sides, transfer the layout to the bottom and cut the pins on the bottom board, then fit the joints.

Dados for the Shelves

The shelf or shelves for the chest are held in place with 1/4"-deep dados in the sides of the chest. Lay out the shelf locations using the drawings as a guide. I typically cut this joint by hand without a guide for my saw. However, if this is your first handmade dado, this is the easy way to do it:

Clamp a stout batten to the work and your bench that sits right on the line of your dado. Use a crosscut handsaw or panel saw to saw one wall of the dado by pressing the sawplate against the batten.

Don't remove the batten yet. First place the shelf against the batten and scribe the location of the other wall of the dado. Now reposition your batten onto that line, clamp it down and saw the second dado wall. Remove the bulk of the waste between the walls with a chisel and finish the bottom of all the dados with a router plane. Make sure all your dados are the same depth, which will keep your chest square.

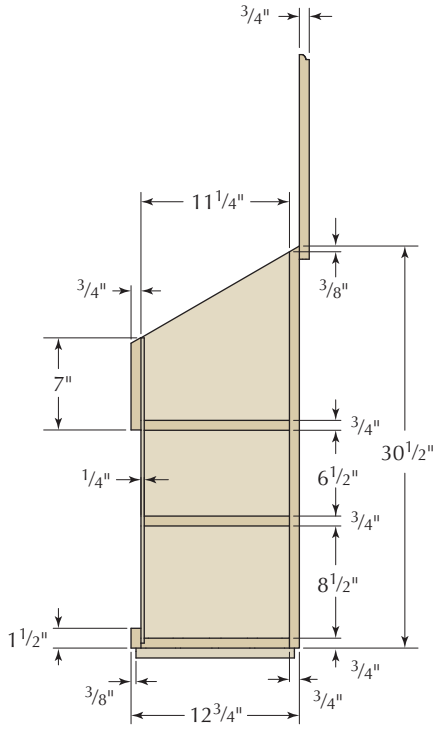
Once the dados are cut, plane the shelves to fit the dados, if necessary.

Saw the Top

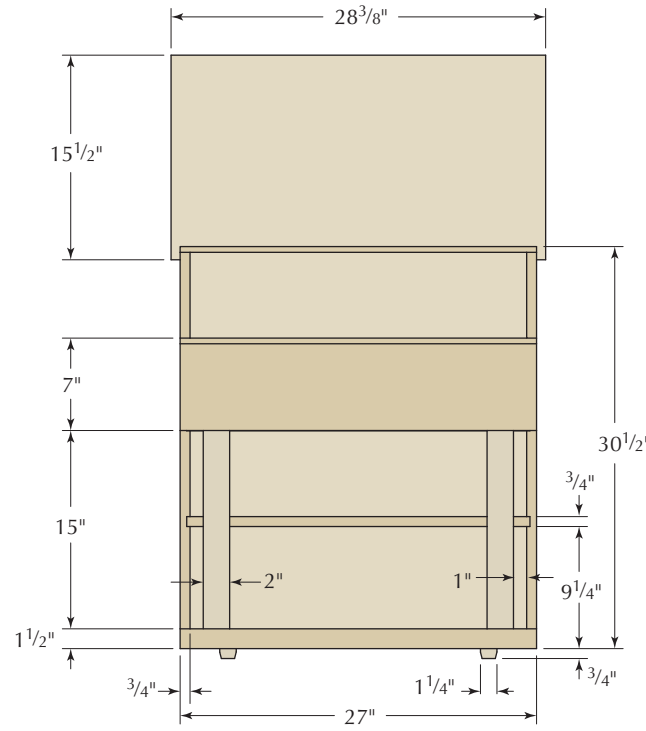
The sides of the chest are cut at a 30° angle. The best way to cut them is to clamp the sides together, lay out the angle and then saw the angle with the pieces sandwiched together. I used a sash saw to make the cut, though any crosscut saw will do the trick.

Once the sawcut is complete, keep the sides clamped together and plane away the sawblade marks. Confirm that your cut is 90° to the faces of the sides – adjust the cut with a plane if necessary.

Keep the rain out. *You can make this saw cut with a batten – like you did with the dados. But try it freehand. This is an easy cut if you start at the far corner and nibble a kerf back toward you – then proceed with power strokes.*



LARGE CHEST – SECTION



LARGE CHEST – FRONT

Lock hardware? *These notches receive the sliding locks that thread through the carcase and the fall-front. Make the notches in the shelves as clean as you can – you'll be looking at them for a long time.*

A screw job. *The backboards, front and bottom lip are all attached to the carcase with screws. This greatly speeds construction.*

Assemble the Carcase

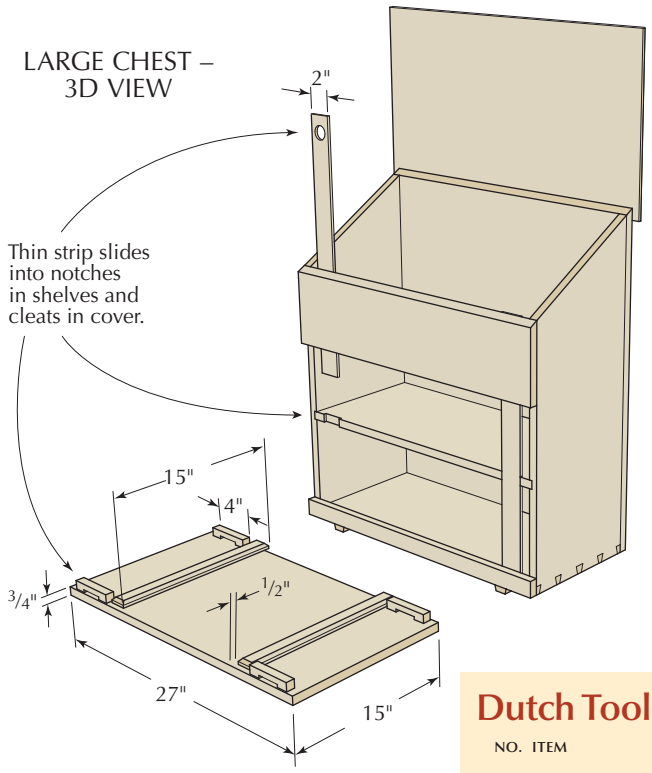
After a quick dry-fit, apply glue to the dovetails and knock those corners together. Then put glue in the dados and drive in the shelves. Apply clamps across the shelves until the glue sets up. Then nail the shelves in place by driving 4*d* (1 1/2") cut nails through the outside of the case and into the shelves. Set the nails. Confirm the carcase is square.

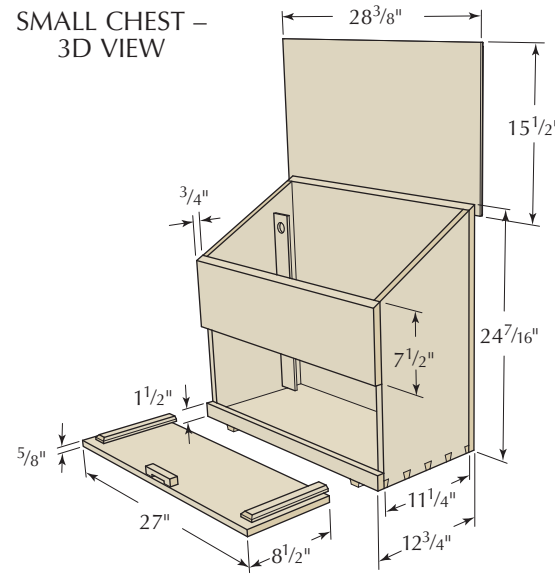
While the case is clamped up, cut the notches that will receive the sliding lock. I used two sliding locks for the large chest and one for the small one. The notches in the shelves are 1/4" deep and 2" wide. The notches in the bottom are 1/4" deep, 2" wide and cut halfway through the thickness of the bottom. All the notches need to line up vertically for the locks to work.

Saw out as much waste as you can, then chop away the remainder with a chisel.

Once the notches are cut, screw the front, lower lip and back onto the carcase. The lower lip is easy – just glue and screw. The front piece needs a 30° bevel on its top edge to match the 30° on the sides. The backboards should

> "The woodworker can make himself a first-rate craftsman, he can persevere in spite of present difficulties, learning all the time, and enjoy a sense of personal achievement in surmounting them. Because personal achievement is the only answer to the cipher business and the one which a man owes his soul."
>
> —*"The Woodworker," February 1947*





be shiplapped at the least (tongue-and-groove would be better). Then the top board of the back requires a 30° bevel on its top edge. Use No. 8 x 1¾" screws for the job.

The last bit of work on the carcase is to add the skids to the underside of the bottom. These disposable strips of wood prevent the bottom from becoming rotten or worn quickly away. Screw the two skids to the bottom about 3" from the ends of the carcase. Bevel the corners of the skids to make the chest easier to drag.

Make the Fall-front

The removable fall-front of the Dutch chest is a cool feature. To make it work, you need to first fit the fall-front in its opening. Then you screw the battens to the backside of the fall-front. The battens do two things: They keep the fall-front flat through the long haul, and they grab onto the lower lip of the case to help keep the chest locked tight.

Screw the battens to the back of the fall-front so they protrude ½" beyond the bottom edge of the fall-front. Be sure to ream out the clearance holes for the screws in the battens to allow for a bit of seasonal wood movement.

Dutch Tool Chests

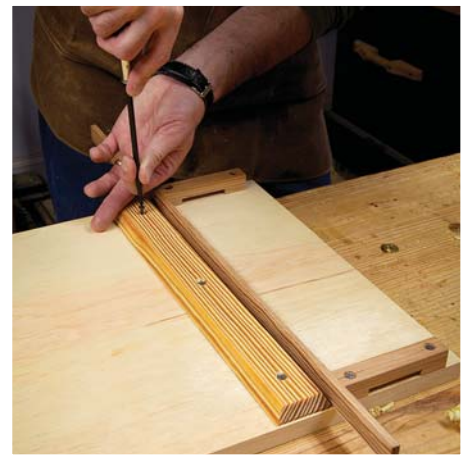
NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
LARGE CHEST						
❑ 2	Sides	3/4	11 1/4	30 1/8	Pine	
❑ 1	Bottom	3/4	11 1/4	27	Pine	
❑ 2	Shelves	3/4	11 1/4	26	Pine	in 1/4"-deep dados
❑ 1	Front	3/4	7	27	Pine	
❑ 1	Bottom lip	3/4	1 1/2	27	Pine	
❑ 1	Lid	3/4	15 1/2	28 3/8	Pine	
❑ 2	Skids	3/4	1 1/4	12	Pine	
❑ 1	Back	3/4	30 1/2*	27	Pine	
❑ 1	Fall-front	3/4	15	27	Pine	
❑ 2	Panel battens	1/2	1 1/2	15	Pine	
❑ 4	Catches	3/4	3/4	4	Pine	
❑ 2	Locks	1/4	2	23 1/8	Pine	

*Width is composed of several tongue-and-grooved or shiplapped boards.

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
SMALL CHEST						
❑ 2	Sides	3/4	11 1/4	24 1/16	Pine	
❑ 1	Bottom	3/4	11 1/4	27	Pine	
❑ 1	Shelf	3/4	11 1/4	26	Pine	in 1/4"-deep dados
❑ 1	Front	3/4	7	27	Pine	
❑ 1	Bottom lip	3/4	1 1/2	27	Pine	
❑ 1	Lid	3/4	15 1/2	28 3/8	Pine	
❑ 2	Skids	3/4	1 1/4	12	Pine	
❑ 1	Back	3/4	24 7/16*	27	Pine	
❑ 1	Fall-front	3/4	8 1/2	27	Pine	
❑ 2	Panel battens	1/2	1 1/2	8	Pine	
❑ 1	Catch	3/4	3/4	4	Pine	
❑ 1	Lock	1/4	2	17 1/8	Pine	

*Width is composed of several tongue-and-grooved boards.

That's catchy. *These little wooden bits receive the sliding locks as they slide down through the carcase. The more catches you have, the more secure the fall-front will be.*



Batten down. *The battens are attached with No. 8 x 1" screws. Note how I chamfered the corners of the battens to make them more friendly to fingers.*

Smaller bits. *Here you can see how the fall-front is simpler on the smaller chest.*

Next you need to add the catches to the back of the fall-front that will receive the sliding locks. The catches are ¾" x ¾" x 4" and have a ½" x 2" notch cut in them to receive the sliding locks. You can add as many catches as you like, though one or two per sliding lock is sufficient.

Once you have the battens and catches screwed in place, you can make the sliding lock pieces. These are ¼"-thick x 2"-wide pieces of material (I used old pieces of heart pine). Thread them through all the notches and catches to make sure they fit. Cut them to final length so they are flush with the top of the front edge of the carcase. Then bore a 1"-diameter hole near the top of each sliding lock to make it easy for you to slide it out.

Details & Paint

You can trick out the chest as much as you like. I added a bead to a couple long edges. On the front of the fall-front, I planed a ⅛" deep, ½"-wide rabbet. On the lid I added a thumbnail moulding around three edges. There really are no hard-and-fast rules.

The lid itself can be fancy or plain. On the large Dutch chest, I screwed battens to the inside of the lid to keep it flat. On the smaller chest I used breadboard ends to help keep the lid flat.

The traditional finish for the exterior is paint. Most of the Dutch chests I've seen have been a chalky blue. I like black chests, so I used a black milk paint – not for its historic correctness but for its durability.

Strap hinges and a hasp will make the lid open and shut – and stay shut if you like. You can make your own wooden chest lifts to attach to the sides or buy metal ones.

Interior Details

The real genius of the Dutch chest is how efficient the interior space is. The bottom compartments are sized perfectly for moulding planes, rabbet planes, plows and generally piling stuff. I don't recommend you break up this space into little compartments. Some Dutch chests would put a shallow drawer in this area, so that's an option to consider.

The top compartment is where you should have a tool rack for your chisels and other pointy tools – these racks are *de rigueur* on Dutch chests. I've experimented with lots of different racks through the years. What I prefer is a rack made from a 1" x 1" stick that is bored with ½"-diameter holes that are

For security. *A hasp will keep the lid down and the sliding locks in place. Skip the hasp if you don't travel.*

Fancy or plain. *I made these mahogany lifts from scraps left over from another job. You also can buy simple chest lifts from the home center. You need lifts. Don't skip them.*

on 1⅛" centers. You'll have to widen a few of the holes for your wide chisels, but otherwise, it will hold many of your tools as-is.

The floor of the top compartment is ideal for holding your three bench planes – jack, jointer and smoother – and your three joinery backsaws – dovetail, carcase and tenon. You can divide up the space with ¼"-thick walls that are tacked in place, or use an open floor plan.

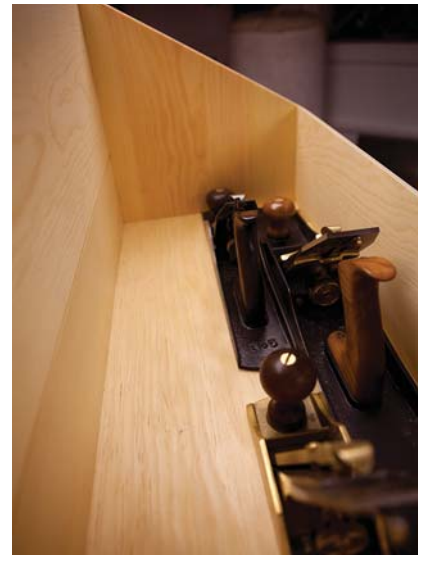
The lid of the chest is a great place for holding two panel saws and, with a little creative leatherwork – all your marking tools.

How do you use this chest? I like to park it on a sawbench or chair by the workbench. I lift the lid and let it stay open. This setup give me easy access to all the tools in the chest without stooping.

What is most surprising about the chest is how easy it is to move around by myself. Unlike my English floor chest, I can lift this one easily by myself – it's only 130 pounds when fully loaded. And it fits in any car (even a two-door coupe). The only question mark in my mind about this chest is how long the whole thing will last. And I can promise I will find out – I use this chest almost every week when I'm on the road. **PWM**

Christopher Schwarz is the editor of Lost Art Press (lostartpress.com) and the author of "The Anarchist's Tool Chest."

The open plan. *The lower compartment is typically left open so you can stack or pile tools in as you see fit. I have been happy to leave it wide open because I can get more in there.*



Planes above. *The top compartment is large enough to hold your three bench planes and more – with ample space to add thin walls to keep the planes in place if you care to, and perhaps add a till for backsaws.*

Lid business. *You can cram a lot of stuff onto the lid if you think a little creatively. The saw till is simply made from bits of scrap that are glued together to allow the saw to slide in and out. Then I screwed them to the lid.*

A CASE FOR BLACKSMITH HARDWARE

You can build this chest with almost any strap hinges – new or vintage. It's not a fussy project. But if you want to go all out, I suggest you look in your area for a blacksmith to make strap hinges and a hasp for you.

I used hardware from John Switzer of Black Bear Forge (blackbearforge.com). Yeah, they cost more than the off-the-rack stuff, but they look incredible. — CS

Worth it. *These strap hinges look about 2,000 times better than machine-made hinges. Once you use blacksmith-made hardware, it's difficult to go back.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

VIDEOS: *Take a video tour of both the large and small Dutch tool chests.*

BLOG: *Read a comparison of Dutch and English tool chests.*

ONLINE: *Download SketchUp models of the Dutch chest in both sizes.*

TO BUY: *"The Anarchist's Tool Chest," by Christopher Schwarz.*

IN OUR STORE: *"Two-day Tool Chest," a DVD by the author on building an English chest using home-center materials and screws.*

Our products are available online at:

- **ShopWoodworking.com**

Kōshi-do

BY TOSHIO ODATE

A new entrance to a master's studio comes from the beginning of his career.

Tradition reborn. *The entrance to Toshio Odate's studio is a* kōshi-do *– traditional Japanese lattice-work panels of the same form that he made as an apprentice in the 1950s.*

The *kōshi-do* form (a latticed door) has existed since ancient times in Japanese temples, and has long been used to divide the exterior and interior, and sometimes as a room divider.

In the last century, the use of these lattice-style panels in contemporary housing has flourished in many parts and places. *Kōshi-do* evolved in style and designs immensely, especially entrance doors. Because of its origin in history and its place in ancient temple entrances, today these rolling doors represent to some extent a family's higher social status.

In the early 1950s I saw *kōshi-do* of all sizes with lattice and white shoji paper. However, my master said he'd also seen oilpaper used. Before glass became popular in Western society, oilpaper was commonly used for exterior windows and doors. Because of the predominant style of the Western house (which had a very short roof overhang) the exterior doors and windows were exposed to rain and snow. The oilpaper let light go through while repelling some water and moisture.

Oilpaper was rarely used in Japan. I had never seen it. Because the Japanese house overhang was commonly much deeper than its Western counterpart, doors and windows were more protected from rain and snow. Also, the Japanese use the same white shoji paper for many other sliding doors, dividers and partitions. Today, however, most Japanese entrance *kōshi-do* have glass instead of paper.

I believe it was in the late 1800s that common flat glass was introduced to Japan – so using glass in a Japanese house started not too long ago. The combination of the Japanese craftsman's wisdom and ingenuity made it possible to apply glass to the traditional doors without changing or destroying the original form and structure.

Return Home

I emigrated to America in 1958 and returned to Japan for my first visit in 1969. I then saw that Japan had undergone

PHOTOS BY LAURE OLENDER

Problem solving. *Dimensions for the four panels are worked out with a sketch on the chalkboard.*

Ripping stiles. *A* gagari *saw is used to rip the stiles from the Alaskan cedar plank.*

Smooth inside. *The* roku-dai kanna *is used to smooth the inside faces of the stiles.*

All at once. *The lattice pieces are clamped together and marked for length.*

a great face-lift during those 11 years. A big concrete highway resembling a gigantic serpent meandered through the middle of Tokyo. I did not see much subtle regimentation in the change. It was not only in Tokyo but all the way into the deep countryside. It seemed like many things had changed for the better – but also that many things changed just for the sake of change.

My brother had a new house, and the entrance with *kōshi-do* looked very nice and neat with a dark wood grain. When I advanced closer to the entrance door, I noticed to my surprise that it was not wood; the lattice was made completely out of aluminum. My brother was watching my face."Nobody is making or using the *kōshi-do* with wood any longer. It would be too expensive and it's now much easier to clean," he said with a big smile on his face, as if telling me I was way behind modern Japanese culture. Sadness filled my body, but I do not think my brother knew why.

During World War II, Japan was struck by a dreadful food shortage; city dwellers would take their belongings to exchange them for rice, potatoes and other food. Eventually, farmers became rich. Finally the war ended and soon thereafter the new government freed farmers from the feudal-like system by agrarian reform.

It was the first time in Japanese history that common farmers turned suddenly extremely rich, and now they wanted to live as rich land owners once did. The farmers began to renovate their houses with new entrance doors and exterior *shoji*.

Learning Experience

In a small village near Tokyo, my master and I were working during that period, and my first day as an apprentice was at the farmer Magobei's house. He was the first in his village to apply these changes. Many other farmers soon followed his example. The work started at the entrance to his home, which had one large wooden door, just like a Western barn door, with two wooden wheels, about 7" in diameter, that ran in a wide grooved track. In the right corner there was a small door.

Often one finds this door with wooden panels, however, Magobei's had a short lattice sliding door with white *shoji* paper to let light through. This door is called *kuguri-do* or "go through-door." First we removed the large door and reformed the large opening to a 6' x 6' entrance. The head of Magobei's household then went into the

"No ideas are intelligible to those who have no backing of experience."

—D. T. Suzuki (1870-1966), Japanese author

storehouse and returned with several *Sawara-itawari*.

Sawara wood is related to the *Hinoki cypress* family; its heart has a strong yellow color and it has a very pleasant, sweet aroma. *Itawari* were planks of wood that used to be a Japanese standard, with a thickness of 1 3/8" and sometimes 1 1/2", and of random width and length, commonly 6' or longer.

I helped farmer Magobei bring the planks down from the attic. There I cleaned off the dust and laid them down side by side on a straw mat. Every one of them was clean and clear, without any defect. He said he had sliced them more than 30 years ago for the entrance door. He had plenty of that material for the two *kōshi-do*.

I do not remember much of the beginning of my apprenticeship; I just kept myself busy moving non-stop and made myself useful at any time, any moment. I do remember the end of the day, though; I was always exhausted and collecting mounds of plane shavings with a pleasant, sweet aroma.

Danger of Distraction

After Magobei's *kōshi-do*, my master and I made many pairs for houses in the village and nearby small towns during the next few years. I remember one incident very clearly. It was a hot summer day. A three-day village festival was taking place and the young village boys and girls were wearing clean *yukata* or summer *kimonos*. Most of them were about my age, 16 to 17 years old. I was working with a sweat under the hot sun; honestly, I did not want to work that day. I was making 1/4" x 3/4" through-mortises on lattice; I had to make 69 of them.

I was using my master's 1/4"-mortise chisel because I did not yet have my own. It was a very short, well-used, beautiful chisel. I was mortising five pieces at the same time and the lattice pieces were quite thin; it seemed all so fragile in which to make through-mortises. I was in the middle of my work when the chisel got stuck. I pressed down with my right hand on all five lattices with my open palm, flat and wide. I grabbed the chisel-handle with my left hand tightly and yanked it out. The chisel came out and at that moment the sharp edge gouged out the middle of my forearm.

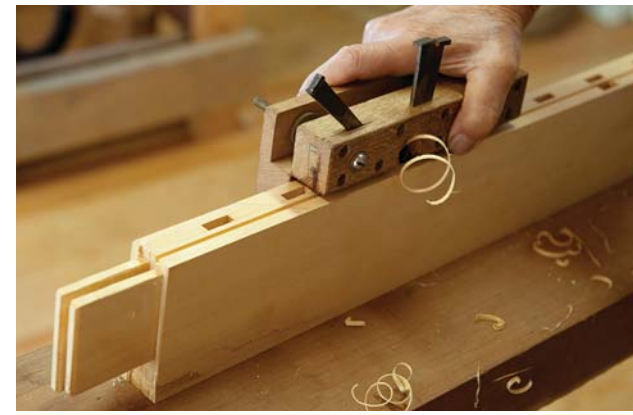
The chisel was still in my hand with a little piece of flesh on the cutting edge. Blood oozed from the fresh wound. Immediately I pinched fine sawdust to fill the cavity, then tore the bottom of my shirt and taped my wounded forearm very tightly.

No matter what, I could not waste any time. I was certain that my master knew my chisel was stuck, even though he was working 20'-30' away from me. He detected all my movements, includ-

Two mortises, one chisel. *A double-bladed chisel is used to chop the paired mortises in the stiles.*

Not square. *The shoulder of the dividing rail is angled to match the bead below with the bevel above.*

Cutting flush. *The vertical shoulders of the tenon are sawn.*



Groove for glass. *The* shakuri kanna *(plow plane) is used to form a narrow groove for the glass panels.*

Square end. *One of the raised-panel hipboards is planed square on the end.*

ing how I handled tools, as if he was watching me in a clear, clean mirror. I am sure he knew that I tore my shirt and wrapped my arm with it.

I could not spend any time with my wound. If I did, he would shout at me out loud, "What are you doing!?" Then, if he discovered what happened, there would be unpleasant consequences. I tried hard to pretend as if I had bad splinters. Then I quickly proceeded to hammer the chisel with normal strength. If I eased my pounding, he would detect my condition.

Then I started hearing a strong heartbeat from the wound. I was 17 years old, and today, about 65 years later, I still remember it all clearly: the village festival, young people wearing *yukata*, working under a hot blazing sun, hiding the pain and wound from my master and the customer.

Old & New

My master is gone now, but the chisel is still much alive within me. The beautiful 1/4" mortise chisel with dark shiny white oak handle, a brilliant bevel and cutting edge, a gouged-out forearm wound and fresh-flowing blood. Unlike many other items or objects I have made, this *kōshi-do* has always remained in my heart and mind. I always thought that some day I would make *kōshi-do* just for myself – not for social status, but for the fulfillment of my young man's dream.

In the 1960s I was teaching at the Brooklyn Museum Art School. One day, one of my students brought over a piece of 2" x 4" x 8" light yellow soft wood with very tight grain and a beautiful scent. I asked him the name of the wood, but he said he did not know.

He gave me a little piece for a propeller of my model airplane. As I cut into the wood, a strong and pleasant fragrance filled my little studio. I fell in love with this wood immediately. Many years later at a woodworking show, one of my friends brought a plank of wood to me. "Toshio, this is yellow cedar or

Low bench. *The hipboards are cut to size by hand.*

Looks right. *The fit of the joint between the dividing rail and the stile is checked.*

On the bevel. *The stiles are beveled above the dividing rail.*

Practiced adjustment. *The iron of the finishing plane is adjusted with light taps of a hammer.*

Coming through. *The horizontal braces pass through mortises in the vertical lattice pieces.*

Complex corner. *Note the joinery detail at the lower corner of a panel. The bottom mortise accepts a wheel that rides on a track.*

Becoming ready. *All the parts for one panel are arranged before assembly.*

No turning back. *Glue is applied and the panel is clamped together.*

Finishing touches. *A slot is cut in the bottom of the stile, allowing it to clear the rail.*

Sweeping up. *Take time between stages of the project to sweep up the chips and shavings.*

Alaskan cedar. Have you ever used it before?" I looked at it and smelled the beautiful scent.

I told him about the episode from years ago, then he gave the plank to me. I did not know much about the wood; I had used it to make just one little propeller. But I decided that someday I'd like to make my *kōshi-do* with Alaskan cedar.

More years passed, and I renovated my little studio that I call "Japanese studio." There, I only use hand tools, and mostly traditional Japanese tools. My studio is a lot like a typical Japanese workshop, if perhaps a bit larger. The front opening is 6'-2" high x 12' wide. It was the perfect place to make use of the *kōshi-do* I'd long been wanting to make.

The Japanese house's usual front entrance is 6' x 6' with two 3' x 6' doors. However, I have a 12' opening, so I decided to make four panels. When I renovated the little studio, I also made an entrance opening at the side, 6'-2" high x 12' wide. There I will make a different style glass door. I made traditional Japanese sliding glass door track for both entrances.

About seven or eight years ago, one of my friends told me of a nearby lumber company that carries Alaskan cedar, so I went. They had 1"- and 2"-thick planks that were 11" wide and 16' long. I bought both sizes, just enough for four doors. And I purchased door wheels from Japan. Now I was ready to make my dream doors and a different design glass door for the far side opening.

I made the four *kōshi-do* with glass in 2011; the photographs show some of the process.

Now, I've finally fulfilled the dream begun in my apprenticeship 65 years ago. **PWM**

Toshio Odate finished his apprenticeship and came to the United States in 1958. Since then he has written books about Japanese tools and making shoji*, taught woodworking and sculpture. He continues to work in his Connecticut studio.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

SLIDE SHOW: *More photos of Toshio Odate at work on the* kōshi-do *are available online.*

PLANS: *A 3D SketchUp model and some PDF drawings are available online.*

TO BUY: *"Japanese Tools & Joinery," a video by Jay Van Arsdale, is available in our store.*

Our products are available online at:

- **ShopWoodworking.com**

NOW AVAILABLE!

Google play

amazonkindle

nook by Barnes & Noble

zinio

The Mighty Compass

A swing of an arc is the solution to many layout and construction problems.

All shapes & sizes. *With a compass, straightedge and pencil, you have a woodworking trifecta with which you can draw many geometric shapes.*

If you think a compass is only for drawing circles, think again. This simple and inexpensive device can divide almost anything into precise and equal sections, construct complex polygons and find the precise settings for making miters on any angle. Most woodworkers own or have access to this incredibly powerful layout, design and problem-solving tool – but they don't realize its capabilities.

Get your compass out of your toolbox and play along. If you have to, borrow one from the nearest grade-school student or buy a cheap one. By the time you reach the end of this article, you'll likely want to get a nice one. At the very least, you'll have a new-found respect for this simple device.

Divide by Two, Prove Square

People often turn to numbers when they don't need to, and that can slow them down or lead to frustration. Where a compass really shines is dividing things in half. Many geometric constructions are based on two points being an equal distance from something else. The important part is that of equality, not the actual measurement.

Despite what you may have thought in high school, geometry is useful, relevant and empowering. Let's start with a straight line of any length. Stick the point of the compass on one end of the line, and set the other end to anywhere beyond the halfway point. It doesn't matter how far. Don't worry about it; just set the distance by eye and swing an arc above and below the original line. Without changing the settings, stick the point of the compass on the other end of the line and swing arcs above and below from there.

The intersections of the arcs are at equal distances from each end of the line, and when you use a straightedge to draw from intersection to intersection, the new line crosses the original line at exactly the midpoint. Even better, it's at a right angle to the original.

Stick the point of the compass on the intersection of the two lines and reset the distance to put the pencil lead on the end of the original line. Now swing an arc across the perpendicular line. Connect that intersection with the end of the first line, and you have just drawn a perfect 45° angle.

Without changing the compass setting, swing arcs from the ends of the 45° line so they intersect. Take the straightedge and connect that intersection with the ends of the angled line. One line is parallel to the first line and

Above & below. *Swing arcs above and below a line from both ends so they intersect. Connect those points to divide the line squarely into two equal segments.*

Connect the dots. *Set the compass between the center and the end of the line, then swing an arc to cross the vertical line. Connect those points to make a 45° angle.*

Now it's square. *Keep the compass set and swing arcs from each end of the angled line. Draw lines back to the ends of the diagonal to make a perfect square.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS & ILLUSTRATIONS BY THE AUTHOR

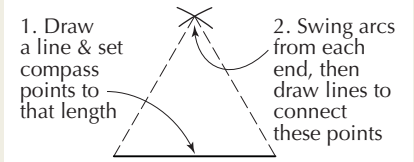
POLYGONS BY COMPASS

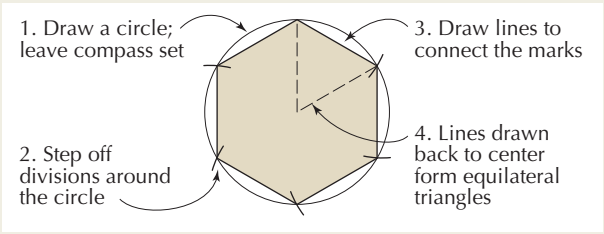
If you need to make an equilateral triangle, set the distance between the compass points to the length of one side. Draw a line that length, and from each end swing arcs that intersect above the line. Connect the points to make the triangle.

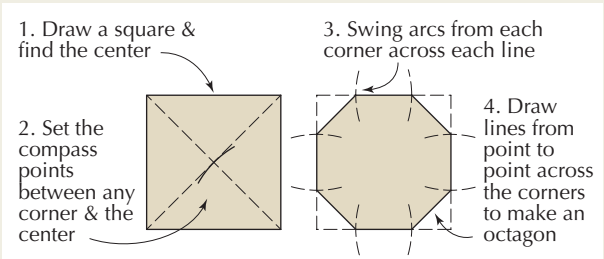
To create a hexagon, first draw a circle, and without changing the compass setting, set the point of the compass anywhere on the perimeter. Step off around the perimeter and connect the intersections with lines to make a hexagon. If you draw back from the perimeter points of the hexagon to the center of the circle, you will create six equilateral triangles along with a visual explanation of how (and why) this method works.

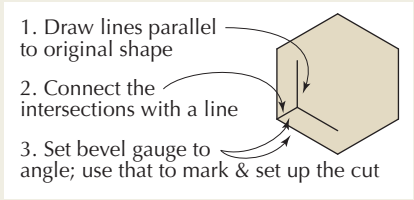
You can easily clip the corners of a square and turn it into a perfect octagon. Find the center by drawing diagonal lines from corner to corner. Where those lines cross is the exact center of the square. Stick the point of the compass in one corner and set the lead to the center point. Swing two arcs from each corner to intersect with each horizontal and vertical line. Connect those points and you have an octagon.

If you want to make a mitered frame in any of those shapes, you can determine the cutting angles using the method outlined in the article, but an even easier method is to draw lines parallel to the shape. This method also works if you want to miter two pieces that are of different widths. Draw from corner to corner and set your bevel gauge to the drawing. Use that to set up the cut, and don't worry about how many degrees are in each angle. — RWL

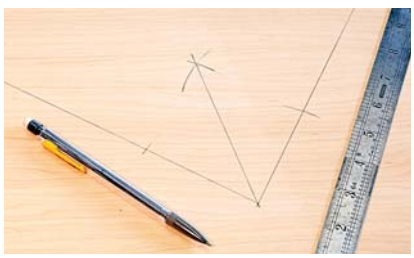








Divide & conquer. *Swing arcs from the vertex of an angle, then make intersecting arcs from those points.*



No numbers needed. *Use an adjustable bevel to transfer the bisected angle to your work.*

the other is parallel to the perpendicular line. The result is a perfect square.

Two Ways to a Perfect Angle

In addition to dividing lines exactly in half, you can also use the compass to bisect angles. This will be a lifesaver when you need to miter a wacky corner.

For practice, draw two lines from a single point at any angle. Set your compass to any reasonable distance, and swing arcs from the intersection between the two lines to cross each line. Move the point of the compass to each intersection and swing arcs into the opening between the lines. Draw a line from the point where the arcs meet back to the intersection of the two lines.

That splits the angle into two equal parts, and the drawn angle can be used to set your bevel gauge. Your bevel gauge, in turn, sets your saw to make the cuts, and to check the cuts after you've made them. A simple solution, no numbers were used, and no brain cells were harmed in the process. **PWM**

Bob is the executive editor and project illustrator of Popular Woodworking Magazine.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

VIDEO: *See these techniques in action.*

IN OUR STORE: *"By Hand & Eye" a new book by Jim Tolpin and George Walker.*

About This Column

Woodworking Essentials takes a close look at the tools, materials and processes of woodworking.

Our products are available online at:

- **ShopWoodworking.com**

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 - Inert Gas Preservation System. 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

Hand Tools

DI LEGNO WOODSHOP SUPPLY Quality woodworking hand tools at an affordable price. www.dlws.com or 1-412-331-1236.

WWW.JIMBODETOOLS.COM The Largest Antique Tool Website on Earth! Fine Antique Woodworking Tools of every kind. 845-505-8665.

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.

PRIVATE CLASSES with woodworking author in the Great Smoky Mountains- All skill levels- www.GregoryPaolini.com (828) 627- 3948

MARY MAY'S SCHOOL OF TRADITIONAL WOODCARVING. Learn the traditional techniques of woodcarving from online video lessons. www.marymaycarving.com/carvingschool

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

Boring in the 18th Century

Today's array of bits has nothing on historical practice.

In my attempts to recreate period work, I've many times come across the need to make holes that no modern tool can practically create.

My workbench has 16 1½" holes bored into its beech top to house vise screws. I bored them with a framing auger. I use shell bits when I have to drill a hole from the back of a workpiece to the front. I typically do this to drawer fronts, positioning the lock on the inside of the drawer, and then drilling the hole for the keyhole from the backside to the front. Shells don't typically break out fibers when they exit.

I use center bits for all kinds of inlay work. Most people would probably use a Forstner bit in a drill press for this. But I have neither and do just fine with a sharp center bit. I use gimlets and bradawls for nail and screw holes. I don't use tons of fasteners in my work and these simple tools work well enough – and faster than some might think.

In this article I'll review the boring tools I use in my shop. I realize you aren't itching to trash your new cordless drill; I'm just thinking you might enjoy reading about the tools our great-great grandfathers used to drill holes, a task I think many of us take for granted.

Simple & productive. *The boring tools of the 18th century were like so many others we've come to know and appreciate; they're outwardly simple, yet deceptively complex and thoughtful. In skilled hands they are capable of near-electric powered productivity.*

What is an Auger?

The augers we know today, those twisted things with the lead screws on the business ends, were not invented until the end of the 18th century. I don't believe they were available to Anglo-American woodworkers much before 1800. And it would be a few decades into the 19th century before folks figured out how to mass-produce them efficiently in the versions we find today at flea markets and tool-swap meets.

Before their invention, "auger" was the term used for a range of different and often T-handled tools, dating from at least as far back as the Middle Ages. Some may have been twisted – but perhaps only once or twice if at all.

Spoon Bits

Spoon bits are hollowed semi-cylinders that were made in different forms for various jobs or trades. The best-known spoons are probably those used as chairmakers' tools. Their blunt, rounded ends allow them to penetrate turned legs deeply, maximizing the tenon length. They are typically short (only a few inches long) and limited to the sizes required for chair work; that is, they are typically not much larger than ⅝" in diameter.

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

HARBOR FREIGHT TOOLS

Quality Tools at Ridiculously Low Prices

LIFETIME WARRANTY ON ALL HAND TOOLS!

FACTORY DIRECT TO YOU!

How does Harbor Freight Tools sell high quality tools at such ridiculously low prices? We buy direct from the factories who also supply other major brands and sell direct to you. It's just that simple! Come see for yourself at one of our 400+ Stores Nationwide and use this 20% Off Coupon on one of our 7,000 products*, plus pick up a Free 1" x 25 Ft. Tape Measure, a $5.99 value. We stock Shop Equipment, Hand Tools, Tarps, Compressors, Air & Power Tools, Woodworking Tools, Welders, Tool Boxes, Generators, and much more.

- **Over 25 Million Satisfied Customers!**
- **1 Year Competitor's Low Price Guarantee**
- **No Hassle Return Policy!**
- **100% Satisfaction Guaranteed!**
- **Over 400 Stores Nationwide**

NOBODY BEATS OUR QUALITY, SERVICE AND PRICE!

SUPER COUPON!

FREE!

WITH MINIMUM PURCHASE OF $9.99

Item 47737 shown

PITTSBURGH

1" x 25 FT. TAPE MEASURE

ITEM 47737/69080/ 69030/69031

REG. PRICE $5.99

LIMIT 1 - Only available with qualifying minimum purchase (excludes gift value). Coupon good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount, coupon or prior purchase. Offer good while supplies last. Shipping & Handling charges may apply if not picked up in-store. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

6194972

SUPER COUPON!

20% OFF

ANY SINGLE ITEM!

LIMIT 1 - Save 20% on any one item purchased at our stores or HarborFreight.com or by calling 800-423-2567. *Cannot be used with other discount, coupon, gift cards, Inside Track Club membership, extended service plans or on any of the following: compressors, generators, tool storage or carts, welders, floor jacks, Towable Ride-On Trencher (item 65162), open box items, in-store event or parking lot sale items. Not valid on prior purchases after 30 days from original purchase date with original receipt. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

19583001

SUPER COUPON!

12" COMBINATION SQUARE

PITTSBURGH

SAVE 50%

LOT NO. 92471

$4.99 REG. PRICE $9.99

47928965

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

14" OSCILLATING SPINDLE SANDER

SAVE $60

CENTRAL MACHINERY

LOT NO. 69257/95088

Item 95088 shown

$89.99 REG. PRICE $149.99

59191735

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

3 PIECE TITANIUM NITRIDE COATED HIGH SPEED STEEL STEP DRILLS

Item 91616 shown

SAVE 60%

WARRIOR

LOT NO. 91616/ 69087/60379

$7.99 REG. PRICE $19.99

31657555

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

27 LED PORTABLE WORKLIGHT/FLASHLIGHT

Item 67227 shown

SAVE 56%

HFT

LOT NO. 67227/ 69567/60566

$2.59 REG. PRICE $5.99

Requires three AAA batteries (included).

46607307

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

US★GENERAL PRO FIVE DRAWER TOOL CART

SAVE $135

LOT NO. 95272/ 69397/61427

"Impressed with the Quality Construction and Ease of Use" – Hot Bike Magazine

$164.99 REG. PRICE $299.99

Item 95272 shown

700 LB. CAPACITY

29964777

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

10" SLIDING COMPOUND MITER SAW

CHICAGO ELECTRIC POWER TOOLS

SAVE $120

LOT NO. 98199

$79.99 REG. PRICE $199.99

FREE 60 Tooth Carbide Blade A $19.99 Value Included

90069078

LIMIT 3 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

POWDER-FREE NITRILE GLOVES PACK OF 100

Item 68498 shown

SAVE 45%

5 MIL. THICKNESS

YOUR CHOICE! $5.99 REG. PRICE $10.99

MEDIUM LOT NO. 68496

LARGE LOT NO. 68497/97582

X-LARGE LOT NO. 68498/37052

30172340

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

WIRELESS DRIVEWAY ALERT SYSTEM

Item 93068 shown

Bunker Hill Security

SAVE 56%

LOT NO. 93068/69590

$12.99 REG. PRICE $29.99

70441471

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

PITTSBURGH 12" RATCHET BAR CLAMP/SPREADER

LOT NO. 46807/68975/ 69221/69222

Item 46807 shown

SAVE 66%

$1.99 REG. PRICE $5.99

95240128

LIMIT 8 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

12 SPEED BENCH DRILL PRESS

CENTRAL MACHINERY

SAVE $70

LOT NO. 60237/44836

Item 60237 shown

$99.99 REG. PRICE $169.99

22442131

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

CENTRALPNEUMATIC 2.5 HP, 21 GALLON, 125 PSI VERTICAL AIR COMPRESSOR

SAVE $70

$149.99 REG. PRICE $219.99

LOT NO. 67847/ 69091/61454

Item 67847 shown

45738276

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

18 VOLT CORDLESS 3/8" DRILL/DRIVER WITH KEYLESS CHUCK

drill master

Includes one 18V NiCd battery and charger.

Item 68239 shown

SAVE 54%

LOT NO. 68239/69651

$15.99 REG. PRICE $34.99

83921117

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

2.5 HP 12" PLANER

CENTRAL MACHINERY

LOT NO. 95082

SAVE $80

$219.99 REG. PRICE $299.99

79488382

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

SUPER COUPON!

4 PIECE WOOD CHISEL SET

PITTSBURGH

LOT NO. 69471/42429

SAVE 41%

$4.69 REG. PRICE $7.99

Item 42429 shown

72216681

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 12/20/13. Limit one coupon per customer per day.

Order at HarborFreight.com or 800-423-2567

We FedEx Most Orders in 24 Hours for $6.99

GRAND OPENINGS La Mirada, CA · Vista, CA · Crest Hill, IL · Crystal Lake, IL · Madison Heights, MI · St. Louis, MO · Dallas, TX · Richmond, VA

CONTINUED FROM PAGE 58

An OK tool. *Augers have been the darlings of tool-collecting galoots for years; I have several sets. But in my opinion, they work only moderately well in softwoods. And even the best Jennings' pattern (above) augers with fine lead screws are not stellar performers in hardwoods. Frankly, 18th-century craftsmen had better alternatives.*

Thinner, longer spoons with sharply pointed ends were useful for creating the holes for drawbore pegs. Their pointy ends permitted precise starting locations.

Spoons, like shells, cut only at their ends. The sides of the cylinder, though sharp looking, are not cutting edges. The sides of spoons (and shells) are to help keep the hole straight.

Shell Bits

Shell bits are improbable-looking tools more closely resembling carving gouges than any kind of drill. Contrary to popular belief, they are not spoons gone bad, though it would be possible to grind a spoon bit into a shell. They typically have fingernail-shaped ends.

Though surviving bits in general appear to have been turned clockwise, shells are often found sharpened on both sides of the bit axis. The problem many have encountered when using shells is that there is no center on the bit by which to position the tool on the work. It has been my experience that a precise hole can be made by ratcheting the bit in the first few motions. Perhaps this is why they were originally sharpened on both sides.

Shell bits are fantastic, functional tools. They slice the material around the periphery of the hole leaving the untouched center to simply fall out. (Shells are almost an ancient version of today's hole saw, but without the center drill.) This allows these bits to cut quickly in hardwood or softwood.

Like spoon bits, shell bits can drill holes at absurdly low angles. Some projects, 17th-century stools for example, call for angled pegs that essentially toenail the top to the legs. These are the sorts of bits that did that. I've never seen one much larger than 5/8" in diameter.

Nose Bits

Nose bits are shells with turned-in cutting lips at the end. The lip shaves the bottom of the hole. The cylindrical sides of the bit don't cut, but rather guide the bit, keeping it traveling in a straight-ish line. I have found these bits to be good at cutting end grain, which is particularly difficult with any other sort of bit. They must be sharpened carefully.

Tapered Reamers

Taper shells are variations of normal shells. They can be used to enlarge holes in thin material, but more likely were used to make locking tapered joints

Ratchet motion. *My trick for using shells is to ratchet the bit back and forth to position the hole where I want it. The gouge shape of a shell bit means I cannot simply center the bit on the chalked mark.*

such as plugs. When I first started using tapered shells, I thought I could simply taper a hole and that the new taper would follow the axis of the parent hole. *Au contraire.* If you are doing chair work, know that the taper is a do-over with respect to the angle of the hole. Also, tapers are reamers that cut the sides of a hole; they must be kept very sharp. As a result, the tapered hole can easily be cut out of round.

Using tapered bits can be uncomfortable. Period chair makers made wooden chest "bibs" that they wore around their necks—a carved hollow fit the brace head. Bibs reduced discomfort to allow chairmakers to exert force, and they helped steady the brace for precise drilling.

Center Bits

Though center bits first appear in the 1708 inventory of Charles Plumley's estate (a.k.a. "The Plumley Inventory"), they are clearly highly developed versions of earlier bits. The modern spade bit is its closest living relative, but spade bits are horrible scraping disasters by comparison. The center spur functions in the same way a brad-point drill works; it easily registers into a knifed line or an awl-stabbed point. The side spur cleanly defines the hole diameter while the lip planes away the waste between the center and side spurs.

These bits make beautiful entries, only tearing wood when they are improperly sharpened. But never try to penetrate through with a center bit or you will surely tear out the backside. As soon as the long center spur penetrates the far side, move the other side of the work, locate the bit in the center spur hole, then complete the cut.

Center bits do a much better job of making large holes than any other period bit. They were available in fairly large sizes, easily up to 2" in diameter.

Gimlets & Bradawls

Gimlets are used for making small holes for large nails or screws. Most feature lead screws that pull in shell-like ream-

Precision depth. *I find center bits particularly useful for creating pockets for inlays or other jobs where precise depth control is important. Unlike tools with lead screws, they work easily in hardwoods. The lip cuts at a steeper angle than any normal auger.*

Small holes. *Bradawls (top) and gimlets are used for small holes, such as pilots.*

ers. Unless they are very sharp, they function more like bradawls, displacing and compressing wood more than cutting it. When sharp, however, they are a joy to use, far out-performing the later twisted versions

Bradawls are used primarily for preparing pilot holes for nails or small screws. Most often they are steel or iron rods (no taper) with double-beveled chisel ends. The sharpened end is placed perpendicular to the long grain to sever it, then pushed and twisted back and forth to produce a hole. They were made in a variety of sizes for different sizes of nails.

Period Stocks

Wooden cranks used for rotating boring bits first showed up in Western Europe in the 14th century, possibly brought to Europe by returning crusader armies. In the 18th century, bit stocks (later called braces) were made from either wood, metal or a combination of the two.

The earliest bits had flattened, slightly tapered tangs, not unlike tanged chisels' ends. These were fitted to tapered wooden pads which were then fitted to corresponding sockets cut into wooden stocks. Some craftsmen, such as chairmakers, may have found it more economical to simply make a separate stock for each bit, because they used only a limited number of bit sizes.

Metal pads, fitted to wooden stocks (sometimes reinforced with brass side plates) were later made to receive bits made to a standard square taper. An internal spring catch retained the bits.

Different bit grips. *A pod brace or stock (right) holds wooden pods that adapt flat-tanged bits to the stock. The brass-padded brace (left) relies on bits with standardized tapers.*

Conclusion

Some of the bits highlighted in this article are the clear ancestors of modern tools, while others passed into extinction for no good reason other than machines and factories could not cheaply mass-produce them. You may find that some of these actually work better for you than modern bits. **PWM**

Visit Adam's blog at artsandmysteries.com for more discussion of traditional 18th-century tools, techniques and projects.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

BLOG: *Read Adam's Arts & Mysteries blog.*

IN OUR STORE: *"The Arts & Mysteries of Hand Tools" on CD, updated through June 2013.*

About This Column

ARTS & Mysteries

Adam covers 18th-century shop practices and tools in his own, inimitable style. The phrase "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").

Our products are available online at:

- **ShopWoodworking.com**

A Brief History of HVLP

Vacuum cleaners were the basis for a major change in spray technology.

For almost a century the dominant spray technology was based on high-pressure compressed air. This technology produces wonderful results, but it has the downside of creating a lot of bounce back – the spray, under high pressure, that bounces back off the surface only to be exhausted into the atmosphere.

The result is a lot of wasted finish, and a cloud of unhealthy-to-breathe mist in the work area if the exhaust isn't adequate.

This changed with the introduction of a new class of spray systems that perform just as well, but create a soft spray that has little bounce back. This newer technology is called High-Volume, Low-Pressure, or HVLP.

It has been so successful in replacing high-pressure spraying that it's difficult to find new high-pressure spray guns available to purchase. How and why did this change come about?

SCAQMD & Apollo Sprayers

It all started around Los Angeles, Calif., the area of the country most concerned with air pollution. In 1976 a regulatory entity comprised of five counties was set up to try to reduce this pollution. Its name is South Coast Air Quality Management District, or SCAQMD.

The main polluters, of course, are automobiles and industry, but paints and finishes also contribute. So SCAQMD looked for ways to reduce the amount of solvent exhausted into the atmosphere.

One way was to limit the amount of pollution-causing solvents allowed in paints and finishes. This has been fairly well accomplished. Water-based paints and finishes and lacquers thinned with acetone (an exempt solvent) are now almost the only coatings you can buy (or legally use) around Los Angeles.

Contrasting high pressure & HVLP. *Old high-pressure spray guns such as this Binks model #7 (top), which served me well for 20 years, produce great results but also produce considerable bounce back and waste. HVLP spray guns like this Accuspray (bottom) eliminate most of the bounce back and waste but maintain the high quality.*

But the change over to HVLP has arguably played an even bigger role and this is where Apollo Sprayers comes in.

The story actually goes back to the 1930s and to Kirby and Electrolux vacuum cleaners. These household appliances came with accessory kits that contained a primitive spray gun; this gun attached to the vacuum cleaner's outlet, and could be used to spray thin liquids, primarily soapy water for cleaning carpets and fabrics.

Vacuum-cleaner motors produce a high volume of air with little air pressure – the opposite of compressed air.

Kirby guns. *Some old vacuum cleaners came with little spray guns like this Kirby model that uses the exhaust air to propel a thin liquid, such as soapy water, onto carpets or fabrics. These were the original HVLP systems.*

The most efficient way to use high-volume air to atomize liquids (turn them into a fine mist) is to let the air pass unhindered through the spray gun.

Small European companies took this technology and advanced it. First they developed more efficient spray guns, then came stand-alone spray systems (not attached to a vacuum cleaner) that included a box-mounted vacuum motor – this is now called a turbine.

In 1966, an English company, Bambi, improved enough on the technology that professionals could use this system. In 1982, Apollo Sprayers, based near Los Angeles, began to import the Bambi systems and sold them under its own name. But the market was small.

PHOTOS BY THE AUTHOR

Original Apollo system. *This is the original Apollo spray gun and turbine model that was used in the 1984 transfer-efficiency tests to convince SCAQMD to set efficiency standards that high-pressure guns couldn't meet.*

Current Apollo system. *Turbine HVLP spray systems have come a long way. Not only does this unit include better air control, but it also increases air pressure in some models to almost 10 psi at the spray cap.*

The critical turn came in 1984 when Apollo Sprayers submitted independent laboratory tests to SCAQMD demonstrating that its turbine system could produce more than 80 percent transfer efficiency (the ratio of the amount of finish left on the work surface to the total amount sprayed). The "Turbo Spray System," as it was then called, produced a soft spray with much less bounce back. Far less solvent was exhausted into the atmosphere.

It was SCAQMD that came up with the name "High-Volume, Low-Pressure" and its acronym HVLP, and defined it as 10 psi or less at the air cap.

Around 1986, SCAQMD began requiring the use of HVLP or other technology that produced at least 65 percent transfer efficiency, which is approximately double that of traditional high-pressure spray guns.

SCAQMD created a market for turbine-HVLP systems beyond just their advantages of reduced waste, less expense and portability.

The Role of Bill Boxer

If you were attending woodworking shows from the mid-1980s through most of the 1990s, you probably met Bill Boxer. At the time, he was an independent contractor selling Apollo turbines and spray guns, and woodworking shows gave him direct contact with the large amateur market.

I taught at woodworking shows during that period and saw what a central role Bill played in educating woodworkers about the advantages of HVLP. He became the go-to guy for magazines looking for articles and information.

Largely through Bill's efforts, the market for turbine HVLP spray guns spread rapidly to the rest of the country. A number of additional small manufacturers entered the space. Most have now disappeared or been absorbed into larger companies. (Today, Boxer is senior vice president and chief operating officer at Apollo Sprayers International.)

Compressed-air HVLP

For a while, the only air source available for HVLP spray guns was a turbine, so companies making these systems had the American market to themselves. Manufacturers of compressed-air spray guns were reluctant to enter the market.

Slowly they relented. They didn't want to be shut out of Southern California; they were being challenged in the industrial market by European spray-gun manufacturers that had made compressed-air HVLP guns for years; and they could clearly see the advantage of a soft spray to reduce waste.

To engineer a gun to spray a soft, 10 psi-or-less spray, manufacturers "pinched" the high-pressure air as it came through the gun, then widened the passageway so the pressure decreased and the volume increased. To maintain the same quality of atomization with the high-volume air, they made the holes in the air cap larger and added more of them. (Air-cap design is critical for good results.)

The first American-made, compressed-air HVLP spray guns appeared in the late 1980s, but they met with resistance, especially among discriminating automobile painters. The car guys didn't think they got as good atomization with the HVLP guns. And when they thought the atomization had improved enough, they grew to like the gravity-feed guns coming in from Europe better than the siphon-feed guns supplied by American manufacturers.

By around 2000, American manufacturers caught up with the Europeans (including gravity-feed guns), and compressed-air HVLP replaced traditional spray guns.

The changeover to HVLP is now so complete that it has become almost unnecessary to identify compressed-air spray guns as such; they all are. **PWM**

Compressed-air HVLP. *By the turn of the millennium, American spray-gun manufacturers perfected HVLP technology to produce guns that run off of compressed air. This DeVilbiss GTI gun looks and operates just like a high-pressure, compressed-air spray gun but has the soft spray of HVLP.*

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

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/oct13**

ARTICLES: *You'll find many free finishing articles on our web site.*

IN OUR STORE: *"Flexner on Finishing" – 12 years of columns illustrated with beautiful full-color images and updated, and "Wood Finishing 101."*

Our products are available online at:

- **ShopWoodworking.com**

In Tune with Woodworking

The best work is often built one piece at a time, so toss your cutlist.

I have been in professional piano repair and tuning for more than 30 years. My father taught me how to tune by ear. That's "old-school" style.

The piano is an imperfect instrument. When a note is played, a series of imperfect harmonics are produced in the string. In the tuning process the ear and brain immediately calculate how much to "temper" each note so it is acceptable with other imperfect notes. Using this method of comparing frequencies tells you exactly how to best tune a piano.

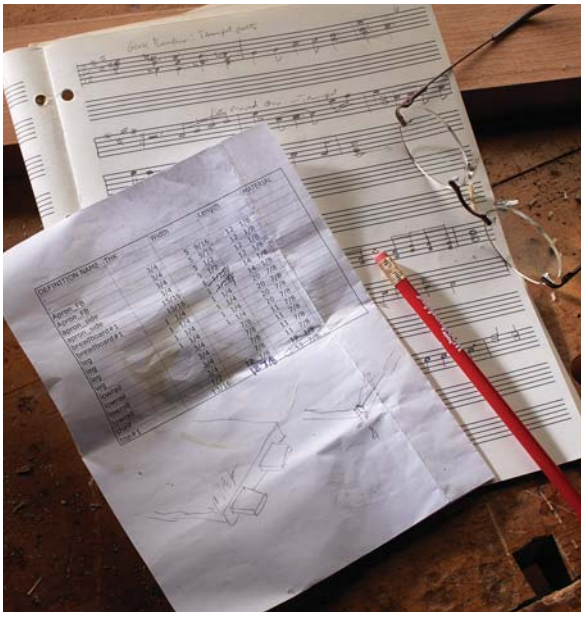
This tempering is the aural equivalent of *sfumato*, a painting technique in which lines are blurred – Leonardo da Vinci used this technique when painting the Mona Lisa. Many consider it to be a masterpiece; however, a person might argue that work from a paint-by-numbers set is the perfect painting with its predetermined colors placed perfectly between the lines.

Similarly, an electronic tuning device measures the fundamental frequency and a harmonic of one note, then calculates a value that is then used to place all the notes inside the lines.

The difference between a properly done aural tuning and a tuning using an electronic device, in a nutshell, is akin to the difference between a painting by da Vinci and that from a paint-by-numbers kit.

So what does this have to do with woodworking? Piano builders back in the day were rarely restricted by measurements. They had a few critical numbers to get them going for a particular model, but old documents and plans are lacking in dimensions. These craftsmen didn't need or use many measurements, yet old instruments are some of the best ever made.

Truly crafted by hand, old pianos were assembled piece by piece with each step trued up using the proper hand tool. The dimension of the next part could not be known until the previous step was completed. Indeed, period makers didn't care what the size was – they would simply glue on the next part then plane it to a perfect fit. This process also avoided introducing external stresses that come when one tries to force a "perfectly" pre-dimensioned part into place during assembly.



Modern day mass-production techniques require that all the parts be machined to exact tolerances before assembly. It's impressive how good some of the better mass-produced pianos are, but the truly great instruments are still built by hand.

I recently was commissioned to build a bookcase in which the starting dimensions were determined by the size of the boards. My client wanted the bookcase to be 9' feet long with no one piece longer than 36". And it had to able to be disassembled.

To have fun with the design, I decided to make it fit together like a puzzle. I would use no glue, no screws, no tape measure and no plans; I would, however, use a story stick.

I designed the bookcase with sliding dovetails and an interlocking top that was slightly oversized to spread the sides and put pressure on the dovetails.

With the sides spread 1/4" out of square, the two outside back slats were cut accordingly. The center back piece had beveled edges and fit like a keystone to lock the carcase tight and square. It was one of the most enjoyable projects I'd done in many years.

So the point is this: When you are woodworking, are you painting by numbers or making a true work of art? Do you assemble pieces sized from a cutlist, or do you "tune by ear?" PWM

Glen Hart (hartpiano@bresnan.net) of Hart Piano Remanufactory, Grand Junction, Colo., specializes in the restoration of Steinway Grand Pianos. He also runs "Hart of Gold" Gilding Studio.

ONLINE EXTRAS

For links to all online extras, go to:
- popularwoodworking.com/oct13

TWITTER: *Follow us on Twitter @pweditors.*

Our products are available online at:
- ShopWoodworking.com

PHOTO BY AL PARRISH

The facts are hard to ignore.

Titebond® III outperforms polyurethane glues.

As the leader in wood glues, we want you to know the truth about polyurethane glue and woodworking. A straightforward comparison between Titebond® III Ultimate Wood Glue and polyurethane glue tells the story.

Titebond® III is THE ultimate choice for bonding wood to wood. Period.

For more information and a detailed comparison, please visit www.titebond.com/TBIIIvsPolyurethane

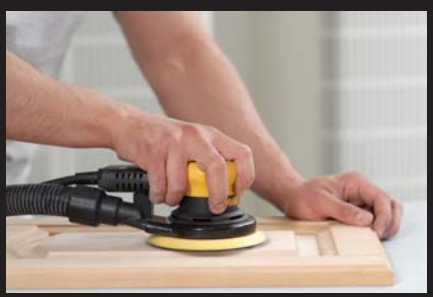
Made in the USA

CARD #14 or go to PWFREEINFO.COM

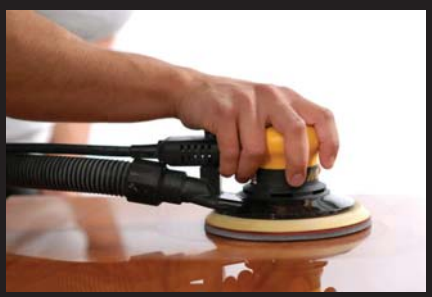
MIRKA

Innovative Solutions for Wood Finishing

www.mirkawoodworking.us



White Wood Finishing



High Gloss Finishing

Solid Surface Finishing

Mirka offers the perfect combination of net abrasives, tools and dust extractors for a virtually dust-free sanding solution.

Mirka's net abrasives offer unparalleled dust extraction across the entire abrasive surface and virtually dust-free sanding!

Mirka's CEROS electric finishing sanders are effective and durable tools for professional sanding. These machines are built for maximum dust extraction even at low suction power.

The MV-912 portable dust extractor is a premium, variable power vacuum that is strong enough for use by multiple users with the optional dual operator fitting.

The Portable Dust-Free Solution

Visit www.mirkawoodworking.us for more information

Mirka Abrasives, Inc. • 7950 Bavaria Road, Twinsburg, Ohio 44087 • tel 800-843-3904 • fax 800-626-6970

CARD #78 or go to PWFREEINFO.COM