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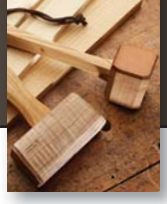

POPULAR WOODWORKING MAGAZINE

June 2014 ■ #211

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Solid Construction & a Touch of Brass

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Plus a Clever Router Trick for a Flush Fit

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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, 10° L
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1800 & 3100 FPM
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CSA C US 177335

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- Table tilt: 45° R, 10° L
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- 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.

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- 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)
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- Includes ⅜" blade
- Approx. shipping weight: 196 lbs.

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17" 2 HP HEAVY-DUTY 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: 346 lbs.

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G0513P ~~$895.00~~ **SALE $875.00**

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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.

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G0514X ~~$1495.00~~ **SALE $1450.00**

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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
- Encapsulated blade for improved dust collection
- Camlock fence with micro-adjust
- Fence scales on left and right side of blade
- Approx. shipping weight: 208 lbs.

MADE IN TAIWAN

FREE 10" CARBIDE-TIPPED BLADE

CSA C US 175370

G0732 ~~$795.00~~ **SALE $650.00**

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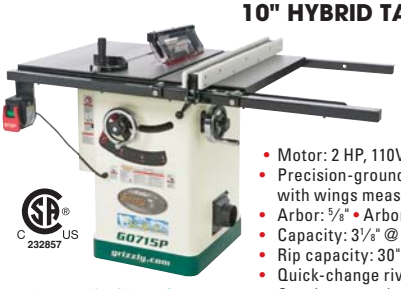
10" HYBRID TABLE SAW



BEAUTIFUL WHITE COLOR!

- 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

INCLUDES BOTH REGULAR & DADO BLADE INSERTS

G0715P ONLY $795.00

$99 shipping (lower 48 states)

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: 550 lbs.

MADE IN TAIWAN

CSA C US 177335

G1023RLW 3 HP ~~$1360.00~~ **ONLY $1325.00**

G1023RLWX 5 HP ~~$1395.00~~ **ONLY $1350.00**

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- 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°, 2⅜" @ 45°
- Max. rip capacity: 50" R, 12" L
- Max. dado width: 13/16"
- Approx. shipping weight: 557 lbs.

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Good Woodworking Magazine Top Value Approved 2009

FREE 10" CARBIDE-TIPPED BLADE

3 HP LEESON® MOTOR!

CSA C US 232857

G0691 ~~$1595.00~~ **SALE $1525.00**

$150 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.

CSA C US 208624

CHOOSE EITHER 4 HSS KNIVES OR SPIRAL CUTTERHEAD MODEL

Powermatic Parts Always In Stock

4 KNIFE CUTTERHEAD

G0656P ~~$825.00~~ **SALE $795.00**

SPIRAL CUTTERHEAD

G0656PX ~~$1250.00~~ **SALE $1225.00**

$150 shipping

FREE SAFETY PUSH BLOCKS

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: 704 lbs.

NEW END-MOUNTED FENCE

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CARBIDE INSERT SPIRAL CUTTERHEAD!

WOOD Hot New Tools 2009

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$150 shipping

WITH SPIRAL CUTTERHEAD

G0634XP ~~$2350.00~~ **SALE $2295.00**

ALSO AVAILABLE IN GRIZZLY GREEN

G0633 JOINTER/PLANER WITH HSS KNIVES ~~$2050.00~~ **SALE $1995.00**

G0634Z W/SPIRAL CUTTERHEAD ~~$2595.00~~ **SALE $2550.00**

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

Powermatic Parts Always In Stock

CSA C US 208624

$150 shipping

G0453P ~~$1125.00~~ **SALE $1095.00**

WITH SPIRAL CUTTERHEAD

G0453PX ~~$1750.00~~ **SALE $1695.00**

20" PLANER

- Motor: 5 HP, 240V, single-phase
- Maximum cutting width: 20"
- Maximum cutting height: 8"
- Minimum stock thickness: 3/16"
- Minimum stock length: 8"
- Maximum cutting depth: ⅛"
- Feed rate: 16 FPM and 20 FPM
- Cutterhead diameter: 3⅛"
- Cutterhead speed: 4800 RPM
- Feed rolls: solid serrated steel
- Table size: 20" x 25¾" (20" x 55½" with extension)
- Overall dimensions: 55½"L x 39½"W x 45⅞"H
- Approximate shipping weight: 920 lbs.

CSA C US 208624

POUND FOR POUND, THE BEST 20" PLANER VALUE IN THE WORLD!

$179 shipping

G0454 ~~$1695.00~~ **SALE $1650.00**

WITH SPIRAL CUTTERHEAD

G0454Z ~~$2575.00~~ **SALE $2550.00**

VARIABLE SPEED PLANER/ MOULDER

SHOP FOX

- Motor: 2 HP, 240V, single-phase, 12 Amps
- Precision-ground cast iron table and wings
- Maximum cutting width: 7"
- Maximum planing height: 7½"
- Maximum planing depth: ⅛"
- Maximum moulding depth: ¾"
- Feed rate: Variable • Cutterhead type: Square
- Knife size: 7⅛" x 1½" x ¼" HSS
- Cutterhead speed: 7000 RPM • 4" dust port
- Rubberized steel feed rollers • Powder-coated paint
- Approx. shipping weight: 324 lbs.

CSA C US 177335

MADE IN TAIWAN

$99 shipping

W1812 ~~$1650.00~~ **SALE $1525.00**

CYCLONE DUST COLLECTOR

- Motor: 1½ HP, 110V/220V, single-phase, TEFC, 3450 RPM
- Air suction capacity: 775 CFM
- Static pressure at rated CFM: 1.80"
- Intake port: 6" with included 5" optional port
- Impeller: 13⅛"
- Height: 65½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

MADE IN TAIWAN

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BEAUTIFUL WHITE COLOR!

FULLY MOBILE WITH BUILT-IN CASTERS

PLEATED FILTER IS PROTECTED BY A STEEL CAGE

ONLY 65½" TALL!

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G0703P ~~$825.00~~ **SALE $795.00**

2 HP DUST COLLECTOR *with Aluminum Impeller*

- Motor: 2HP, 240V, single-phase, 3450 RPM
- Motor amp draw: 9 Amps
- Air suction capacity: 1550 CFM
- Static pressure: 11"
- 6" inlet has removable "Y" fitting with two 4" openings
- Impeller: 12¾" balanced cast aluminum
- Bag capacity: 5.7 cubic feet
- Standard bag filtration: 2.5 micron
- Portable base size: 21¼" x 33½"
- Bag size (dia. x depth): 19½" x 33"
- Powder coated paint
- Height with bags inflated: 78"
- Approx. shipping weight: 122 lbs.

MADE IN ISO 9001 FACTORY!

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CSA C US 247570

MADE IN TAIWAN

W1049 2 STAGE CYCLONE SEPARATOR FREE WITH PURCHASE

$79 shipping

G1029Z2P ~~$335.00~~ **SALE $325.00**

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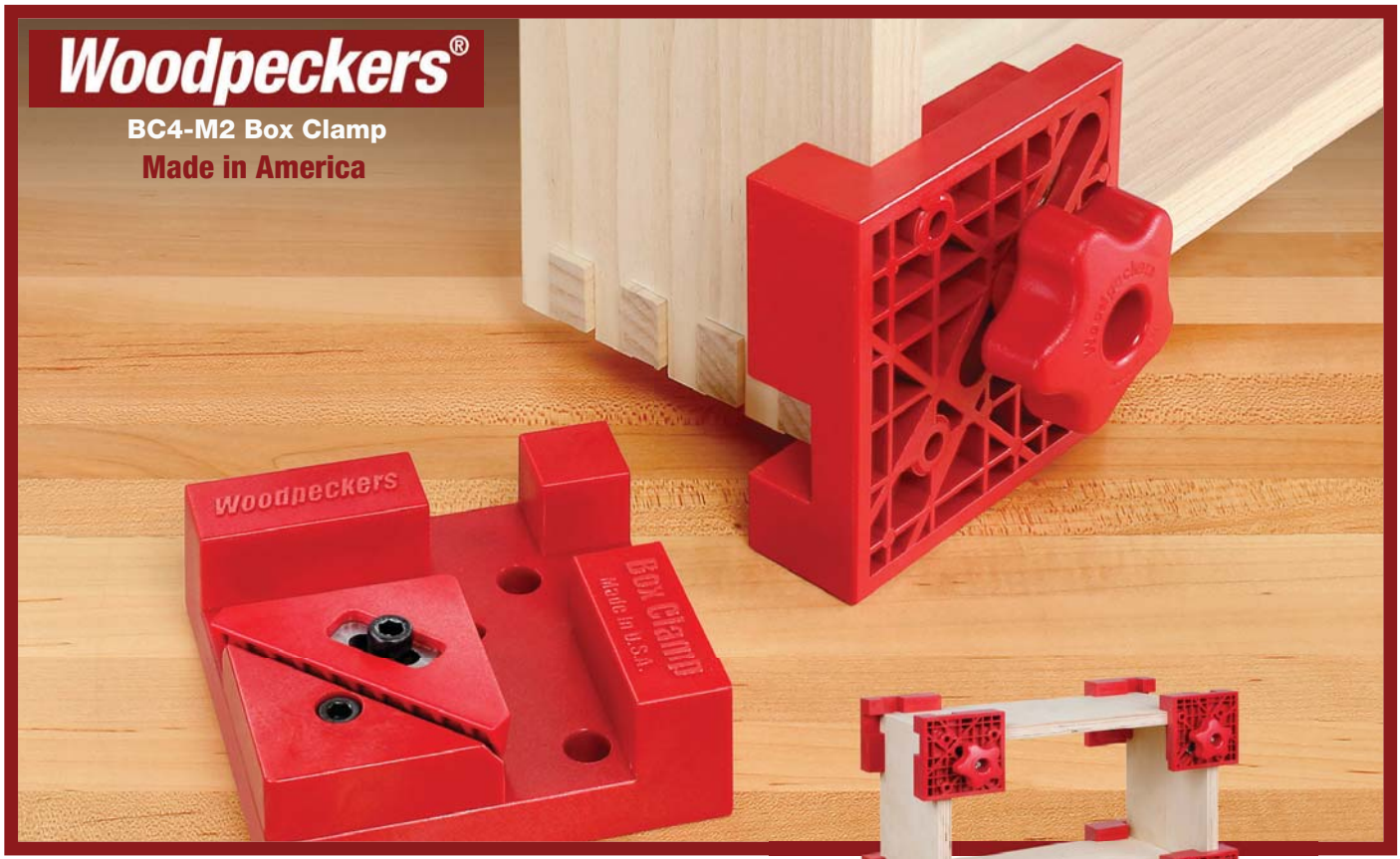
Our Box Clamps Streamline Glue-ups, Guarantee Square Assembly Every Time



Like Having an Extra Pair of Hands. With our new M2 Box Clamps you can glue-up or dry-fit any 90° joint quickly and easily and know your joint is square. Just position the clamp in the corner of the joint, give the knob a twist and equal pressure is applied while instantly squaring the joint. It's that simple.

Our M2 Box Clamp Has Many Uses. These clamps work great on butt joints, miters, dadoes, rabbets; through or half-blind dovetails and box joints even when material overhangs the joint face. Its design let's you easily nail or screw along the full length of the joint. And if you are a fan of pocket-hole joinery, our Box Clamps are the answer to your prayers.

Rugged with A Full Range of Adjustment. Our clamps are molded using a nearly indestructible glass fiber filled polycarbonate. The Box Clamp quickly adjusts for use with material ranging in thickness from ¼" to a full 1". An easy twist of the knob or hex key (depending on clamping application) provides ample torque to tighten the clamp and secure the work.

When you want square corners you just can't beat Woodpeckers M2 Box Clamps. Watch how simple and handy they are to use at www.woodpeck.com/boxclampm2.

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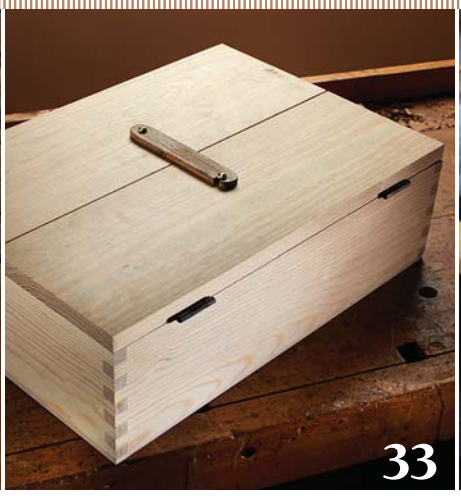


FEATURES

CABRIOLE LEG PHOTO BY JEFF MILLER; HARDWARE HIDEAWAY & STOOL PHOTOS BY AL PARRISH; SPOON CARVING PHOTO BY PETER FOLLANSBEE

30 Days for Dad Sweepstakes

It's time to give every Dad his due with a month-full of top-flight woodworking prizes. From May 17 through June 15 (Father's Day), Popular Woodworking Magazine and its sponsors are giving away a prize a day to celebrate Dads. To earn your chance, you must enter separately for each day's prize. All entrants will qualify for the Grand Prize, a Jet 10" ProShop Table Saw (Model 708494K) with 30-inch fence, cast iron wings and riving knife.

May 17

Amana Tool — Redefining Woodworking

Historical Shaker Door Router Bit Set

card# 115

May 18

RIKON

RIKON #62-400 Air filtration System

card# 42
www.rikontools.com

May 19

BESSEY — Simply better

BESSEY K-Body Revo Kit KRK2440

card# 101
www.besseytools.com

May 20

EASY WOOD TOOLS — Made in America

Set of 3 Easy Hollowers

card# 39
www.easywoodtools.com

May 21

Blue Spruce Toolworks — Hand tools for your finest work

16 oz Joiner's Mallet

card# 104
www.bluesprucetoolworks.com

May 22

KNEW CONCEPTS

Woodworker Fret Saw

card# 60
www.knewconcepts.com

May 23

ARBORTECH

Mini-TURBO Wood-carving Blade

card# 99
www.arbortech.com.au

May 24

M POWER

MPOWER CRB7MK3 BUNDLE CRB7MK3 + Edge Trim + Edge Guide

card# 116
www.m-powertools.com

May 25

Lee Valley

Lee Valley Tools $100 Gift Card

card# 28
www.leevalley.com

May 26

MASTERPIECE WOOD FINISH

Masterpiece Wood Finish 3-Part Oil/Wax Finishing System

card# 117
www.masterpiecewoodfinish.com

May 27

STEVE WALL LUMBER CO.

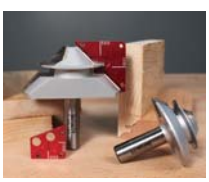
20 Bd Ft of Select Cherry

card# 47
www.walllumber.com

May 28

INFINITY CUTTING TOOLS

2-piece Lock-Miter Master Jig



card# 23
www.infinitytools.com

May 29

HAMILTON 2005 TONITOWN, AR

Hamilton Traditional Marking Gauge

card# 118
www.hamiltontools.com

May 30

BESSEY — Simply better

BESSEY 30-Clamp Kit BTB30

card# 101
www.besseytools.com

POPULAR Woodworking MAGAZINE

ENTER NOW for your chance at more than $7,500 in prizes!

May 31 — Excalibur

EX-21K Scroll Saw (with Stand & Foot Switch)

card# 17
www.general.ca

June 01 — Titebond

Titebond II Premium Wood Glue

card# 14
www.titebond.com

June 02 — HORIZON WOOD PRODUCTS

Figured Red Elm Slab

card# 108
www.horizonevolutions.com

June 03 — MIRKA

Mirka® CEROS 550 CV Random Orbit Sander with MV-912 Dust Extractor

card# 31
www.mirka-usa.com

June 04 — Woodpeckers®

Precision Router Lift V2 (PRLV2)

card# 52
www.woodpeck.com

June 05 — WORK SHARP, The Wood Tool Sharpener

Work Sharp 3000 Wood Tool Sharpener

card# 119
www.worksharptools.com

June 06 — trend routing technology

8"x3" Double-Sided Diamond Bench Stone (DWS/CP8/FC)

card# 120
www.trend-usa.com

June 07 — BESSEY, Simply better

General Purpose BGP Clamp KIt

card# 101
www.besseytools.com

June 08 — EYEMUFFS

EYEMUFFS

card# 83
SellsSafety.com

June 09 — LEIGH

R9 Plus Dovetail & Box Joint Jig

www.leighjigs.com

June 10 — FORREST

Woodworker II 10x30 Ripping Saw Blade (WW10307125)

card# 13
www.forrestblades.com

June 11 — JessEm Tool Company

Clear Cut Stock Guides (model #04215)

card# 65
www.jessem.com

June 12 — GORILLA

$100 prize pack from The Gorilla Glue Company

card# 18
www.gorillatough.com

June 13 — WOODLINE

4-Piece Super-Joint Set

card# 50
www.woodline.com

June 14 — STEVE WALL LUMBER CO.

Ambrosia Maple Natural Edge Slab

card# 47
www.walllumber.com

June 15 Father's Day

GRAND PRIZE
JET ProShop Table Saw, 708494K

card# 72
www.jettools.com

Enter every day at popularwoodworking.com/30days

Popular Woodworking Magazine and its sponsors will award one prize each day from May 17 through June 15. The prize pictured on each day in the calendar above is the prize offered for that day. To register for a chance to win each prize, you must enter on the day the prize is offered. You may enter as many of the daily contests as you like but you are limited to one entry per day. All entries from the first 29 days will be eligible for the Grand Prize: the JET 10" ProShop Table Saw (Model 708494K.).

Registration starts at 12:01 A.M. EDT on May 17, 2014 and ends at midnight EDT on June 15, 2014.

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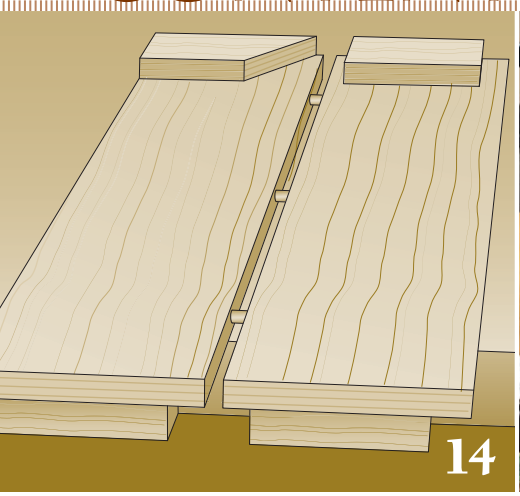

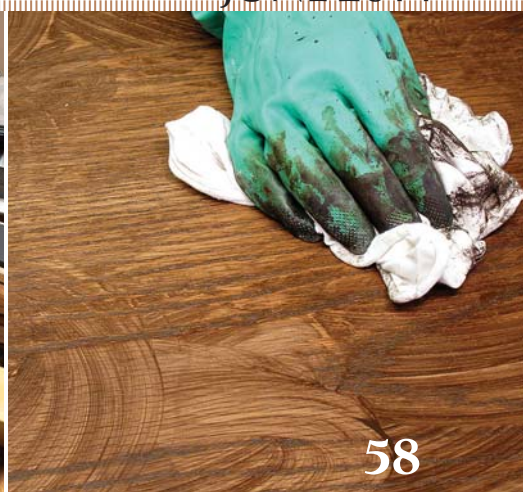

REGULARS

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POPULAR WOODWORKING MAGAZINE

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TRACK SAW

- Motor: 120V, 9A, 1100 watt, 5500 RPM
- Blade diameter: 160mm (6¼")
- Cutting capacity:
  With track: 1 31/32" @ 90°, 1 7/16" @ 45°
  Without track: 2 5/32" @ 90°, 1 5/8" @ 45°

New

W1832 Track Saw Master Pack
Includes: Saw, Guide Rail, and Accessory Pack

W1835 Track Saw only
D4363 Accessory Pack **D4362** Guide Rails

14" BANDSAW

- 1 HP, 110V/220V
- Precision ground cast iron table measures 14" x 14" x 1½"
- Blade size: 93½" (⅛" to ¾" wide)
- Cutting capacity 13½" (throat)
- Cast iron frame and wheels
- Ball bearing blade guides
- Includes fence and miter gauge

Feature packed, and an incredible value

W1706 14" Bandsaw

PLANER MOULDER with Stand

- Motor: 2 HP, 240V, single-phase, 10.8A, 3450 RPM
- Precision ground cast iron table measures 14⅛" x 10" x 7/16"
- Max planing width: 7"
- Max planing height: 7½"
- Cuts per minute: 14,000
- 2 HSS knives

PATENT OWNED BY WOODSTOCK INTERNATIONAL INC.

W1812 Planer Moulder with Stand

10" TABLE SAWS with Riving Knife

- 3 HP, 220V, single-phase motor
- Cast iron table size:
  27" x 40¼" (W1819) 53⅝" w/extension
  (W1820) 74" w/extension)
- Max. rip capacity: (W1819) 29½",
  (W1820) 50"
- Camlock fence with HDPE face

Free 10" Carbide-Tipped Blade

W1819 10" Table Saw
W1820 10" Table Saw w/ Long Ext. Table

POCKET HOLE MACHINE

- ½"-1½" material thickness range
- Go from making face frames, casework, drawers etc. without stopping between operations.
- Two or more workers can share the same machine without interruption.
- Approx. weight: 56 lbs.

New

U.S. Patent No. 7,140,813

W1833 Pocket Hole Machine

6" x 12" HEAVY-DUTY COMBINATION SANDER

- 1½ HP, 120V, single-phase, 10.5A, 1725 RPM
- Precision-ground cast iron tables (2)
- Sanding belt size: 6" x 48"
- Belt Speed: 1066 FPM
- Disc size: 12"
- Disc speed: 1725 RPM

Made in an ISO 9001 factory

W1712 Oscillating Benchtop Spindle Sander

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3 HP CYCLONE DUST COLLECTOR

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A Weekend Feast Of Woodworking

As I write this, we are chin-deep in finalizing plans for Woodworking in America (WIA), our annual conference on all things woodworking. To put it succinctly, WIA is a weekend of gorging on woodworking – it's simply the best one-stop opportunity for you to choose tools, learn how to use them and get better at the craft.

I hope you'll make plans to join us for WIA 2014, Sept. 12-14, in beautiful Winston-Salem, N.C.

This year – as always – we'll have scads of educational sessions to help you jump-start your shop skills with face-to-face instruction with some of the best woodworkers alive. You'll see and learn from many of your WIA favorites (Roy Underhill, Don Williams, Frank Klausz and Peter Galbert, to name just a few), plus we're excited to welcome some renowned woodworkers and teachers who are new to the conference, including Phil Lowe, Drew Langser, Patrick Edwards and Will Neptune.

Sessions will run the gamut of all things woodworking – from joinery methods (both hand and power) to marquetry, furniture design to finishing, orthographic drawing to carving. Plus, because we'll have several excellent chairmakers on hand, we're presenting a special roundtable talk dedicated to that challenging pursuit.

The unparalleled WIA marketplace will offer tools and personalized instruction from some of the world's best makers, from individuals who offer top-quality, individually designed tools to the best manufacturers of both hand and power tools. It's a unique setup that allows you to try before you buy, compare tools from different makers and ask questions of the folks who know them from the inside out.

Many folks have asked, "Why Winston-Salem?" Beyond its being a lovely location, Winston-Salem is home to Old Salem and the Museum of Early Southern Decorative Arts (MESDA)– and we're partnering with both for special behind-the-scenes tours. Conference attendees will get to see behind, inside and under the furniture that's on display at MESDA, as well as get a look at items most of the public doesn't get a chance to see – including several intriguing antique Moravian workbenches. Plus, historians and makers from the museum and Old Salem will be included among our expert speakers.

By the time you're holding this issue in your hand, we'll have the entire schedule and descriptions of all the sessions on the conference web site (woodworkinginamerica.com). Plus, you'll find information there on travel and accommodations, conference pricing (which is better if you register early) and more.

So make plans to join us Sept. 12-14, 2104, in Winston-Salem, for a weekend of woodworking fun and camaraderie. Pick up some new skills, try out new tools, hang out with woodworking friends new and old, and learn from some of the best names in the business. I and the rest of the editors look forward to seeing you there. **PWM**

PHOTO BY CHRISTOPHER SCHWARZ

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Problems with Polyurethane

I'm using an HVLP sprayer and Minwax Fast-Drying Polyurethane on a project. I'm spraying product right out of the can, without additives or thinning, and I'm about 12" away from the project. Within seconds after spraying, the finish pimples up and dries as if sawdust was in the air when I sprayed.

Each time I've tried to spray, even with a fresh can of material, I have to use #220- or #320-grit sandpaper to knock off the grit and smooth the surface. If I brush on the finish, everything comes out fine.

The strange thing is that I've been using polyurethane this way for several years and my results were great.

What's wrong?

Jeff Thompson
Salinas, California

Jeff

I'm not sure I have the explanation. It's been years since I've sprayed polyurethane – I learned quickly not to do this because as the overspray settles, it sticks to everything, including me. I recommend using a precatalyzed lacquer instead. It's just as durable and dries quickly.

Because polyurethane dries very slowly, it's definitely not drying in the air before it hits the target.

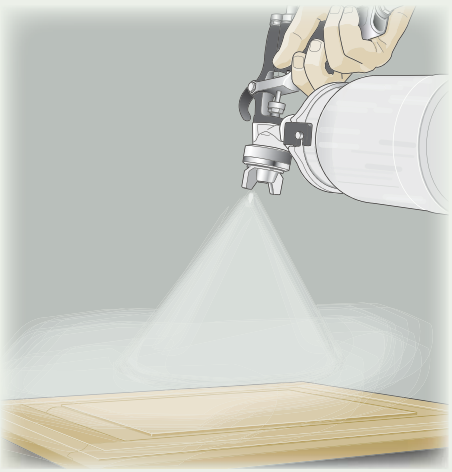
To try and solve your problem, begin by thinning the polyurethane with mineral spirits (paint thinner) to see if it helps overcome the problem.

I think that polyurethane is too thick straight out of the can. You want to apply a thoroughly wet coat, which you can see in reflected light. Maybe you're not wetting the surface enough.

Otherwise, what you have explained doesn't make sense to me. A wet coat of polyurethane thinned enough so it atomizes well out of the spray gun should level well.

If this problem has suddenly appeared, you need to identify what has changed. Is your spray gun clean? Is the spray pattern and the atomization, the same as it's always been? If these hold true, there's not much left to evaluate but the finish. Some companies are notorious for changing their products without telling anyone.

Bob Flexner, contributing editor



Not Another Mortise Option

I enjoyed Robert W. Lang's article "4 Ways to Make a Mortise" in the February 2014 issue (#209). That's a joint I use a lot when building furniture.

There is, however, a variation on one of the four mentioned methods that I find most useful. Because the dedicated mortiser is one more machine that takes up valuable real estate in your shop, I use a mortising attachment for my drill press.

It's a bit of a fussy setup to get the fence and the chisel aligned just right, but if you have a lot of mortises to make, it's well worth the effort.

Rob Cairns
Nevada City, California

Rob,

I admire your patience in being able to get the drill press mortising attachment to work adequately. In my experience the fussy setup you mention isn't worth the time it takes.

The results are dependent on the power of the drill press motor and the amount of leverage you can achieve on the down stroke. You might be able to get it to work for 1/4" mortises, but then your drill press is tied up until the task is finished.

I deliberately didn't mention this attachment because I wouldn't want to encourage anyone to take this route.

Robert W. Lang, executive editor

Make Hide Glue Waterproof With Gelatin Hardener

In Don Williams' article on hammer veneering (December 2013, issue #208), the author makes mention of photographic gelatin hardener as a way to improve the glue's resistance to moisture.

I have great interest in any improvement on the hide glue veneering technique. What type of hardener does he use, and from what source?

Charles Miller
Fayetteville, Tennessee

Charles,

Incorporating gelatin hardener into your hide glue opens up a whole new world of possibilities. In the past, when film photography was dominant, the range of hardeners available was vast.

Now, with film-based photography nearly extinct, except perhaps as a hobby or art medium, I find the most easily available hardener is Heico NH-5, a concentrated liquid available from many photography suppliers and Internet merchants.

It is exceedingly important to experiment and practice with hardeners regard-

CONTINUED ON PAGE 12

ILLUSTRATION BY MARY JANE FAVORITE

CONTINUED FROM PAGE 10

ing adding them to hot hide glue – it reduces the pot life by 50 percent to 99 percent, depending on the concentration.

I find that 5 percent of the hardener to dry glue (by weight) is plenty if you are adding it directly to the glue. It does, however, reduce the working time to mere seconds.

For "sizing" the glue surfaces before glue application, the same 5 percent ratio, but of hardener to water, will yield a tough, almost completely waterproof and irreversible glue line.

Don Williams, contributor

Jointer Adjustments

I have a question regarding my 6" Delta jointer. When I run a board either on the edge or the face over the jointer, the wood chatters and cupping occurs at the end of the board.

I'm using two push blocks to apply light pressure to the board as I move it over the cutters, but the cupping on the end still occurs.

Do the jointer knives need to be adjusted? Am I not using the correct method to feed the board over the jointer knives? What do I need to do to get smooth, evenly jointed boards? Perhaps you can provide me with a few tips to get me up and running.

Harvey Hayden
North Conway, New Hampshire

Harvey,

If I understand your description, you're getting what we know as snipe on the last couple of inches of your board. In this case, the outfeed table of your jointer is set slightly below the apex of the knives.

As the board comes off the infeed table, it drops to make contact with the outfeed table; that causes the snipe.

To fix the problem, raise the outfeed table so it's aligned with the jointer knives at top dead center. It can be a fickle adjustment, so have patience.

If, however, you get a bowing cut over the entire length of your board, then you may have the outfeed table slightly above the knives as they cut. This is a common problem with power jointers because freshly sharpened knives are installed in perfect alignment with the outfeed table, but as the sharp edge wears down, the knives eventuallydrop below the table. Again, the correction is to level the outfeed table with the apex cut of your jointer knives.

Glen D. Huey, managing editor

Goodbye Beeswax

In my home, a small cherry side table that I made several years ago gets a lot of use; the top could use a new coat of finish.

The table was originally finished with oil/varnish and Clapham's Beeswax Polish. I've added more polish a couple of times over the years. How can I remove the beeswax prior to refinishing the top?

Craig Adams
Charlestown, New Hampshire

Craig,

One of the easiest ways to remove wax build-up from wood is to use naphtha or mineral spirits. It takes a good wiping or two, but you should get the surface clean and free of the unwanted wax.

If you plan to use a film finish to renew the tabletop, I'd suggest a coat of shellac to seal the wood to avoid any potential finish problems.

If you're going for a new oil/varnish finish, you should have smooth sailing after a naphtha or mineral-spirits wash. **PWM**

Glen D. Huey, managing 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.

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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 GLEN D. HUEY

Highly Recommended

Titebond's No-Run, No-Drip wood glue is my choice when working with small parts, or when I need a fast-setting glue that stays put. It's perfect for edge banding around a door, adding stringing to any project or when making a small repair.

I use my finger to spread the adhesive (a brush also works), then a simple rub joint is all that's needed. The glue's strong initial tack holds pieces in position so well that clamps may not be required. Cleanup is easy; wipe with a damp cloth.

— Glen D. Huey

POPULAR WOODWORKING MAGAZINE

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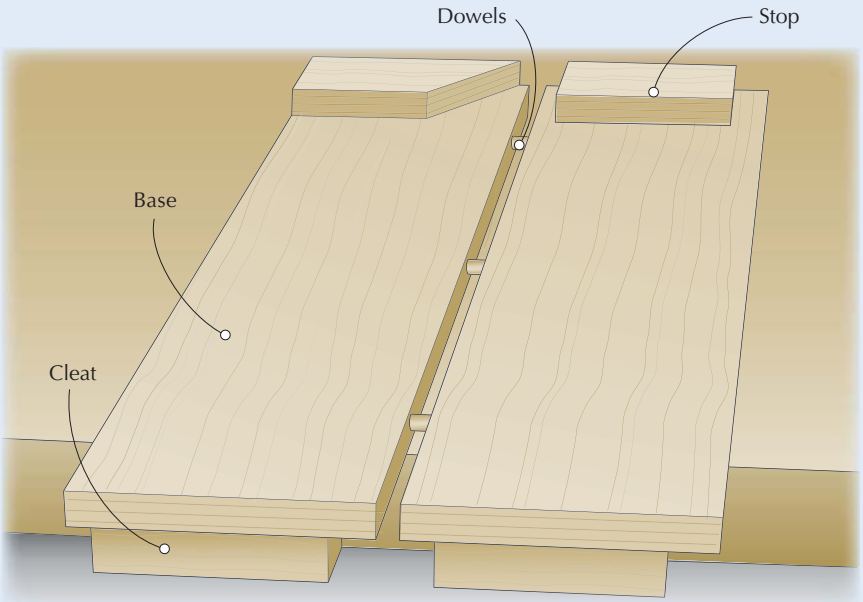
Safety Note

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

Split Bench Hook



A bench hook is an indispensable workholding device for crosscutting. The traditional bench hook is made of a base, a stop or rest and a cleat. It is usually used against the apron or front edge of a workbench, or clamped in the vise.

To crosscut a long piece, I used to place a spacer that was the thickness of the bench hook at the other end of the stock. Frustrated with finding a scrap of the proper thickness and length all the time, I decided to cut my wide bench hook into two and use one half as the spacer. A split bench hook was born with little extra work.

To prevent either piece from getting lost in my shop, I keep the base and spacer together using dowels (Dominos would also work) set into to the edges of the two boards, but glued in to only one piece. The holes on each edge are about 1" deep while the dowels are 2½" long, leaving a ½" gap. The gap serves two purposes: I can pull apart the two halves with ease, and I can hang the split bench hook onto a nail or hook.

Using the split bench hook is the same as using a traditional one-piece design, but finding a spacer to support a long piece of stock will just take a split second.

Charles Mak,
Calgary, Alberta

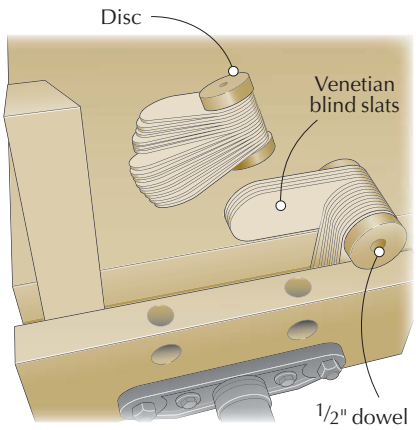
Venetian-blind Vise Spacer

Venetian blinds purchased from a home center come in a variety of standard sizes. They are cut to the correct width by the retailer, but to adjust the height you remove a number of the slats at home.

If you're like me, you hold on to these extra slats because "someday you will find a use for them." For me that day finally came; I used the extra slats to make spacers to keep my vise from racking.

Unless you are able to clamp a piece in the center of your vise, the jaws will rack, or skew, as you tighten them. This makes it difficult to firmly grip the workpiece in the vise and can damage the work or your vise.

You can always use a board of similar thickness to prevent racking, however, unless you have three hands it's difficult to hold the workpiece and the board in place while tightening the vise. Invariably, the board or your workpiece (or both) slips loose and falls to the floor.



Commercial vise-rack stops are available, but making one out of extra Venetian blind slats is pretty easy. Cut a number of 2"-wide x ⅛" thick-slats into 5" lengths. Round the edges using your band saw (it is best to tape them together and cut them all at once). Then, at one end, drill a 9/16" hole through the slats.

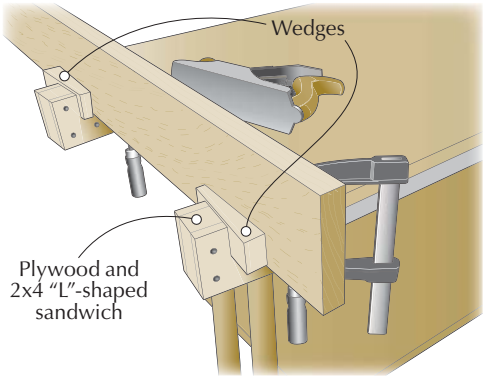
Using a 2" hole cutter, cut two discs and drill a ½" hole in each. Insert a ½" dowel through the hole in the slats and glue one of the discs to each end of the dowel.

To prevent the vise from racking, insert as many of the segments of the slats as needed to match the thickness of the workpiece being held in the vise. The discs prevent the vise-rack stop from falling through the jaws and onto the floor when you tighten or loosen the vise.

Peter Marcucci,
Woodbridge, Ontario

ILLUSTRATIONS BY MARY JANE FAVORITE

Wedge Edge Vise

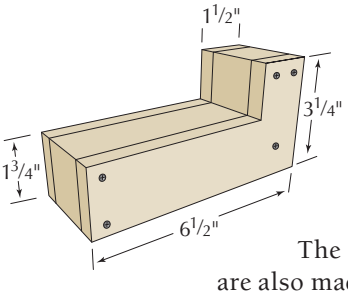


I frequently need to clamp wood on edge to saw tenons or work the edge of a plank, but I don't have a traditional woodworking bench.

While studying at the Northwest School of Wooden Boatbuilding, I worked at a traditional planking bench where boards were clamped to the edge of the top. That inspired me to make my "wedge edge vise."

This simple shop-made vise clamps to a rolling cart or my assembly table. It can be adjusted to hold nearly any size piece of wood, but stores away easily and takes up little room. The vise consists of two plywood and 2x4 sandwiches that are glued and screwed together to form the jig. Each is cut out to form an L-shape that is clamped to the tabletop. A wedge is then used to secure the board against the edge of the table.

I use 1/2" plywood and scraps of 2x4 that are 6 1/2" long to make the jigs. Once they are glued and screwed together, I cut out the L shape. The plywood adds strength to the 2x4 core.



The wedges are also made from scraps; they are 3/4" thick x 1 3/4" wide x 7" long, with a taper toward one end.

Put an edge on your work with this portable, versatile, adjustable vise that can be stored in your toolbox.

Erek Johnson,
North Hampton, New Hampshire

Taped Hinge Alignment

While installing piano hinges on a box lid, I came up with a good way to align the hinge to the lid.

Install the hinge on the box first. Place some shim material onto the box-side leaf so that, when the hinge is closed, it stays just proud of the hinge mortise. Close the hinge. Place a piece of double-sided tape on the lid-side leaf and press down firmly. Cut away and remove any tape that is not on the lid-side leaf and remove the tape cover.

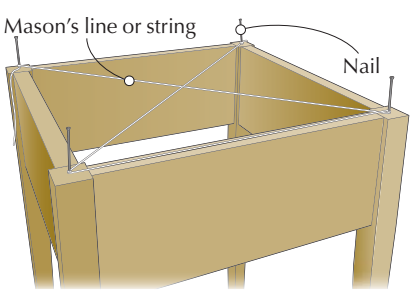
Place the lid onto the box and align it. Press firmly so the double-sided tape sticks to the lid. Gently open the lid.

If everything works correctly, the hinge will stick to the lid and everything will be perfectly aligned. Mark your holes, remove the tape from the hinge and lid, and complete the hinge mounting.

Jonathan Szczepanski,
Beltsville, Maryland

Flatten a Table With a String

When I'm building a table and know the legs are the same length, I might still get a wobble. What I do during glue-up is run a mason's line from one corner to the other, then run the string across the other two corners.



In order to see if the table is flat the strings just need to touch where they cross. If they do not touch, or the bottom string is bowed toward the corners, the project is out of plane. Depending on whether the strings touch or not, you'll be able to figure out how to tweak the assembly to bring the assembled table base back into flat. PWM

Leonard Harrison,
Browns Mills, New Jersey

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Nova Comet II Midi Lathe

The reversible motor turns this benchtop tool into a sterling machine.

Teknatool's new Nova Comet II wood lathe is feature-packed at a price that's hard to beat. Not only does it have variable speed, it has a reversible motor – not usually found on lathes of this size – that's tucked out of the way under the tail end of the lathe.

That might not sound like a major innovation, but many small lathes have the controls mounted on an arm off the back; the Nova's setup saves space and, because you don't have to stretch over the spinning work to reach the controls, it's safer.

I like the reversing switch because I think you can do a better job of sanding with the work spinning in the opposite direction.

An easy-to-adjust three-step pulley works in combination with the controller to vary speeds from 250 to 4,000 revolutions per minute.

The Nova has a 3/4-horsepower, direct-current motor, which gives you plenty of power, yet you can plug it into a standard wall outlet.

I tested the machine by spindle turning, because as a furniture maker, that's the operation I need most often. The machine handles a reported 16 1/2" between centers (though I was able to fit 18 1/2"), but an accessory bed extension takes that up to 42".

With its 12" swing (the largest diameter the machine can turn inboard), you can, of course, also turn bowls and platters on this lathe (for outboard turning, however, you'll want a bigger lathe).

Variable power. *With a 3/4-horsepower direct-current motor, the Nova lathe also sports a reversible, variable-speed control that's tucked under the tail of the lathe for safe, easy access.*

For furniture makers, the 12-point index on the head is a plus; it's easy to adjust, accurate and locks the head firmly into position.

I found the Nova to be powerful enough for my needs, quiet and vibration-free; the 77-pound weight helps.

Right out of the box, this lathe is almost fully assembled. You only have to attach the hand wheel, the rubber feet (unless you're mounting it on a stand), the tailstock-adjustment handle and the tool rest. That's it. You'll be turning in a matter of minutes.

The tool rest, however, could be longer – but I have yet to meet a lathe on which this is not a common problem.

My primary complaint about this machine is that some of the edges on the castings are rather sharp. Between and under the ways, and inside the headstock housing, could all use a little softening.

If you want accessories, this machine has them – everything from a grinding-wheel attachment, belt sander, disk sander and wire wheel, all of which mount outboard, to the previously mentioned bed extension. With the accessories added, you can get your tools sharp, turn a bowl and polish it, all without stepping away from the machine lathe.

The Nova Comet II is a full-featured turning package suitable for most home woodworkers – it's a compact and powerful midi lathe that won't break the budget.

— Chuck Bender

CONTINUED ON PAGE 18

Nova Lathe

Teknatool ▪ teknatool.com or 866-748-3025

Street price ▪ from $500

▪ **WEB SITE** *Learn to turn with our new online wood turning show.*

Price correct at time of publication.

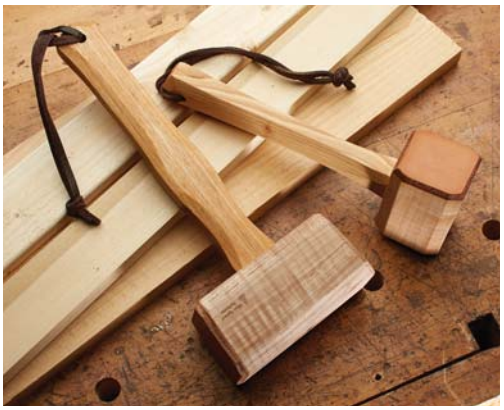
PHOTOS BY AL PARRISH

CONTINUED FROM PAGE 16

Blue Spruce Joiner's Mallets

For some woodworkers, building your own mallet is a rite of passage. After using dozens of student-made mallets, however, I wonder if many of us would be better off with a well-balanced, professionally made mallet. If you are a person who wants to buy a thing once and be done with it, you should look at the new rectangular joiner's mallets from Blue Spruce Toolworks.

Unlike other mallets, these are designed to last a lifetime thanks to the resin-infused heads, which are nearly indestructible. I've used a Blue Spruce resin-infused round mallet for years as my primary striking tool, and it hardly has a mark on it. The company's new rectangular mallets are built with the same material and are holding up nicely after a few months of use in my shop.



The striking surfaces of each mallet's maple head are properly angled so you hit tools and your work with the full face. One of the two faces is covered in thick leather, which allows you to use the mallet to knock assemblies apart without denting your wood. The leather has survived surprisingly well.

The resin-infused heads add a little weight to the tools, but both sizes of mallets (16 oz. and 24 oz.) are balanced because the heads are compact. And like all Blue Spruce tools, the fit and finish is somewhere north of outstanding. The small mallet is good for light chopping, such as removing dovetail waste and chopping out hinge mortises. The big boy is good for mortising and knocking things together and apart.

These might be the most expensive wooden mallets on the market, but a Blue Spruce mallet is likely the last one you'll ever have to buy.

— Christopher Schwarz

Blue Spruce Joiner's Mallets

Blue Spruce ▪ bluesprucetoolworks.com or 503-668-8665

Street price ▪ from $95 to $115

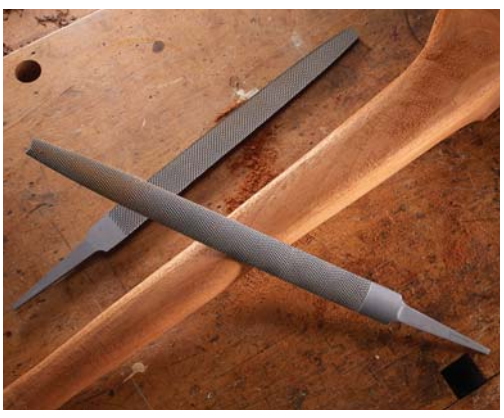
▪ **BLOG** *Discover the maker's round mallet.*

Prices correct at time of publication.

Grobet Cabinetmaker's Rasps

A good quality machine-cut rasp or two should be in every serious woodworker's tool box. Rasps come into play when a small amount of material needs to be removed, either on a flat or curved surface. It wasn't that long ago that you could walk into your local hardware store and ask for a Nicholson #49 and #50 and walk out with tools that would do the job, and last the rest of your life.

Nicholson still produces tools that bear those numbers, but when home centers moved in, production moved overseas and quality was lost in the transition. Hand-cut rasps became better known, but they come at a higher price.



Swiss file manufacturer Grobet has long been an alternative to Nicholson, and Lee Valley now carries two versions of Grobet half-round rasps. These are comparable to early Nicholsons, and fill the gap between bargain-basement rasps and hand-cut tools.

There are two cuts available; Lee Valley calls them "medium" and "fine" instead of the earlier terms "bastard" and "second cut."

There isn't a tremendous amount of difference between the two, and if you are new to rasps, get just one and see how you like it. These are tools for intermediate work; they will remove band saw marks in a hurry, but the surface will still need to be further refined with a scraper or sandpaper. If you need to tweak the fit of a tenon or other joint, a good rasp will get you there.

The teeth in these tools are machine cut in rows, and the rows are offset so as not to cut deep furrows. They are sharp, uniform and offer a nice balance between rapid material removal and surface quality. The Grobets aren't quite as nice as hand-cut rasps, but they do the job and should last a long time. **PWM**

— Robert W. Lang

Grobet Rasps

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

Street price ▪ from $64 to $72

▪ **BLOG** *Read about refining curves with rasps and a card scraper.*

Prices correct at time of publication.

The Rule of Three

Grind, hone, polish: the basics of all sharpening.

Among the fundamental skills necessary for good woodworking, I'd put knowing how to sharpen your edge tools at the top of the list. Even if you consider yourself a power-tool woodworker, I'll bet you have at least a chisel (or two) and a block plane in your kit that need sharpening from time to time.

There are many different ways to sharpen: waterstones, sandpaper, mechanical solutions, oilstones and more. Now I'm not about to stick my head in the lion's jaw and recommend one system over another (and I'm certainly not going to tell you whether or not to use a jig).

I will tell you that I use traditional waterstones, and that when my pocketbook allows, I will buy a set of Shapton Pros (waterstones that don't require soaking). And I'll tell you that the reason I use waterstones instead of other systems is because I have waterstones – and they're what I learned on.

That final statement is the key point: I started using one system and stuck with it. Do that, and not only will your sharpening technique improve, your wallet will thank you.

No matter what media you use to sharpen, there are but three operations: grind, hone, polish. (And most of the time, you can skip the first one.)

Awash in options. *The choice of sharpening media is legion. The key is to choose from one system a grinding, honing and polishing item (maybe two polishers) – and stick with them.*

Grind. *All of these are used for grinding. The #300-grit diamond stone is considered coarse; the sandpaper on the platen for a powered machine is #80 grit; the hand-cranked grinder is equipped with a #60-grit wheel.*

Grind

Grinding is done with a rough grit: #40 or #80 grit on a power grinder, #40-grit sandpaper on glass, a coarse diamond stone, a hand-cranked grinder, an #80-grit waterstone.

But you don't grind every time you sharpen – do this only when you need to fix a damaged edge, shrink a secondary bevel that's become too large, or change the shape of an edge (for example, add-

PHOTOS BY AL PARRISH

Hone. *From front to back are pictured a #1,000-grit diamond stone, a soft Arkansas oilstone, a #1,000-grit no-soak waterstone and a #1,000-grit Japanese waterstone.*

Polish. *Here's where things get crazy; polishing media goes to great heights on the grit scale. Pictured front to back are a #16,000-grit Japanese waterstone, a hard Arkansas oilstone, green stropping compound and an #8,000-grit no-soak waterstone (that a student gouged).*

ing an 8"-radius camber to a new jack plane blade).

Hone

Unless you let your tools go for too long between sharpenings – or you damage a blade – honing is where you'll start sharpening nine times out of 10.

Honing simply erases the existing dull edge and cuts a new one.

Just run the blade on the rock until you turn a burr on the backside. That burr means you've created is a zero-radius intersection of two points – also known as a sharp edge. In fact, that's as sharp as you can get it.

For this operation, think soft Arkansas (sometimes called Washita), #200-grit sandpaper, or #800-#1,200 in the waterstone system.

And when it comes to honing media, you need only one waterstone/oilstone/sandpaper grit/sanding disk.

Polish

Everything above honing – from a #4,000-grit waterstone to the miniscule particles in a honing compound to a workaday hard or translucent Arkansas stone to a #30,000-grit Japanese waterstone – is polishing.

No matter how high you go, all you're doing is progressing up the scale to a higher polish on the blade – that is, with each higher subsequent grit, you're erasing the scratches from the previous grit (and creating new, tinier scratches).

This doesn't make the blade any sharper – you (ideally) achieved a zero-radius while honing. But polishing does make your newly sharp tool a lot more durable. Smaller and shallower scratches mean a less friable edge.

The polish level is completely up to you.

What I Do (Not That You Care)

I'm in the perhaps enviable situation of getting to try out many different types of sharpening systems and many makers within each; I put through the paces everything that comes into the shop to give it proper consideration. But in the end, I come back to what I first learned – and bought – for sharpening edge tools: waterstones (that I flatten with a diamond stone after every use).

And I typically prefer using my tools to using my waterstones. So when I need to grind, I do it on my diamond flattening stone. I hone on a #1,000-grit stone, then polish on a #4,000-grit stone; I remove the burr on the backside with the #4,000-grit stone after polishing. (Unless I'm in the rare mood for super-shiny; then I'll go up to #8,000 grit or strop with green compound, which are equivalent.)

And while I can certainly sharpen freehand, I typically use an Eclipse-style honing guide – I appreciate the mindless repeatability. Sue me. **PWM**

Megan is the 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/jun14

BLOG: *Compare grits on sharpening media.*

IN OUR STORE: *Learn how to sharpen – and the whys behind the hows, from "The Perfect Edge," by Ron Hock.*

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‘Rivet’ Your Furniture

BY CHRISTOPHER SCHWARZ

This strong and simple – but uncommon – joint imparts a decorative touch.

PHOTOS BY THE AUTHOR

After 20 years of making furniture, it's not every day that you stumble on a joint you've never seen before. But that's exactly what happened several years ago when I encountered a floor chest from the West Indies in a Charleston, S.C., antiques store.

The chest had a series of brass circles that ran in a line up each corner of the chest. At first it looked like brass inlay, which is a common feature of some Anglo-Indian campaign furniture pieces I've encountered in my research.

Instead of decoration, however, the brass circles turned out to be the joinery.

A 'rivet.' *This piece of early campaign hardware is held in with screws that then had their heads filed off flush to the pull. This feature shows up on other pieces and even on English handplanes.*

The dealer, who had imported campaign furniture from the Indies for decades, told me that some collectors referred to that joint as a "rivet." He explained that the rivet was nothing more than a brass screw that had been driven in so its head was still proud. Then the screw head was filed flush to the carcase, eliminating the slot.

It's a surprisingly simple and (I think) attractive way to make a strong joint that looks a lot better than having 12 wooden screw plugs lined up on each corner.

This approach shows up in other applications in the woodworking field. Sometimes, screw heads are filed flush with a piece of hardware. And if you've ever seen an infill handplane, you know it is common for the maker to screw in both the wooden infills and the lever cap inside the shell then file off the heads – making for a clean sidewall of the tool.

After attempting the joint on several pieces of scrap, I decided to use it on a campaign-style trunk that features a lot of brass hardware. Making the "rivets" didn't require any new tools – just a simple jig made from two scraps of wood.

Here's how I did it.

Screw it Up

This officer's trunk is made with simple joints: The ends are captured in rabbets in the front and back of the case. The bottom is captured in a groove. The lid is made like the carcase below it, though the top of the lid is merely nailed on.

The carcase of the trunk is 15" x 15" x 26" and it sits on top of mitered bracket feet that are each 2" wide x 3" long. Many of these trunks started life with four simple sledge feet, which are square blocks of wood at each corner. Bracket feet were sometimes added to the trunk later on, perhaps when the military officer returned home or the chest passed into someone else's hands.

Many of the trunks were lined with zinc, cedar or camphor wood to protect the contents from water or bugs. The inside also typically had a till, similar to what you would find on a blanket chest, for holding small objects. Some trunks were fully fitted out with trays and cubbyholes for brandy glasses.

The exteriors of these trunks were made in pine, oak, camphor or other species. The expensive trunks had flush

Screw details. *The most important detail here is the diameter of the screw's head right where the slot bottoms out. That will be the diameter of your finished "rivet" and is the maximum diameter of your countersink. With these screws, that diameter is .325".*

Walk it off. *On the chests I examined, the spacing between each screw was greater than the diameter of one screw. So don't space them too tightly if you want a traditional look.*

Tiny countersinks. *Set the stop on your bit so it makes just a shade of a countersink. This allows the screw to compress the wood a bit and leave a seamless joint.*

And screw. *Drive the #10 screws in so the bottom of the slot is coplanar to the carcase. That results in the least amount of brass to remove.*

brass hardware, such as the example shown here. Less expensive trunks, or those made by joiners overseas, had thin hardware that was merely nailed to the corners. So really, almost anything goes when you design a trunk such as this.

After a few experiments with test joints, I added the screws after the entire case was assembled and the glue had cured so that I didn't have to deal with driving the screws while the pieces of the trunk could still slide around on me.

> "Every nail driven should be as another rivet in the machine of the universe."
>
> —*Henry David Thoreau (1817-1862), from the conclusion of "Walden"*

For the screws, I used #10 x 1¼" oval-head brass screws. While other types of screw heads will work, these screws had the particular diameter I was looking for at the base of the screw slot.

The first step is layout. Take care because small differences in screw spacing are obvious. First strike a pencil line where your screws will go. Then get your dividers and the screws you plan to use.

Decide on the spacing for the screws. After looking at several Anglo-Indian chests, I decided to measure the diameter of the head of the screw, then space the screws so there would be an expanse of wood equal to 1½ head diameters between each finished rivet.

Confused? Step it off with dividers and line up some screws on your chest (start at the back of the chest where mistakes aren't as obvious) to find the right spacing. In the end, I set my dividers to 11/16" and walked down the chest to leave 13 holes on each corner of the carcase (with two more on the lid).

With the holes pricked on all four corners, you can drill the pilot holes and just a shade of a countersink. I used a bit that drilled the pilot and countersink in one operation – and it had a stop so it made the same countersink every time. This is quite handy.

You want the diameter of the countersink to be a wee bit smaller than the diameter of your screw head where the slot terminates. This results in a gap-free fit between the brass and wood. A too-big countersink looks terrible – either part of the screw's slot will remain or you'll have a gap around the brass.

Before you start drilling, make a couple test holes in some scrap.

Then drive the screws. Use a little lubricant – I use paraffin or beeswax – and sink the screws in so the bottom of the slot is coplanar to the surface of the carcase. Do not allow the bottom of the slot to go below the surface. That's bad.

Filing jig. *An offcut of poplar and some double-sided tape makes the basic jig. Add a fence to the jig to make it a can't-miss affair.*

Push or pull. *By orienting the file one way or the other, you can use the jig in pushing or pulling position. Both work.*

Slow & steady. *After 10 minutes of filing, you will reach the bottom of the slots. Then you have to clean up your work deliberately in order to avoid gouging the surrounding wood.*

Filing the Screw Heads

Leveling the brass screw heads is more tedious than it is difficult. I tried a variety of ways to speed up the process: a metal-cutting blade in a Fein Multi-Master, a hacksaw and various files.

Those solutions worked. Kinda. But the Multi-Master scored the wood unacceptably, as did the hacksaw.

The best solution I found was to use a file – either a laminate file or a multi-cut file used for auto-body work. And instead of using it freehand, I did most of the work with the file in a jig that prevented an errant stroke from decimating my mahogany.

The jig is simple. It's a chunk of wood that I cut a rabbet into. The rabbet is the width of the file. The depth of the rabbet is the thickness of the file plus some double-sided tape. Then I glued a fence to the block to keep the jig at 90°.

To file the screw heads, clamp the trunk's carcase to your bench then push the filing jig across the screw heads. It took me about 30 minutes per corner to file the screws, so take your time and don't try to rush the job.

Every few minutes, clean the file (rubbing chalk across its teeth helps keep it clean). And vacuum up the brass filings from the work.

When you reach the bottom of the screws' slots, you can switch to some power sanding to help move things along. I used #120-grit sandpaper in an orbital sander to remove a little brass and wood. The sander will remove more wood than brass, leaving the brass bits a bit higher – like a mosquito bite.

Use a fine file to dress down the bumps until the surface feels smooth. Sand a little more then file a little more if necessary. The last step should be filing away the last little bit of brass bumpiness with a fine file and gentle stokes.

And that's all there is to it. Finish the piece as you normally do. And when your woodworking friends ask you, "How did you do that?" don't screw it up and spill the beans. Tell them, "It's a secret joint from the West Indies." **PWM**

Christopher is the editor at Lost Art Press. This trunk is from his book "Campaign Furniture" (Lost Art Press).

A little abrasive action. *When you reach the screw slot, you can move things along a little faster with a random-orbit sander and some #120-grit sandpaper.*

Final filing. *The sander will eat away more wood than brass. So level the tops of the screws with a file with a few finishing strokes.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun14**

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BLOG: *The author has reviewed lots of campaign hardware; take a look.*

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Contemporary Cabriole Legs

BY JEFF MILLER

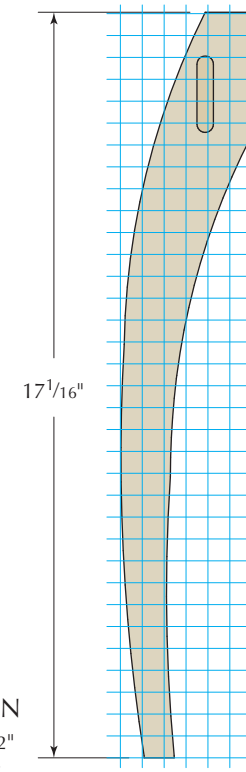
A new approach to a traditional design element.

Early on in my career, I built a number of tables with different types of cabriole legs. These ranged from period-inspired pieces to designs a little farther afield. But as I began creating my own designs, I wasn't entirely satisfied with what cabriole legs offered. I liked much about the legs – the organic character and the refined subtlety of the curves – but I wanted design elements that didn't have all of the obvious historical connotations of the cabriole. In other words, I was looking to create a modern translation of some of the ideas behind the cabriole leg.

I had seen plenty of modern interpretations, but none of them really captured what I was looking for. I realized that this was because there was often an element of the design that was missing: the connection between the aprons and the legs. On a traditional leg, these are typically in the form of

In order. *Decide on a location for each of the rift-sawn legs and mark them with a triangle.*

Inside job. *The inner corner is the reference point on which to align the pattern and from which to locate the mortises.*



knee blocks. They are important to integrating the apron and the leg, and I wanted to incorporate a version of this into my legs.

It took a few iterations to come up with something that I really liked. I finally settled on a simple leg that grows very naturally out of the apron. Part of the way that works is that the aprons have two facets; the upper one is more or less contiguous with the top of the leg. On the lower, visually recessed facet, filler pieces (a form of knee block) create the transition of the leg up to the upper part of the apron.

Patterns for the Legs

The curves are a crucial part of these legs. Whenever I work with curved parts, I develop patterns in 1/8" or 1/4" plywood (or in clear Plexiglas, when I need to see and work with the wood grain). The patterns allow me to easily refine the curves to perfection. When the time comes to lay out the curves on the wood blanks, I've got perfect lines to cut to, and a better shot at identical parts. Mark out your pattern, cut it out, then get to work refining the curves.

The ideal wood for the 3 1/4"-square leg blanks has rift grain (growth rings running from corner to corner). You'll get more consistent grain patterns on all four legs this way, and grain-matching the transition blocks will also be a little easier. You'll have to find thick stock for this project; gluing up the blanks gives you unsightly glue lines.

Mark out the leg shapes on the inside faces of the legs with the straight part of the leg sharing the inside corner. If you haven't done much of this type of work before, it helps to lay out a spare leg or two so you can practice the cutting and smoothing process without worrying about things going wrong on your first or second attempt. By leg number five, you should feel like a pro.

Next, you'll want to lay out and cut all of the mortises. I used a 3/8" x 1 3/4" mortise, located 7/8" from the inside of the leg, and from 1" to 2 3/4" down from the top of the leg. The adjacent mortises should not quite touch, so they'll wind up a little less than 7/8" deep. I cut these mortises with a plunge router and fence (the leg blanks are wide enough to provide good support for the router), but use your choice of mortising methods.

Now you can cut out the shapes of the legs. To start this process, I make not-quite-complete cuts on one side of a leg; I band saw all but the last 1/8" at the bottom of the legs, then shut off the saw and back out of the cut. That little bit is enough to hold the offcuts in place as I flip the leg 90° to cut from the adjacent side. If you forget to stop,

Stop short. *Cut close to the end of the leg, turn off the saw, then back out of the cut. This holds the pattern in place for the next cut.*

Cut, turn, cut. *After making the mortises, the pattern is cut on two adjacent faces of the leg blank.*

or the blanks falls apart, you can tape the parts back together, then proceed with the second set of cuts.

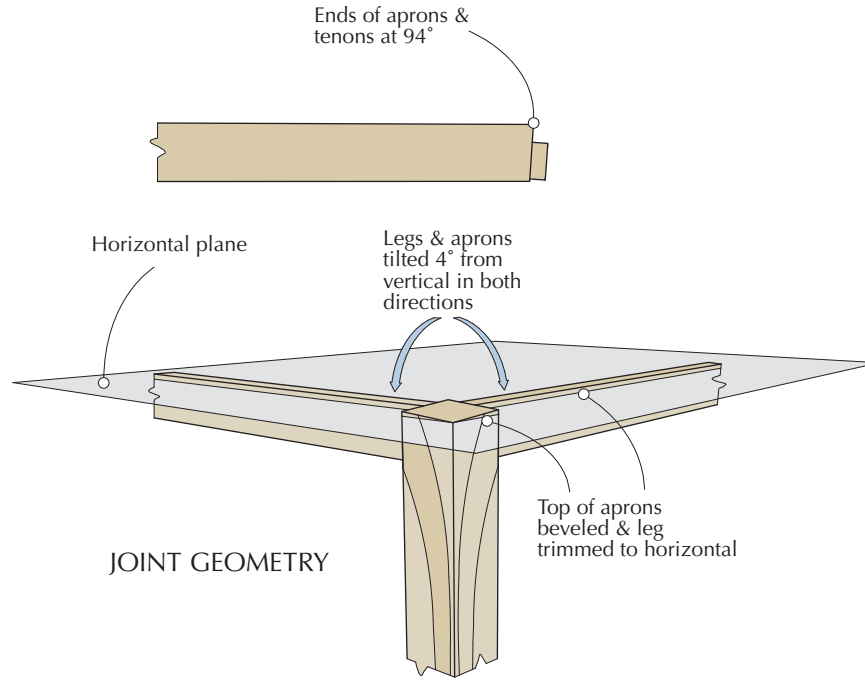
Either way, these next cuts can be made all the way down the leg. When you're done, pop off the waste and see your shaped leg emerge from the block. Save all of the offcuts – we'll use them twice before the end of the project – and mark them so you can figure out just which ones match each leg; you'll get the best grain match for your transition blocks from the matching material.

Angled Tenons

Now you can mill your rail stock and lay out the tenons. The location of the tenon will determine exactly how the rail meets with the leg, and you want the curve of the leg to cross the surface of the apron about half-way up. I hold the rail up to a leg and move the rail back and forth until it is in the right position, then transfer the mortise location to the end of the rail to locate the tenon.

You'll also need to angle the shoulders and ends of the tenons roughly 4° off of square, leaving the tops of the rails longer than the bottoms. This angle is necessary to position the legs more gracefully on the table. I made up a 14 3/8"-long wedge that tapers from 1/2" to 1 1/2" and didn't bother with a protractor.

Start by cutting the 4° bevel on the ends of the rails. Use the wedge along with the miter gauge or crosscut sled on your table saw. Using the wedge makes layout easier, even if you're planning to cut the tenons by hand.



JOINT GEOMETRY

It's not hard to set up the table saw to do this kind of work. For the cheeks, simply use the wedge to tilt the rail forward in your tenoning jig and cut as usual. The shoulders are a more interesting challenge. It's hard to set up to cut the shoulders so they line up perfectly. But a dead-simple jig and a cool technique for the table saw can make quick work of the job. The key is to use an L-shaped auxiliary fence on the table saw that allows you to cut away the waste safely.

Set the height of the L-shaped fence so that the end of the tenon registers against the fence, but high enough that the waste piece will be cut free. Use the wedge with the miter guide to help support the rail as you cut. Keep the end of the tenon tight against the fence. This involves using a rip fence and miter guide together, but this setup allows you to make the cut and not leave the waste piece trapped between the fence and the spinning blade.

Wise wedge. *A simple wedge behind the angled aprons allows the cheek cuts to be made with this tenon jig.*

Fence & wedge. *The auxiliary fence prevents offcuts from being trapped between the blade and fence. The wedge is used to quickly set the proper angle.*

FAIR CURVES

You want your curves to be smooth and fair. Smooth is fairly obvious – no lumps or bumps. Fair means that there are no sudden changes to the curve and that your eye can follow along with no disturbances. It's like driving on a winding road that sets up perfectly for the driving experience; there are no straight sections or sudden changes in the road where you have to suddenly pull the wheel.

I smooth my curves with a block plane for the convex curves and a spokeshave (flat or curved sole, depending on the level of curvature) for the concave. I find that I get great results very quickly. The technique may take a little practice to get the hang of, but it's an incredibly useful skill to have in your repertoire; it's worth the little bit of time invested to master it.

I keep a separate "plywood" plane for doing this work on plywood patterns (an old $5 flea market Stanley that is nonetheless a good block plane), but the need to resharpen the blade on a better tool shouldn't keep you from trying this. You can also rasp, file or sand (with straight and curved sanding blocks) if you choose. — JM

Save the scrap. *The waste from cutting the legs is used for support while cleaning up the concave inner surface.*

Low dogs. *The outer convex curves are easier to hold, but keep the dogs out of the path of the block plane.*

Cutting the angled shoulders is also a perfect task for the tenoning frame and armchair maker's saw I wrote about in the February 2014 issue of *Popular Woodworking Magazine* (#209). Just lay out the tenons, use your wedge to set up the rail in the tenoning frame then saw the shoulders all around with the armchair maker's saw. You can even leave the rail in the tenoning frame to saw the cheeks.

Fit each of the joints and label the legs and corresponding joints on the rails so you can put things back together correctly.

Smooth the Legs

Smoothing the legs poses a couple of challenges; holding the legs securely for work, and then actually smoothing out the curves. Use the offcuts to help hold the legs concave-side up on your bench between bench dogs. On the convex side you won't have to worry about using the offcuts, but be sure to keep the dogs low enough that you don't run your plane into them. You'll probably wind up adjusting the convex side a little bit after assembly to match up with the aprons, but you should strive to have the concave curve meet the flat spot exactly as laid out.

You'll need to pay careful attention to grain direction and be sure to plane "downhill." In the areas where the grain direction changes, you will almost certainly need to follow up with scrapers; it's all too easy to get tear-out as you go beyond the fairly sudden change point. A curved sanding block (try a section of the offcuts) also helps.

Faceted Aprons

Dry-assemble the table, then mark out the profile of the upper legs on the shoulders of the aprons. Depending on your accuracy in cutting and shaping the legs, these may not be exactly the same from one side to the next. You can adjust either the leg or the bevel to correct the problem.

You should also bevel the top of the aprons at this time, removing material

Right angle. *The end of the apron falls in the middle of the curve. Fit the apron in the leg and mark to bevel the top of the apron.*

Offcuts again. *The waste from cutting the legs provides a flat surface that keeps the clamps from slipping as they are tightened.*

toward the inside of the aprons and just touching the top outside corner. This will be roughly 4° out of the plane of the top of the table, due to the tilted tenon shoulders. You'll still need to flush off the very tops of the legs, but don't do that now; it's easier once the table base is fully assembled.

Cut grooves for the table buttons that attach the top in two opposite aprons. These grooves should be 1/4" wide, 1/4" deep and angled at 4° so that they are parallel to the top of the aprons. Smooth the aprons in preparation for assembly.

> "We construct and construct, yet intuition is still a good thing."
>
> —*Paul Klee (1879-1940), painter*

It's not immediately obvious how you can clamp the table together. The solution is to use the leg offcuts. A piece of leather or cork added between the offcut and the leg protects the smoothed surface of the leg. Simply clamp this "caul" in place about halfway up the leg, and you've got a good place to clamp.

It's much easier to glue up in stages. Start with opposite pairs of legs and their aprons (check to make sure you have everything located properly based on your marks). Spread glue in the mortises and very lightly on the tenons, then clamp each assembly. When the glue is dry on the two sides, you can glue together the full table. If you want, you can add the transition blocks (see below) to the sub-assemblies before gluing up the whole table, finishing up the remaining blocks when the table is fully assembled. You can also wait until the table is together.

Elegant Transition

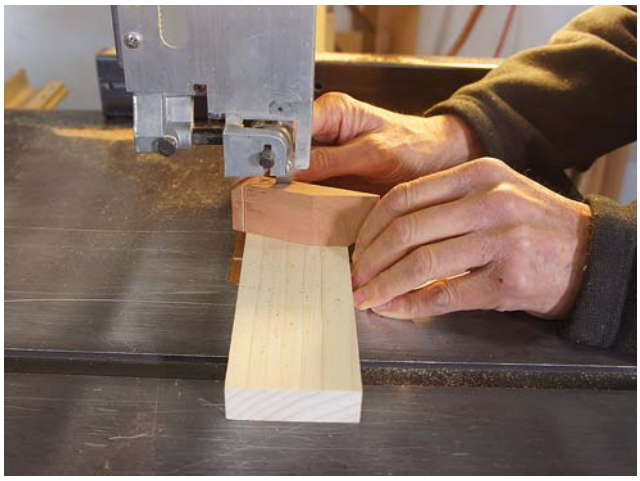
The hardest part of preparing and gluing on the transition blocks is keeping track of what goes where. In order to keep the grain match as close as possible, you want to use the offcut from the face of the leg for its transition block. The goal is to shift that piece over while maintaining the grain orientation.

This requires a few steps and a systematic approach. I find it best to work on one transition block at a time, and to mark out carefully for orientation, because the parts are both small and easily confused.

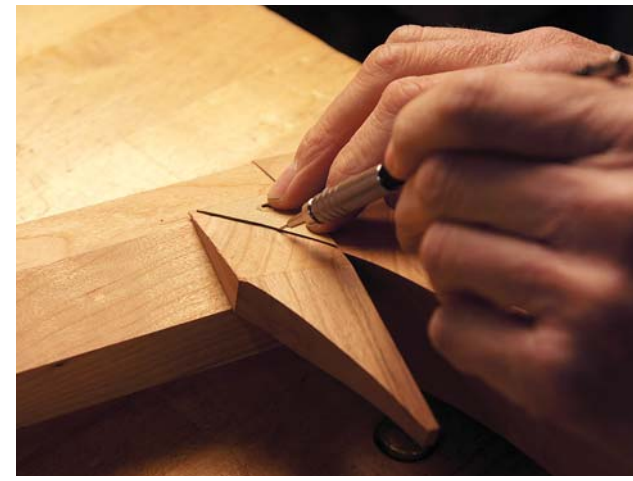
Start by finding the appropriate offcut for the side of the leg you're working on. Rip the piece parallel to the flat face on the band saw (the table saw is too dangerous for this cut), making it about 1/16" thicker than the distance from the apron to the thick part of the leg. Handplane the just-cut face flat. You have to rip this piece to about 1 3/8" wide, but this is also too dangerous to do as a rip cut on the table saw. Instead,

Straighten out. *The first step in making the transition blocks is to create a straight edge that butts against the flat surface of the leg.*

Direct line. *With the knee block in position, mark the curved edge where the block meets the leg.*



Safe & sound. *A larger block beneath the transition piece makes it easier to control and keeps hands at a safe distance from the blade.*



Follow along. *The curve of the leg continues into the transition block. A cardboard pattern ensures consistency.*

set up a hold-down clamp on a crosscut sled, and use this to safely hold the piece as you cut.

Hold this part up to the apron and tight to the leg then trace out the profile of the leg on the side of transition block. Now head back to the band saw to cut the profile of the transition block. Place the small block on a larger piece of wood so it is well supported as you cut it to shape. Now place the block back on the apron and trace the shape of the extended curve of the leg onto the face. Cut this curve on the band saw using a support piece as well. Finally, smooth out this curved edge. Don't smooth the face yet.

Spread a bit of glue on the back and edge of the block, and hold it in place for a minute until the glue tacks up, then tape it down with masking tape. Pay particular attention to the point at the top of the transition block. Make sure it gets both glue and pressure. Let the glue dry completely before you try to smooth things out.

You can start smoothing the face of the transition block flush with the leg using a block plane set very fine, but be aware that it is very easy to break off the point of the transition block. Plane on an angle from the apron toward the leg to minimize the risk of blowing out the corners. You could also switch to sanding, which is less likely to cause trouble.

Try to keep the line at the top of the block as straight as possible and in line with the apron break. If you do break off the point of the block, carefully carve the edge of the block back a bit. The curve may not be perfect, but you'll be able to restore the point.

Finishing Touches

I find it easy to flush off the tops of the legs by drilling a 2¼" hole, centered in a piece of ¾" plywood at least 12" square

Make it match. *Cut the block a bit thicker than the leg, then plane it down to blend the two pieces.*

Uphill battle. *Pay attention to grain direction as you work on the curved surface of the leg and knee block.*

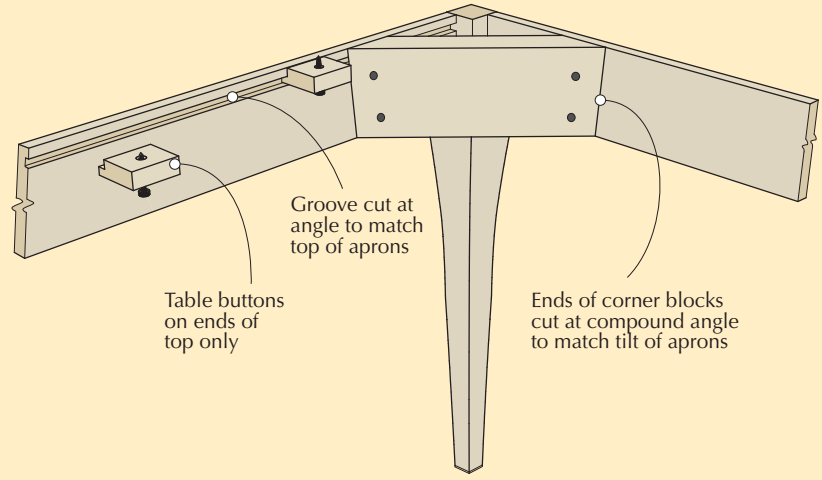
ATTACHING A TOP

All that remains is the top. This can either be a veneered panel with solid-wood edging or a glued-up solid board. In either case, the table looks best with a shaped edge that matches the shape of the top of the legs. Start by cutting a bevel close to the right shape, then plane or sand the edges slightly to round over just a bit. Finally, add a small bevel to the underside of the top at roughly 90° to the main edge shape to create a friendlier edge to the touch.

Attach the top with table buttons that hook into the slots in the two opposite aprons. Make up six table buttons for fastening down the top, insert these into the slots and screw the buttons to the top. Make sure to orient the grain of the top so that the table buttons can accommodate the cross-grain expansion and contraction (you should be attaching near the ends of the top, not along the sides).

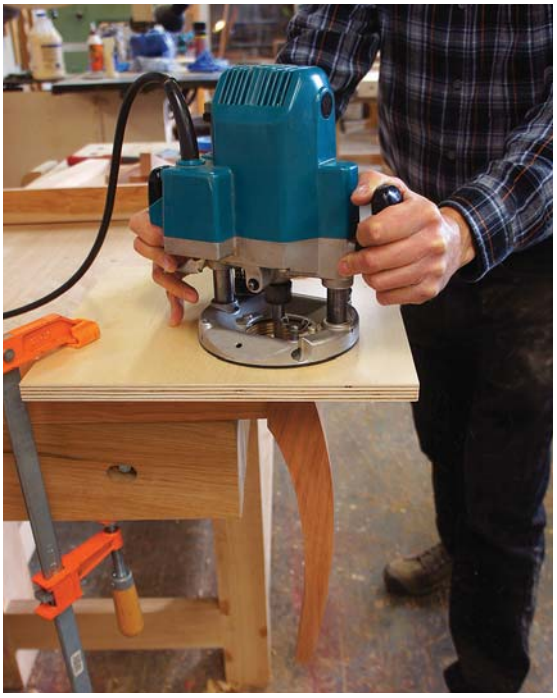
The table should have corner blocks to reinforce the joinery. The ends of the corner blocks need to be cut at a compound angle. Cut these on the table saw with the blade set at 45° using the wedge you used to set up the angle of the tenons to match the secondary angle. Drill four pilot holes for screws – two into each apron.

— JM



(although the exact size doesn't matter). Clamp this to the aprons of the table, with the top of a leg protruding into the hole. Then carefully rout down the top of the leg flush with the aprons. Be sure to start with a light climb cut so you don't blow out grain on your finished leg. Repeat this with each of the legs.

You can use these legs with any size coffee table – I've even scaled them up to work as dining table legs. Be sure to keep the overhang of your top fairly small so the design is clearly noticed; I go with about an inch of overhang on my coffee table. Another great touch is to bevel the edges of the table (at about 12°) to complement the shape of the cabriole legs.



Magic trick. *A hole in the plywood jig exposes the angled top of the leg. Set the router bit to meet the top of the apron to trim the top flat.*

I've used this technique for a few different leg styles, and find it works well. Each time, the language has been translated from the traditional. But the leg design retains richness and complexity, and a strong resonance with the original. **PWM**

Jeff builds furniture and teaches woodworking from his shop in Chicago.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun14**

VIDEO: *Watch Glen D. Huey make a traditional cabriole leg.*

BLOG: *Visit Jeff Miller's blog and web site.*

ARTICLE: *Read about Jeff's work and shop in this "Great Workshops" article.*

PLAN: *Download a SketchUp model of a table that features these legs.*

IN OUR STORE: *Jeff's book and DVD, "The Foundations of Better Woodworking."*

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Hardware Hideaway

BY GLEN D. HUEY

Store handles, hinges and fasteners in this handsome dust-free organizer.

While exploring in an antique store, I found a small, two-level lidded box that would be ideal to store the loads of extra hardware I have stowed in plastic bags. No longer would I need to search endlessly for brads, bails and back plates; everything would be in one place.

The price of the antique, however, was too rich for my wallet, so I took a photo and used the "dollar-bill" method of measuring (a piece of United States paper money is approximately 6" in length). Even if my memory was defective, my notes, measurements and pirated photo could get me close.

Build the Jig

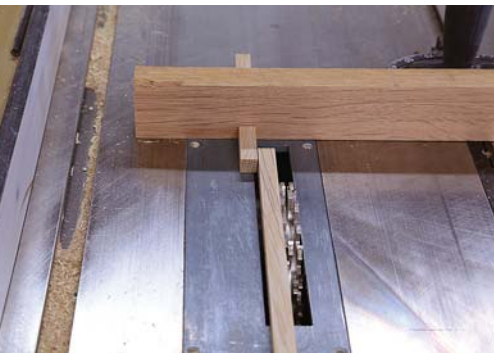
Both the box and the tray, which fits inside and rests on the lower layer of cubbies, are assembled using box joints (also called finger joints) that I cut at the table saw. Box joints have plenty of glue surface for a strong bond, but are easier than dovetails to whip out by machine. In fact, they are perfect for shop builds. (The same basic process is also a great technique for making dentil moulding.)

Mill the sides and ends of both the box and tray to size and thickness, then set them aside and set up your table saw for making box joints.

First, attach a sacrificial fence to your miter gauge. Install a dado stack set at 1/2" wide, and raise the depth of cut to 1/2". Make a single pass of the gauge and fence over the stack to establish the notch for the jig's key – the piece that guides the box-joint making process.

Mill a 12"-long stick of scrap that exactly fits the width and height of the notch (mine is 1/2" square; I milled it at the planer), then cut a 3"-long piece (the key) to fit and attach into the fence's notch. A couple of brads hold the key in place. With the remaining stick held tight to the right side of the table saw blade (as shown on page 34), free the sacrificial fence from the miter gauge, slide the installed key so it's tight to the right-hand side of the stick, then re-attach the fence to the miter gauge. The jig is ready to go. (As always, you should make a test cut to confirm that your joints will be tight…or not.)

For the sides of the box, begin with the workpiece positioned tight to the left-hand side of the key. Run the assembly over the dado stack to make the first notch in your workpiece, spaced 1/2" from the edge of the board. Slip the newly cut notch over the key and make another pass. Repeat these steps



Simple. *Setup for box joints is easy: A sacrificial fence and a milled stick work like magic as long as you dial in your settings.*

First cuts. *The fingers for the box and tray sides begins with the workpiece tight to the left-hand side of the key.*

Make the mates. *I use the milled stick as a spacer for this step; it takes out any guesswork.*

until you've reached the opposite edge of the board, then flip the board to cut the opposite end. Cut the fingers on the second side, too.

To cut joinery on the ends, begin with the edge of your workpiece set even with the right-hand edge of the fence cut-out; with the first cut, you remove the corner of the board. That corner notch then slips over the key and the balance of the end piece is cut in repetitive passes.

Tray parts are cut the same way, but before any work is done, tweak the blade height to 9/16". Your first pass raises the cut area, but doesn't affect anything else in the setup. The idea is to slightly reduce the size of the tray to make it easier to lift the unit in and out of the box. Just as before, begin with the tray sides then finish up with the ends.

Dry-assemble the box and tray. Your fit should be tight, but not too tight. If you're working with pine as I am, there is a bit of a "smash factor" you can count on. Be more particular when using hardwoods.

Dados Add Strength

Each side of both the box and the tray has two dados for the 1/4"-thick bin dividers; the dados are almost equally spaced along the lengths (see the illustration on page 36 for more information). The ends have a single dado that's cut dead center. I use a shop-made jig to guide my router and 1/4" spiral-upcut router bit to cut the dados (see "Simple & Accurate Router Jig" at right).

The layout work is easy. For the sides, measure the length between the joint work, then divide the result by three. Make a mark at the two locations. For the ends, find the centerline of the piece (measure between the joinery) and place a mark. Move 1/8" in both directions off the marks to lay in the location of the bin dividers.

The dados in the box parts extend up from the bottom edge 2"; those in the tray are routed completely through the parts. Use a backer board to keep from blowing out the grain as the router bit exits the cuts.

After you've cut the dados, use a 1/4"-wide chisel to square the ends of the box dados, then assemble the box and tray. To take full advantage of the box joint's strength, apply glue to all the fingers then slip the sides and ends together. A couple of light mallet taps should set the joints tight – but it doesn't hurt to add a few clamps. Make sure they don't catch the fingers, which are slightly proud of the face of the units.

When the glue is dry, plane or sand the fingers flush to the sides and ends.

Divide & Conquer

Mill the dividers to size and thickness, leaving the parts a bit longer than needed. Using the assembled box and tray to measure, square one end of a divider, set the end into a dado then mark and cut the opposite end. (A well-tuned miter saw is perfect for this.) Cut the four pieces for the short dividers, and the two pieces for the longer dividers.

Use an egg-crate joint to assemble the interior of the two units. To mark the location of the cuts, I find it better to use the box or tray itself. Set the part

> "The fellow that owns his own home is always just coming out of a hardware store."
>
> —Kin Hubbard (1868-1930), Cartoonist

Dado strength. *Router-cut dados help to align the bin dividers and increase the overall strength of the box and tray.*

Watch your fingers. *It's a good idea to clamp your box and tray, but as you do, make sure the fingers, which are slightly proud of the face of the units, are not captured underneath.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATION BY ROBERT W. LANG

– short dividers at the ends and longer dividers at the sides – in position on the box or tray. Make sure you align the dividers with the back of the dado slot. When positioned, mark both edges of the dado onto the dividers.

The slots for the egg-crate joints are best cut with another table saw jig. This setup is simply a sacrificial fence with a 1/4"-thick carrier attached to its bottom edge. Attach the unit to your miter gauge so the blade cuts the jig about 2" from the end. Raise the blade to just reach the center of the divider – don't forget to account for the carrier thickness. Once set, make a pass over the blade to cut the 1/8"-wide slot. That slot is key when using the jig.

Position your divider on the carrier and against the fence, align the right-most mark at the right edge of the slot – you can easily see the slot cut in the carrier – then make a pass. To complete the egg-crate cut, slide the left-most layout mark to the left side of the carrier slot and make the cut. If your layout marks are accurate, the newly formed slot should slip over the thickness of any divider. If it doesn't, no worries. Set the divider back on the jig and tweak your slot opening – the edge of the carrier slot easily identifies where to position your divider.

Make the egg-crate slot in each divider. It matters not whether you cut the slots in the top edge, the bottom edge or both. The bin dividers are generic

Two procedures. *Set the parts – short dividers at the ends and longer dividers at the sides – in position on the box or tray as you transfer the layout.*

In plain view. *Drawing a bead on where to position your egg-crate cuts is straightforward because you can easily see the slot cut in the carrier.*

SIMPLE & ACCURATE ROUTER JIG

One of the most useful shop-made router jigs I use is for cutting small dados. (This setup is best used on workpieces no wider than 10".) Make a jig for each router and router bit pairing; different combinations require different jigs. My shop is awash with them.

Each jig requires three parts: a base, guide fence and T-square. Each part comes from small pieces or scraps. For the base, I like 1/4" plywood, but I've used Masonite and even pegboard in a pinch. The fence is usually a piece of 3/4"-thick hardwood that's 1" wide, and my T-square material is most often 1/2" thick, but sometimes I use 3/4".

To begin, load a spiral-upcut bit into your router, then measure the distance from the edge of the router base to the center of the bit; approximate measurements are great, but err to the heavy side. Add 1" to your size. Grab a piece of plywood that's the width needed and a couple of inches longer than your workpiece to use as the base, then attach a guide fence to one edge – I use small brads and glue.

Hold the assembly with the fence to the left-hand side and run the router with its base tight to the fence. Your bit cuts the base and establishes the exact place of the cut each time the jig is used.

Using a square, align the T-square piece at 90° to the just-cut edge, so that its end sits flush or just behind the edge of the base. When set, attach the 1/2"-thick part to the assembly using brads. Be careful – you're driving fasteners through a thin material.

To use the jig, align its right-hand edge even with your layout line, and keep the T-square tight to the workpiece. Clamp the jig and workpiece secure, then set the bit's depth of cut – remember that you need to reach beyond the thickness of the jig's base – and rout the dado. It's easy to align, accurate and works every time. — GDH

Dialed-in location. *Running the router up the assembled jig cuts the jig exactly where the edge of the router bit does its work.*

Get it square. *The usefulness of this jig depends on the T-square piece being set at a perfect 90° to the base.*

In action. *Here you see the dado jig in action – you also see a backer that eliminates any blow-out as you cut the tray parts.*

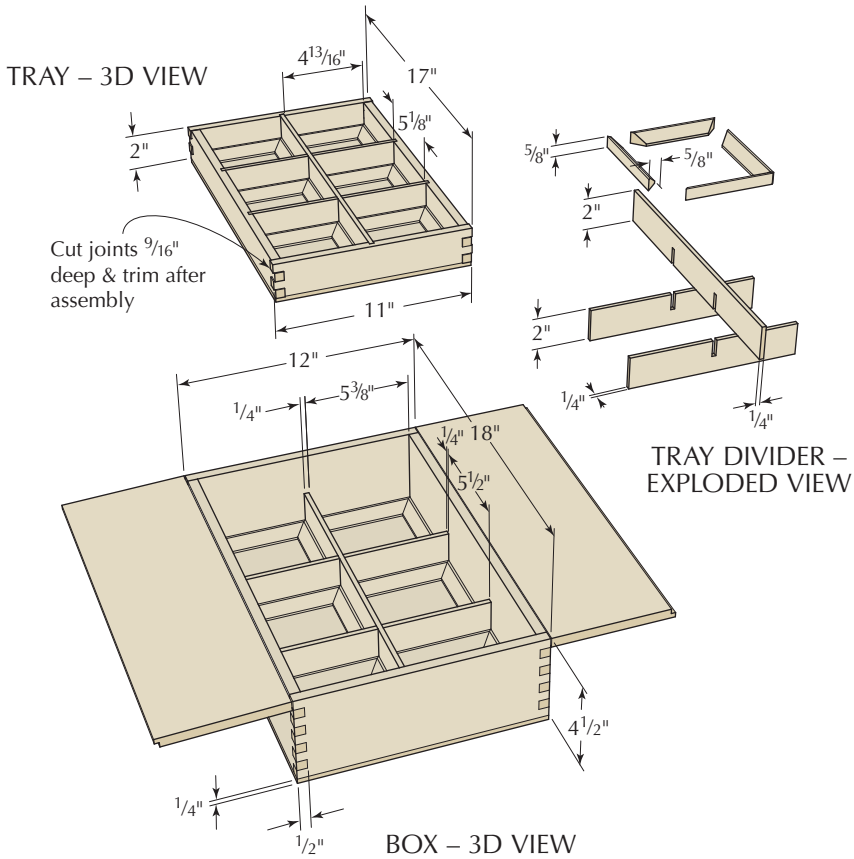
as they fit to the box and tray.

After you've cut and fit your dividers, assemble the pieces in the box and tray. Glue adds little but a mess, so I forego its use here. The box dividers slip in from the bottom; tray parts fit in any direction. As you fit the center pieces in place, you may need to gently bend or twist the shorter dividers to get the egg-crates joined. If you need stronger measures, check the layout and cuts for problems.

The bottoms of the box and tray are 1/4"-thick plywood. Cut the bottoms to fit, add a thin bead of glue around the perimeter, position the plywood then nail the bottom in place – don't attempt to nail the dividers. I use an 18-gauge brad, but a 23-gauge pin works just fine. (Keep the fastener length to a minimum; you don't want to risk bending a brad or pin so it pierces the outside face of your box or tray.)

Hardware Hideaway

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑ 2	Box sides	1/2	4 1/2	18	Yellow pine	
❑ 2	Box ends	1/2	4 1/2	12	Yellow pine	
❑ 1	Box bottom	1/4	12	18	Plywood	
❑ 1	Box divider – long	1/4	2	17 3/8	Yellow pine	
❑ 2	Box dividers – short	1/4	2	11 3/8	Yellow pine	
❑ 2	Box lids	5/8	6 1/4	18	Yellow pine	Shiplap at center
❑ 1	Lid latch	1/4	7/8	6	Spalted tamarind	
❑ 2	Tray sides	1/2	2	17	Yellow pine	
❑ 2	Tray ends	1/2	2	11	Yellow pine	
❑ 1	Tray bottom	1/4	11	17	Plywood	
❑ 1	Tray divider – long	1/4	2	16 3/8	Yellow pine	
❑ 2	Tray dividers – short	1/4	2	10 3/8	Yellow pine	
❑ 1	Bin moulding	5/8	5/8	144	Yellow pine	



No Nasty Corners

Each cubby has a small piece of chamfered moulding wrapping its four sides to make retrieving hardware from the box and tray a snap. The moulding is 5/8" x 5/8" and mitered at the corners. The fit is by friction, although you could add glue as you install each piece.

I make the moulding at a router table using a chamfer bit. Begin with a wide workpiece, profile the two edges then cut the pieces at your table saw, aided by a push stick. As your workpiece gets narrow, it's better to profile from opposing faces so you have a wider support surface riding the saw's table.

Mitering the mouldings to fit each cubby could be done by hand, but I favor my chop saw. To make the operation effective, I use double-sided tape to hold a scrap tight at the saw. The scrap holds your cut away from the fence and the saw kerf provides the perfect registration for your cuts.

To work efficiently, you need only to set the saw to 45° to the left. Position one of your chamfered pieces at the chop saw with the 5/8" flats facing up and against the sacrificial fence. Make the first cut.

Measure the length of the piece

Easy does it. *Your egg-crate joints should slip together easily with finger pressure only (and glue is overkill).*

Work small. *As the workpiece narrows, it's better to profile the opposing faces of the stock so you have greater support as you rip at the table saw.*

One setup*. Both ends of the bin mouldings can be cut with your miter saw set at 45° to the left – the first cut has the chamfered edge facing front and down.*

Mark alignment. *With your measurement marked on the top edge of the moulding, a good set of eyes is all that's needed to dial in the perfect cut.*

needed then transfer the length to your moulding; to mark an exact layout at its top edge, position the workpiece to your box or tray. Align your mark directly at the kerf in the fence to make the second cut. I found that I occasionally had to trim the pieces to get a press-in fit, but again, the kerf makes it easy to determine where to place your workpiece. Cut and fit the 48 pieces.

Lid & Latch

The lid is simply two pieces that are shiplapped at the center. Cut the pieces over-wide, then cut the shiplap (I used a dado stack at the table saw) before you attach the lid to the box with two pair of narrow 2" fixed-pin hinges (available at any hardware store).

Position the two lid pieces on the box and center the joint, then mark and cut the outside edges so the lid fits the box, with a small gap in the middle. (I used two 6" rules as spacers.)

Take your time installing the hardware, and when you've completed the task, use a small plane to even the gap between the lid pieces, if need be. Also, you may need to reduce the width of the hinge leaf attached to the box to facilitate the installation of the tray. I used a file to flush the leaves to the inside of the box.

To hold the box closed, I whipped up a simple wooden latch using a scrap of spalted tamarind, but use whatever you like. Mill the piece to size and length. Drill a slightly oversized hole for a #10 x 7/8" roundhead brass screw in one end of your latch, and cut a slot at the opposite end. Select where you want your latch – I chose the middle of the box – and attach the latch with one of the brass screws. Square the latch to the side of the box, then install the second screw so it fits into the cut-out area of the latch. How much you turn your screws decides how tight the fit. Yes, because they are so noticeable, I clocked these screws.

I decided to allow my box to age naturally, but I used boiled linseed oil on the latch to make sure it stood out. I stripped the zinc coating off the hinges then added a coat of wax.

The box and tray are a great place to store and organize extra pieces of hardware. And this project measures up to my antique-store find, which cost way more than the dollar I used to get sized up on the downlow. **PWM**

By the time you read this, Glen will be the editor of American Woodworker*; he can still be reached at glen.huey@fwmedia.com.*

Perfect alignment. *The challenge for the top is the shiplap center, but if you cut the joint first, the top is easy to trim to size.*

Fine-tune adjustment. *As the hinges go in, it's possible to slightly reposition the lids – a problem that's easily corrected with a sharp handplane.*

Get square. *I positioned the latch to the box holding it dead center. One screw holds the latch, the other catches it.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun14**

VIDEO: *Watch how a pyromaniac might turn zinc-plated hinges into black beauties.*

BLOG: *Read another option to add years of age to new hardware using chemicals.*

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Spoon Carving

BY PETER FOLLANSBEE

This kitchen workhorse presents a surprising and rewarding challenge.

A wooden spoon – you can get one for a dollar in many places. It's just a stick with a hollow shaped at one end. Why go to any bother over such a thing? Use them to stir sauces, dole out rice and beans, then forget about them. But like much in woodworking, the hand-carved spoon is in another sphere than its mass-produced substitute.

I have worked wood for more than 30 years, and made several households' worth of furniture both simple and complex. The spoon remains a greater challenge than my most ambitious court cupboard or joined and carved chest. This aspect of woodworking is about tradition, design, shapes, forms and function. In spoon carving, you learn about edge tools, green wood and body mechanics – all while sampling a variety of local woods that might otherwise never make it to your workbench.

The spoon carving I learned from Jögge Sundqvist, his father, Wille Sundqvist, and Drew Langsner is part of a Swedish tradition, the revival of which was really spearheaded by Wille. My first attempts were thick and clunky.

One nice thing about spoons is that you get another chance to get it right in just a couple of hours or less. Another nice thing is that you can do most of it – other than the hatchet work – anywhere; you don't really need a dedicated shop space.

Ideally, spoon carving is a green woodworking craft. You can experiment with a great range of local woods, usually free. I've used apple, pear, cherry, rhododendron, birch, lilac, olive, mulberry, beech, maple and others. Fruitwoods are the nicest; among them, apple is my favorite.

The tool kit is small; I do most of the work with a hatchet and a few knives. Add some splitting tools and a rough saw for crosscutting the blank. The hatchet is a small, double-bevel affair, not like the large single-bevel tool I prefer for joinery work. We're cutting shapes here, not flat surfaces, so the double-bevel tool allows you to work both convex and concave areas.

The bulk of the shaping is done with a long-bladed carving knife, often marketed under the description "sloyd knife," which refers to the Swedish term relating to handicrafts.

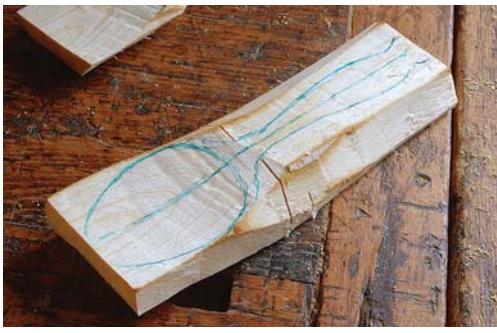
To hollow the spoon's bowl, I use hook knives specifically made for carving spoons, but you can hollow your spoon with a carving gouge.

Some spoons are made from "crooks," sections of bent limb-wood, or places where a limb meets the trunk or a larger limb. These are some of the

PHOTOS BY THE AUTHOR

Tool kit. *It takes only a few tools to shape your own spoons; I use a hatchet and two – sometimes three – knives.*

Crooked blank. *From a crook comes a thin but strong spoon.*



Pencil it in. *After sketching the outline of the spoon on top of the blank, make relief cuts with a saw or hatchet to where the bowl meets the handle.*

most challenging spoons, but can be the most successful. In them, the spoon's bowl flows below the stem and handle while following the tree's fibers, resulting in thin, but strong spoons. When you work with straight-grained blanks, you have to compromise some to create the flowing shape of a graceful spoon. At some point, you're cutting across the wood fibers. But it can work either way.

I'll begin with a serving spoon from a fairly straight blank. Start with a clear piece of fresh wood, the diameter a little greater than the intended spoon's width. Split the piece down its length with a froe or hatchet. (Strike the froe with a wooden club, never metal.) Hew away the inner flat face, removing the tree's pith (the central section); leaving this bit in results in radial cracks or splits, ruining the spoon. Next I hew away the bark side so I can see where I'm going.

One big departure for me from joinery work is the pencil; I use one on spoons, never on furniture. I sketch the top view on the bark side, then make relief cuts where the handle meets the spoon's bowl. These are either sawn or chopped with my hatchet. Now I can chop down the handle's outline without risk of hitting the end grain of the bowl and splitting it.

When using the hatchet, grip and posture are critical. I set the spoon on a clean stump (sometimes called a chopping block) that's between knee and waist high. Hold the spoon on the far side of the stump and start chopping near the bottom of the spoon's handle. Make light relief cuts, breaking the fibers toward your outline. Work your way up the spoon's handle, but stop a good ways from your off-hand that's gripping the wood.

I'm right-handed and keep my feet spread apart with my right leg dropped down behind me. That way an errant blow from the hatchet doesn't glance off the stump into my leg. Having the proper stance also brings you better balance and more power in your hatchet strokes.

To shape the outside of the bowl, it's best to support the spoon on the edge of the chopping block. Jögge showed me how he creates a notch in the edge of the block to nest the spoon into while hewing this shape. The notch allows you to hew accurately, and it makes a stop for the hatchet. The tool's edge bottoms out on the block before cutting too far on the spoon.

Knife work is where all the refinement of shapes comes into play. There are numerous "grasps," as Wille and Jögge termed them, that allow great power in the knife work. These are designed and practiced so that the knife is slicing the wood with tremendous accuracy and power, but the grips, postures and movements also feature a "stop" for the knife, so that it only cuts what you want to cut – the spoon, not you.

Safety stance. *To keep your hands out of harm's way, work at the proper height with the cut angled away from your body and into the chopping block.*

Built-in stop. *A notch in your block gives you more control over detail chopping work.*

First grasp. *Wrist and elbow are locked for the powerful first strokes with the knife. The motion comes from the shoulder. Note how the work is pointing away from all body parts.*

Handle First

The first knife stroke for the handle is a powerful one, used to slice long and generous shavings off the spoon. Hold the knife with your wrist and elbow straight and locked. The movement comes from your upper body and shoulder. Raise your shoulder up as high as it goes, and with the knife engaging the wood at the butt, make a downward thrust while slicing toward the knife's tip. This stroke has no stop, so you need to position yourself and the wood in such a way that the knife travels down beside or between your legs. Make sure there is nothing in the knife's path.

Another useful grasp is the one Wille calls the "chest lever grip." I'm right-handed, so I hold the knife in my right hand, blade pointed out. The spoon in my left hand mirrors the position of the knife. To start the cut, the knuckles on each hand are against my chest and my forefingers bump up against each other. The knife slices as I pull my hands apart, with the action coming from my upper chest and back. The cut ends with my elbows sticking straight out and the knife and spoon have both moved out and away from each other.

> "A three-dimensional object isn't just a picture. It's an infinite number of pictures, and all of the pictures must find harmony within the object."
>
> —*Wille Sundqvist, "Swedish Carving Techniques"*

'Chest lever grip.' *This shows another way to make the first cuts; again, the action comes from the chest and back, not the arms.*

Both of the above cuts end in space; there is no stop for the knife. Other cuts have a built-in stop to keep things safe. One of my most-used cuts draws the knife toward my chest, with the spoon held against my sternum. I begin the cut with my forearms held close to my body; the movement is fairly short. The knife cuts from butt to tip as I draw it toward me. The stop is when my right hand bumps up against my chest. As before, it's a slicing motion.

Body stop. *When my dominant hand (the right) hits my chest, the slicing motion stops.*

Sometimes my off-hand applies pressure on the knife's spine, helping to guide and drive the tool's edge in cutting. In one version of this grasp, I press the spoon against my chest with my left thumb and forefinger, while the other fingers push against my right hand to help slide the knife along its travel. Both forearms are braced against my body. The length of this cut is not great, but it is excellent for defining shapes of both the handle and the bowl.

A related grip I frequently use has the knife pointed away from me and my left thumb helps guide the tool. At the beginning of the cut, my left thumb is extended almost as far as it can be and is pushing on the knife handle right above the blade. The cut begins at the tip, and moves toward the hilt/butt as the knife slices into the cut. The stop is when the knife handle bumps into the spoon.

A Philosophical Stem

The spoon's design employs the wood's strength to great advantage. Think of it as having three parts: the bowl, the handle and the stem that joins the two. The deepest part of the bowl is also the widest in most examples. The stem is narrow where it meets the bowl, there-

Thumb guide. *This cut slices at an angle across the work, stopping when the hilt hits the work.*

A subtle 'S.' *Each spoon is a slightly different shape, but I usually aim for a gentle curve.*

fore it is deep to give it the strength it needs. It can be carved in the shape of a rib that hugs the bottom of the spoon's bowl.

As the stem flows into the handle, it thins out to fit your fingers better. So then you make it wider, both for comfort and for appearance. Just as the handle reaches its end, it can gain a bit of thickness. Carved finials are a pleasing touch at the end.

As I work the spoons, I think of the shapes as a series of bevels flowing one into another. I also try to focus on curves, some slight, some more pronounced (see the opening photo and the photo above for a variety of shapes).

A spoon that has too many flat places in it looks and feels lifeless. Because you hold it as you carve, it is easy to shift the spoon around for a different view. This is critical because the design has to work from all angles and from the hand as well as the eye. Cut a little, look a lot.

I try to make the side view with something of an S-shape to it. Sometimes the wood helps guide you, other times you have to make it happen. I aim for a bit of a lift right at the front end of the bowl, then a curve under the deepest part that then sweeps up toward the handle. The end of the handle can either sweep back down a bit, or take one last lift upwards again. You get to try lots of variations.

Now the Bowl

To shape the inside of the spoon's bowl, you can use a hook knife or the gouge. For my first spoons, I hollowed the bowl with a gouge (mine has a No. 8 sweep in the Swiss-made numbering system). Just as with the straight knife, you want to use your body and hands in such a way that you can cut efficiently, without having the tool's edge land in your flesh.

Gouge. *A gouge works and is a great way to start. But if you get hooked on spoon carving, consider getting a hooked knife.*

With the spoon in my left hand, I hold the gouge in my right, way down on the tool's shank. The heel of my right hand presses against the edge of the spoon blank; my left thumb reaches across the spoon to brace my right hand.

The action is a pivoting motion from the heel of my right hand. The gouge travels a very short distance. The cutting is across the bowl's face.

Then along came the hook knife; it makes life so much easier than hollowing with a gouge. These tools come in many shapes; some are more rounded, others shallower. Hold it with your fingers. Tuck it against your palm, and your thumb provides the leverage to pull the tool into the cut. The knife slices across the bowl most often, except when you are refining some shapes. These tools come in left- and right-handed versions. I mostly use the righty, but there are places and times when the left-handed version is helpful.

I try to do most of the general shaping when the wood is still very green – so at this stage the cuts leave a bit of a fuzzy surface. Next, let the spoon dry then take your final strokes with extremely sharp knives to give the work a fine-finished texture. Some carvers aim for a tooled finish while others use sandpaper, especially on the inside of the spoon's bowl.

When you're done, apply a finish. I use food-grade flax oil. I soak my spoons in it for a few days, wipe off the excess then bring my hand-carved utensils to the table.

Across the bowl. *A hooked knife gives you precise control as you shape the bowl.*

Spoon-fed Revolution

To me, spoon carving is a revolutionary act. It helps cut through the mass-produced cheap culture that we have absorbed like zombies. It's such a simple household implement, taken to extraordinary heights. Why shouldn't our most basic kitchen stuff be beautiful? Out with plastic! I always think of Bill Coperthwaite's line from "A Handmade Life: Search for Simplicity:"

"I want to live in a world where people are intoxicated with the joy of making things." Me, too. **PWM**

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

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun14**

VIDEO: *"The Spoon, the Bowl and the Knife," a documentary about Swedish craftsman Wille Sundqvist.*

BLOG: *Read Peter Follansbee's blog, Joiner's Notes.*

TO BUY: *"Swedish Carving Techniques" by Wille Sundqvist (Taunton).*

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Reeds & Leaves

BY CHUCK BENDER

Design and build a Wharton Esherick-inspired stool.

Looking at Wharton Esherick's furniture, it's easy to see how he brought nature into his designs. I'm not talking about how he simply carved abstract turkey buzzards on the front of an Arts & Crafts-style desk, but how, once he began to view furniture as sculpture, the pieces themselves abstractly represented natural elements.

Like many studio woodworkers, Esherick developed one product that kept the cash flowing. In Esherick's case that was his famous three-legged stool. He made them from scraps of figured material laying about the shop, making each random in shape and size. Esherick sculpted the seats while shop apprentices turned the legs and did the joinery.

The design of the stools is simple – slender legs with a light, draping seat floating atop. When I look at the stools, I am reminded of reeds or rushes by a pond in fall; the willowy reeds stretch upward supporting a fallen leaf. This is the imagery I hope I've captured in my interpretation.

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATION BY ROBERT W. LANG

Pattern seating. *Choosing your figure and grain direction is crucial for a sturdy stool. The nails in the pattern help locate the center of the leg holes.*

Rough cut. *Careful placement of the pattern allows the seat to be defect-free. The band saw makes short work of roughing out the seat blank.*

Time to Design

For a period furniture maker, the hardest part of tackling a project that's inspired by an existing piece is resisting the urge to simply copy it. That goes double for a project that isn't of a period design.

I began with a general concept in mind: a three-legged stool with a low back that would work as seating at my kitchen counter. As the opening photo shows, the concept changed slightly. The final version of the stool came about after much deliberation, contemplation and plain old fear.

Esherick had it easy. His stools had three legs, and the seats were generally small. They played perfectly into his love of asymmetry.

Whenever you add a back to any type of seating furniture, the first thing you need to do is increase the size of the seat. If you don't, the surface area will be too small when used for its intended purpose. Also, there might be too little material to support the back if the seat is too small.

For my larger seat, I bypassed the scrap bin and grabbed a board that was about 10½" wide and some plywood for a pattern. I then started sketching out an asymmetrical seat. My seat demanded a fourth leg; the legs and stretchers mimic those on Esherick's stools. My intent was to design and build something he might have actually made.

Time to Choose

With a basic pattern in hand, it's time to look at the figure in the board and decide from which part to cut the seat.

Consider a few things when selecting your material. Figure is of paramount concern when making something this simple in design. Make sure it gives the piece a sense of visual balance, while not being overwhelming.

Once you've decided on the figure, look at the grain structure of the board. The more figured the board, the less stable and strong the seat will be. At one end I had an off-center crotch. In the middle, the grain was fairly straight, but there was some curl. At the other end, the board had a knot and some good curl: I chose the knotty end.

The crotch end of the board would have made a more spectacular seat, but because it was off-center, one of the holes for a leg would have passed right through a section where the grain direction was almost vertical, making it too weak for a leg joint.

The middle of the board was just too plain for my taste. By staying off the knot, I got a seat with interesting figure that is structurally sound.

After laying out and cutting the seat, I turned back to the pattern to figure out leg-hole placement. The holes need to be in far enough from the edge of the seat so as not to weaken the board, but not so far that they end up too close together. I made the holes in the seat asymmetrical in keeping with Esherick's style.

Once you have the leg holes marked, drive a small finish nail through the plywood pattern at the center of each location. Align the pattern on the bottom of the seat blank and tap the nails to mark the center of the legs.

Time to Drill

By drilling the holes prior to shaping the seat or turning the legs, you'll find the ¾" holes easier to drill, and you'll be able to test-fit the tops of the legs as you turn them.

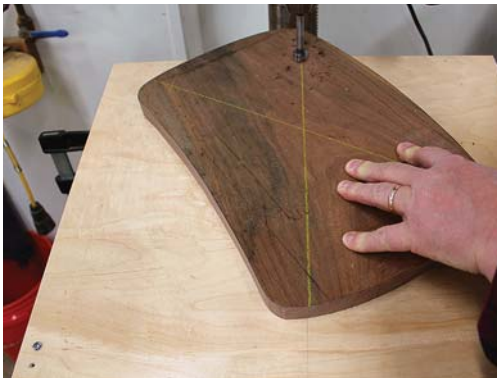
The angles on Esherick's stool legs varied quite a bit. Some were more vertical while others splayed outward to give the stool a greater sense of drama. In choosing the angles for my stool, I used a few offcut sticks, cut to the approximate height of the stool. With the seat inverted on my bench I held the sticks at an angle that suited my eye.

In order to drill the holes in the seat blank, there has to be a way of referencing the blank to get the legs splaying at relatively the same angle. Esherick may have eschewed symmetry, but having the legs on the stool splay at four different angles would have been a bit much, even for him.

I made a simple jig for the drill press from two pieces of plywood and a scrap of 2x4. By placing the scrap between the plywood along one edge, you create an auxiliary table that tilts toward the front of the drill press. If you like more or less splay on your stool's legs, modify the size of the spacer.

Mark a centerline that divides the slope into left and right halves. This is the line you use to set the orientation of the seat to keep the angles consistent on all four legs. Align the centerline with the drill bit on the press then clamp the jig in place.

Draw diagonal lines across the bottom of the seat through the centers of the leg holes. Now you merely have



Angle drill. *Using a shop-made jig, the leg holes are easily bored at the selected angle.*

Layout sticks in action. *After turning the leg blank to a 1¼"-diameter cylinder, use the layout stick to plot the top and bottom, and the middle of the swelled part of the leg.*

Wrench it up. *A fairly simple turning trick to get consistent sizes is to use a wrench as a caliper.*

to line up the center marks with the drill bit and the diagonal line with the centerline on the jig and drill away.

Time to Turn

Esherick made many legs from hickory, oak and ash, but I didn't limit myself to his choices. I've always liked the strong contrast of maple – particularly when it's curly – and walnut (which happened to have been Esherick's favorite wood). If you have other woods that you favor, use them. Just remember: When choosing a species for your legs, make sure that it can stand up to flexing under the weight of an occupant and to the abrasion of actually being dragged across a floor.

Turning the legs is a fairly simple process. Begin with a quick layout stick to ensure all your legs come out the same size. The stick doesn't have to be much more than a scrap cut a little longer than the final leg length, with hash marks showing the top, bottom and middle of the swelled area (on mine, that's 6½" from the bottom).

The only other sizes you need to determine are the final diameters at each of the three points on your stick. On my stool the top of the leg is ¾", the bottom is ⅞" and the middle of the swell is 1¼" in diameter.

> "The beautiful thing about learning is that no one can take it away from you."
>
> —B.B. King (1925), Musician

Skewed turning. *Work from the largest diameter towards the smaller diameters when turning. This is particularly important when turning the slender tenons on the stretchers.*

Once the blanks are sawn to size, mark the centers on the ends and chuck them in the lathe. I usually make my blanks about 1/16" oversized in thickness and width to give me a little wiggle room in case my stock warps or I don't get things perfectly centered.

Start by turning the entire blank to a 1¼"-diameter cylinder. Hold the layout stick to the cylinder and transfer the hash marks. Using open-end wrenches of the appropriate size as calipers, turn the ends down to the proper diameters. All that's left is to flow from the middle of the swell out to the ends.

To get all four legs approximately the same size, I turned the first to size and shape then used it as a reference as I turned the remaining legs. I still transfer all the marks from the layout stick, but the comparison ensures I'm not making the subsequent legs larger or smaller in diameter. Just like using the layout stick to mark all the important points on the leg, using the first turned leg gives you a single benchmark from which to work.

Time to Stretch

With the legs turned, it's time to dry-fit them in the seat, and to figure out the angles and placement of the stretcher holes. I've spaced the stretchers 1" above and below the swell centerline.

To figure out the angles use more scraps. Because the front stretcher acts as a footrest, I positioned it (and the back stretcher) below the centerline.

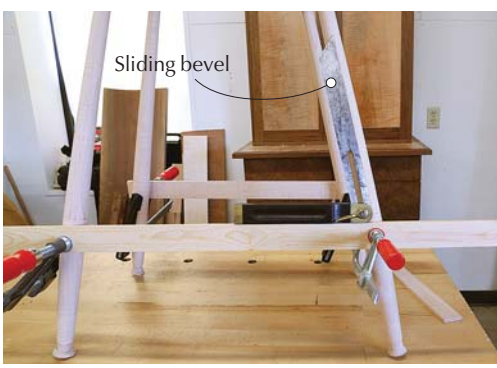
Clamp the scraps to the legs referencing off the stretcher lines. Use a sliding bevel to approximate the angle, and check that the left and right sides are the same. Transfer the angles to a layout stick and label them so you don't get confused later.

The side-stretcher angles are measured the same way. Because my seat is rectangular, the stretcher angles on the sides are different than on the front and back. Pay attention when drilling the holes because the legs are handed.

With the scrap boards clamped in place, take the rough measurements for the stretcher lengths. On my stool the side stretchers are of equal length while the front stretcher is longer than the back.

Once you have the lengths calculated, turn the stretchers. I made mine overlong and made sure the ends were ⅝" in diameter over the last 2½".

To drill the holes at the proper angle on the drill press, you need a way to hold them consistently. I made a simple



Angle it. *Clamp scraps to the dry-assembled base and set a bevel to the centerline of the leg. This will be the angle at which you will drill the holes for the stretchers.*

Double drill. *Making a jig to drill the stretcher holes can be easily done with a small piece of 2x4. Drill a 1¼" hole from both sides then rip the piece to 11/16" thick to create a trough in which to place the leg for drilling.*

Tilted drilling. *Tilt the drill press table to the proper angle using an angle layout stick.*

First angle. *With the drill bit centered on the jig, drill the front and back stretcher holes.*

Side angle. *After tilting the drill press table to the second angle, insert a stretcher into the hole in the leg, place the assembly in the jig and drill the side-stretcher holes through the legs. You'll need to drill two legs with the table tilted left and two with it tilted right.*

jig from a 2x4 offcut. On both ends measure and draw a center mark 1" off the back face and centered on the width. Set up a 1¼" Forstner bit in the drill press. Clamp the piece into a handscrew and drill from both ends until the holes meet in the middle. The handscrew ensures the piece is held perpendicular to the table and provides a safe way to drill the deep holes.

With the hole bored all the way through the 2x4, rip the piece to 11/16" thick, referencing off the back face. This makes a jig that cradles the legs and allows a stretcher to be inserted in order to drill the second hole perpendicular to the first, and it helps minimize tear-out as the drill bit exits the leg.

Chuck a ⅝" drill bit into the press and use the layout stick to set the angles. Center the jig under the bit and drill the first holes through the legs. Insert a stretcher into the holes and readjust the table to the proper angle. Make sure the jig is still centered. Now drill the second hole in each leg. Complete the holes on all legs.

Time to Grind

It's time to shape the seat. This can be done with hand tools, power tools or a combination. I chose to use a combination.

I began by sketching a rectangular shape that encompasses all four leg holes. This represents the transition point from concave to convex shape.

The seat is dished out about ¼" deep. If you plan on making multiples of the same stool – not very Esherick-like, but I can understand the need – you may want to use a Forstner bit to drill some depth guides so you are consistent; otherwise, dive in.

I set up a mini-grinder to hog out the bulk of the waste on the seat. You could also use a scorp and round spokeshave to accomplish the same.

After roughing out the dished area of the seat, I moved to rounding off the outer edge. The idea is to give the seat a drooping appearance.

To lighten the look of the seat, the underside is chamfered. To achieve the natural drooping-leaf appearance, the chamfers arch toward the top, following the shape created when rounding off the outside edge of the seat. The more you chamfer under the seat, the thinner the look; just don't go too far or you'll start to reduce the material surrounding the legs. For this work, I use spokeshaves.

Once the seat is roughed in on both top and bottom, I switch to a sander to smooth out all the bumps. I then round all the edges with a spokeshave, but you can also do this with a sander or grinder. Don't bother to take the seat to final smoothness. There will be cleanup to do after the stool is assembled.

Grind it out. *Attach the seat topside up to a stick with a couple of screws through it. This allows you to secure the work in a vise for grinding and shaping with hand tools.*

Time to Glue

Dry-fit the entire stool one last time. This allows you to cut off legs or stretchers that are just far too long. You want them to protrude through the joints but not so far that you can use them for hanging plants.

At this point, mark how the wedges will be inserted into the joints. I also

THE DESIGN PROCESS

Designing a Wharton Esherick-style stool started long before I milled any lumber or made a sketch. It began with a concept. But how one turns a concept into reality is something of a mystery to many. Most folks begin with a plan, perhaps from a book or magazine, that may or may not have a cutlist. The key thing is that it's something tangible. Many never take the leap of making something that only exists in their head.

While Esherick stools don't exist only in my head, I didn't have access to one of his stools or to measured drawings; I had photos and a concept. For me, the design process usually starts with a layout stick but this project doesn't work well with section drawings. Without knowing the leg angles, SketchUp wasn't the optimal choice, either. While I tried a couple of rough perspective sketches, a mock-up seemed in order.

My first concept kept Esherick's three legs. But because my original thought included a back on the stool, I started sketching out a larger, squarish seat rather than his more triangular, rounded look so there would be room to sit on the stool once it was done. I also wanted to be sure to capture Esherick's sense of lightness.

My first seat had arched sides and arched around the back to accommodate a curved crest rail; it resembled a stylized Windsor D-shaped seat. Using 8/4 poplar, I hacked out a seat, turned three legs and drilled holes. With the first mock-up dry-assembled, it was easy to see that something wasn't right. The top was heavy, the legs looked spindly and I still had to figure out a back. A new design was in order.

I first had to lighten the look of the seat. I narrowed the depth of the pattern but kept it rectangular to give me enough width to include a back. As the seat narrowed, it was evident that the stool needed a fourth leg. It wouldn't otherwise be stable. I grabbed more poplar, hacked out another seat, turned an additional leg, drilled more holes and roughed out a seat. The new mock-up had the lightness and balance I was looking for, but left me wondering about the addition of a back.

At this point, it was best to jump into the real project. This allowed me to refine the majority of the stool and gave me more time to think about the back design. As the project took shape, the reality of adding a back continued to disappear. The more I worked on it and the more I looked at the light appearance, it became clear that adding a low back would do little to improve the design; it would make the seat appear clunky.

Inspiration. *This is Wharton Esherick's bread-and-butter stool.*

If you have a project idea, you might just have to jump in and give things a try. Sometimes your standard method of work just won't cut it when you're trying to work out a design.

You don't have to work out the problems on your good lumber. Don't be afraid to grab cheap scrap material and start hacking away.

You don't need to be exact nor do you need to work to final finish to get an idea of what works and what doesn't about a design. And you don't need to get stuck in one track or the other. If part of the project can be dealt with using a layout stick or SketchUp drawing, and another part using a foam or a wooden mock-up, you need to dive in and give it a try. Your design, as well as your woodworking skills, will benefit from the experience. — CB

Dry-fit. *Rough assemble the stool and trim the tenons close so the wedge placement can be marked.*

take the time to mark each part so they go back in the same places during final assembly.

Disassemble the stool and cut kerfs into all the legs and stretchers for wedges. Often, I'll do this with a dovetail saw if there aren't too many, or at the band saw if I have more. Just don't cut the kerfs too deep or you'll see them on the insides of the joints after assembly.

Esherick typically used wedge material of the same color, but I wanted more contrast; I used walnut. At the band saw, make a series of wedge-shape cuts into a scrap, then cut them off in groups. Don't worry at this point if the wedges are too wide for the joints; they can be trimmed just before insertion.

Use a leg and stretcher to mark off the width of the wedges. Using an offcut as a cutting board, trim each wedge to width with a sharp chisel. A touch of glue on the tip of each wedge ensures it stays in place once driven home.

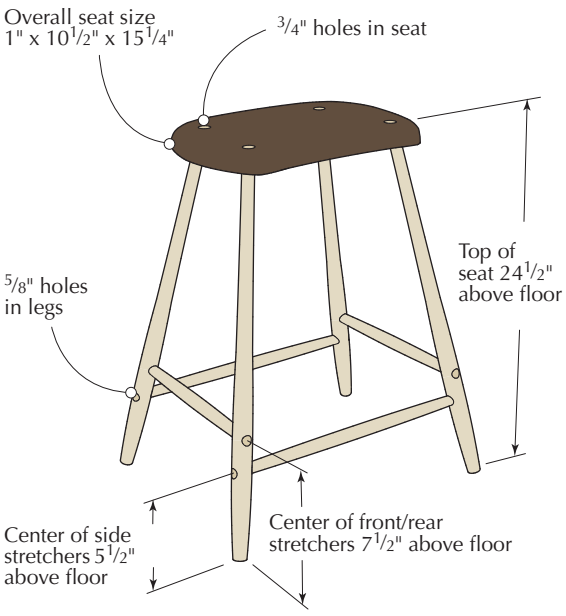
Using a small acid brush, glue each joint and begin by assembling the base. Next, glue the leg-to-seat joints. Tap the seat into place, checking to make sure it remains parallel to the floor. This is easily done by measuring to the flat part of the seat's underside and adjusting until you get the same measurement.

Install the wedges, then use a file, chisel or sander to trim the joints flush and flow them into the legs and seat.

Esherick-style Stool

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Seat	1	10 1/2	15 1/4	Walnut
❑ 4	Legs	1 1/4	1 1/4	26	Maple
❑ 1	Front stretcher	1 1/4	1 1/4	18 5/8*	Maple
❑ 1	Back stretcher	1 1/4	1 1/4	18*	Maple
❑ 2	Side stretchers	1 1/4	1 1/4	13 1/4*	Maple

*Add 2" to length for turning



Wedge it. *Taking time to mark the placement and orientation of each wedge will save frustration later.*

Walnut wedges. *At the band saw, cut wedges from a scrap.*

Split wedge. *Using the stretchers and legs as a pattern, it's easy to trim the wedges to final width.*

Time to Back Out

When my stool was fully assembled, I looked at the overall appearance. It had achieved all the goals I set forth at the beginning of the project: It was light in appearance and harkened back to Esherick's own stools.

The concern at this point was how a back would change the balance. The seat was larger than many of Esherick's stools, but still on the small size for a seating piece with a back.

After mocking up a few different versions, some taller and others shorter, I decided a back was only going to make the stool look clunky and heavy. So I dropped it.

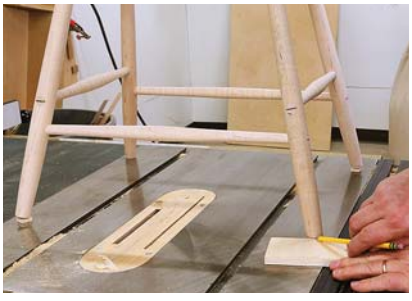
All that remained was leveling and finish prep. I placed the stool on the table saw and made shims to temporarily level it. Using a 1/2" scrap of plywood, I scribed around all four legs and trimmed them off with a handsaw at the bench. If your stool still doesn't sit perfectly level, a little fiddling with a chisel or rasp makes short work of that.

Time to Finish

Finishing in the Esherick style isn't very difficult at all; he used tung oil.

After sanding the entire stool to #180-grit, I rubbed on a few coats of tung oil and allowed it to fully cure between coats. I also lightly sanded between coats with #320-grit sandpaper and wiped the entire stool down with a tack cloth prior to subsequent coats. At the end, I used #0000 steel wool to rub out the finish then applied a light coat of paste wax. The wax isn't necessary on an oil finish, but it leaves the surfaces smooth and tactile.

Not only were Esherick's stools and other pieces very touchable, they were fluid. It's that fluidity that I sought in my stool. I even found it in the design process. Stepping outside my regular sphere of work helped me remember not to get locked into one train of thought or one method of work. Sometimes it's liberating to go where the work and the wood take you. **PWM**



Level it. *Shim the stool on a level surface and use a scrap of plywood to scribe all four legs. Saw to the lines and it might just be perfect the first time.*

Chuck is senior editor of this magazine and can be reached at chuck.bender@fwmedia.com.

ONLINE EXTRAS

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ARTICLE: *Read more about Wharton Esherick in an article from the June 2013 issue.*

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Inside & out. *An X-ray reveals the tangs inside oval-bolstered mortise chisels.*

Get a Handle on Mortise Chisels

BY WILLARD ANDERSON WITH PETER ROSS

Period tools provide an opportunity for study – and for rehandling.

Mortise chisels get a lot of heavy use – and sometimes abuse. Over the years, I've collected a number of chisels without handles and with seriously damaged handles. These chisels are so well designed for their job, but not so readily available, that it behooves us to bring them back to full functional status.

I've made detailed measurements on about 50 chisels (including a modern tool by Ray Iles), looking primarily at the amount of taper in the handle, how regular the handle taper is, how long the handles are and how many of the chisels have significant relief front to back in the shaft.

A Bit of Background

Historically, mortise chisels were offered in two grades. The less expensive, called "Mortise Chisels," came with octagonal bolsters, while a better grade, called "Best Joiner's Mortise Chisels," were made with oval bolsters.

Early pattern books such as Smith's Key (circa 1816) show these and their associated prices with the Best grade at almost twice the cost. Modern users tend to call these tools "Oval-Bolstered Mortise Chisels," or OBMC for short.

The chisels are characterized by a shaft that is thicker than it is wide, that is often relieved along the sides so that the chisel has a slight trapezoidal cross-section. This helps keep the chisel sides from binding as a mortise is deepened.

The chisel shaft also tapers front to back along its length so that it's thicker at the bolster. The tangs, which are of varying lengths, taper evenly to the bolster, and have a rectangular cross-

PHOTOS BY THE AUTHOR , EXCEPT WHERE NOTED;
ILLUSTRATIONS BY DANIEL T. PESSELL BASED ON THE AUTHOR'S DRAWINGS

section in the direction of the oval of the bolster.

The handles are oval in cross section, generally matching the major and minor diameters of the bolster, but also tapered along their length. Grasping the oval-shaped handle makes orienting the chisel square to the work easier.

The average handle length of those in my collection is 5¼", with no handles longer than 6" or shorter than 4¾". This length is approximately 1" longer than the average width of a man's hand. On average, the taper from the bolster to the top of the handle is ¼" per foot off the centerline in both dimensions (there was considerable variation among the chisels studied, however). In other words, a 6" handle would be ¼" wider in both dimensions at the top than at the bolster. (The chisel made by Ray Iles had the greatest taper – ⅜" per foot in both dimensions.)

How Mortise Chisels are Made

Most mortise chisels of the late 18th through mid-19th century were made in shops that specialized in edge tools. The octagonal and oval bolster shapes require special dies to produce clean forgings, even when production is by hand. The dies shape the bolster and the base of the tang only; the rest can be forged freehand. Without several sets of dies (for different chisel sizes), a general blacksmith cannot hope to achieve the efficiency and clean shape evident in surviving tools.

In general, these chisels are of laminated construction. That is, the bulk of the tool is made of wrought iron (which is soft and relatively inexpensive) with a small layer of high-carbon steel forge-welded along the cutting edge of the blade. The steel provides good edge-holding characteristics but is too expensive to have been used for the entire tool.

The performance of a chisel relies on its cutting edge, but the challenge in forging is the bolster.

There appear to me to have been two common methods. A few chisels were made from thick bar. The tang and blade were forged down to finished size, leaving a lump of the original bar to form the bolster. Most of my vintage tools, however, were made by wrapping a collar or ring around the bar and forge welding it solid. This provides the extra bolster material with less manual labor.

With either method the swell can be forged to the shape of the bolster, then the tang and blade can be shaped. The steel is welded on while the blank is oversized, then forged slightly large to allow for grinding later. The tang is forged freehand to finished size. With constant practice, the tools can be forged by eye to startling regularity.

After forging, the tool is hardened and tempered, filed and ground. The forging, filing and grinding are all done freehand by experienced workmen, so although the tools look uniform, they differ slightly in shape and size.

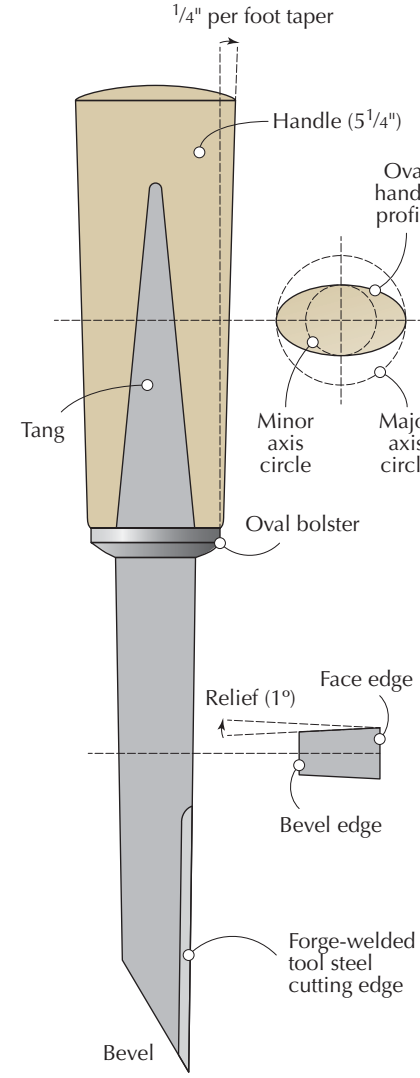
Naked steel. *Here are two vintage chisels – one with a handle, one without. Notice the shape of the tang and the oval bolster on the steel.*

Get a Grip

While it's certainly an option for re-handling a mortise chisel, chopping out a deep tapered mortise for the tang seems a daunting task (see the Online Extras for Derek Cohen's approach). My good friend Peter Ross (everyone needs a blacksmith friend) has an elegant solution to this problem – a technique that is useful for making handles for any tanged tool.

I have a dozen split or shattered handles, a number of which show a blackened interior surface commensurate with having been burned in. Part of the black color is probably due to iron staining, as the color appears to follow the grain lengthwise along some of the handles (see photos on page 50).

All of the handles show some evi-



MORTISE CHISEL – SECTION

Scorched remains. *The black coloring inside these broken handles provides evidence that the tangs were burned in to the wood.*

dence of having been drilled out, in some cases with two or three steps, with a jobber-type bit. Some of the handles were reamed out in the upper part of the mortise, with angled drill cuts leveraged against one edge of the mortise shoulder to work the opposite wall of the slot. One handle had a square bottom, possibly drilled with something like a nosing bit. Another was drilled with a long tapered bit, possibly a gimlet bit. I suspect that many or all of these handles were user-made replacements.

But I wanted to look at original handles, so I selected the ones shown in the opening photos as the most likely candidates.

The X-rays were shot by my local veterinarian, who has a state-of-the art digital setup, which allowed moderation of the contrast between the wood and the metal so that details of the mortise can be seen.

The chisel at bottom left in the opening photos is a modern one manufactured by Ray Iles; it has a square post that's compression-fit into a straight-sided drilled mortise. The top right chisel is one that Peter and I re-handled some time ago. In all of these, there is evidence of drilling or stepped drilling, or the tang appears to fit perfectly against the wood with no apparent gaps except for a drill hole (I suspect those were drilled a bit short with a fine bit, then burned to full length).

While it's a bit difficult to generalize from this limited survey, Peter and I believe that original handles were drilled to the full length of the tang, and possibly a bit longer, often with a series of holes of increasing diameters. The mortises were then burned in with a "burner" tang and the chisel tang fitted precisely to this hole by various means (chisels and rasps).

I suspect that if a handle was broken, a user was likely to resort to the "quick and dirty" method of drilling and reaming out the mortise, then chopping with narrow chisels to fit the chisel tang, followed by shaping the handle by hand.

Workflow Choices

Before we move on to re-handling, let's look at three possible work sequences.

1. Burn then shape by hand. Burn in and fit the tang in rough stock, then shape the oval profile by hand. The advantage of this method is that misalignment of the handle on the burner tang during burning can be easily corrected; also the handle can be precisely dimensioned to the oval bolster.

The disadvantage of this method is that it is a more time-consuming process, and any variation in grain on the handle makes shaping more difficult.

2. Turn then burn. Drill a set of stepped pilot holes, turn the handle to an oval shape, then burn in the mortise and fit the tang to the mortise.

The advantage of this method is that it can be quicker than hand shaping and more reproducible for making multiples.

The disadvantage is that any misalignment during burning cannot be corrected. Plus, the pilot hole at the bolster end of the handle can interfere with chucking the handle stock for turning.

3. Burn then turn. Drill a set of stepped pilot holes, burn the mortise in the rough stock, fit the chisel tang to the mortise, then turn the oval profile on the lathe.

The advantage of this method is that the most fraught step (burning) is done first, and any misalignment of the tang in the square stock can be compensated for when laying out the oval shape prior to turning.

The disadvantage is that the large burned mortise will interfere with the placement of the two offset points on the tail stock end.

The reality is that burning-in requires some skill, and if the handle is already shaped, your options are limited. For this reason, we will focus on the first and last options.

Stock Preparation

I used straight-grained American and European beech because these seem to be the most traditional wood for tool handles. Oak and other coarser-grained hardwoods (hickory or ash) clearly have been used. I suspect that maple or birch would make a great handle. The most important factor is to use riven wood, or to cut your stock so that the grain runs true on adjacent faces.

For turning blanks, an argument could be made for using square billets because the first step in making an oval handle is to turn a tapering cylinder. The beech, however, is hard to come by, so I dimensioned the stock to be just a bit thicker in each dimension than the major and minor axes of the handle. This saves wood, though turning it involves a tad more skill.

The blanks are 6" long. This allows me to chuck the stock for drilling the pilot holes and to eventually part off at the headstock to complete the handle and get a good, clean crown.

Find the center at both ends of the stock, and then lay out intersecting lines that define the minor and major axis of the handle.

Drill the first pilot hole in the blank to the length of the tang. I used a 3/16", 6"-long jobber bit to do this. The 1/8" bit is just too fine for a deep hole. The second (stepped hole) is half the length of the tang and the diameter of the bit is equal to the narrowest dimension of the tang at that point. For the chisel we used here, we drilled a 3/16" hole 3 1/2" deep and a 5/16" hole 1 3/4" deep. For hand shaping, I cut the blank to final length (5 1/4") after the pilot hole(s) were drilled.

Burning-in Process

It's not a good idea to use the actual chisel to do the burning, because heating the tang enough to do the job will likely deform the chisel blade and soften the steel laminate, leaving you with a seriously diminished tool.

The first step is to produce a full-size mock-up of the chisel tang. We'll use this expendable "burner" to burn out the hole. The important thing is to make a good copy of the tang with the same taper, cross section and length. You can do this by sawing, grinding, filing, or machining. With moderate forging skills it should take only a few minutes to hammer out a very close mockup. (Mild steel is a good material for this purpose.)

It's almost impossible to push hot iron into a solid piece of wood, but a pilot hole makes it nearly effortless. The handle is drilled to the same depth as the finished mortise. The burner is heated to glowing red or even orange (approximately 1,500°F-1,800°F). While Peter used his forge, you can also heat the burner with an oxy-acetylene torch. (Smaller propane torches won't produce enough heat.)

Quickly push the glowing steel into the pilot hole. As it burns the hole to size, the burner cools and progress stops. You may find that it takes two or three re-heatings and pushes to get to full depth; after each push, check that the burner is tracking correctly. It's easy for the burner to work more on one side of the centerline and small corrections are usually necessary with each new push (you can correct twist or off-center orientation if you catch it early).

With each check, assess the size of the hole. If you see the large end of the hole is approaching target size, don't get the burner hot in that area the next time; heat only the section of the burner that needs to keep working.

It's easy to burn the hole too large. The best practice is to stop burning when the chisel tang snugs up 1/4" or 3/8" before the handle seats on the bolster. It won't damage the chisel to use it to test the fit it in the hole during the burning process.

As you test the fit of the tang, it's important to make a reference mark on the bolster and a matching mark on the small end of the handle to keep track of

> "When you do common things in life in an uncommon way, you will command the attention of the world."
>
> —*George Washington Carver (1864-1943), American educator & inventor*

BURN TO FIT

Smith. *Peter Ross shapes the "burner" tang at his anvil (if you're smithless, you can shape your burner by sawing, grinding and filing).*

Burner. *Here's the finished burner.*

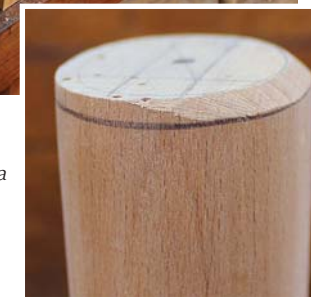
Burn. *Peter inserts the heated burner into the pilot hole.*

And test. *With the hole burned out, I test the fit of the chisel tang.*

PHOTOS THIS PAGE BY ROY UNDERHILL

Handle gauge. *This shop-made layout jig keeps my lines centered off the chisel's shaft.*

Shaping setup. *My clamp for this sort of work resembles a lathe's headstock and tailstock. It holds the work securely as I shape the oval handle with a drawknife, block plane and spokeshave.*



Crown. *A crown about 1/8" down from to top of the handle adds good looks and comfort.*

the orientation. Fit the tang so that it's tight to about a skinny 1/8" shy of the bolster. This allows you to see that the handle will seat square to the bolster and eventually allow the handle to be driven onto the tang without splitting the wood.

Layout & Hand-shape

Because the chisel shaft is tapered along its length and heaviest at the bolster, it's important to lay out the handle's oval shape at the crown so that it is in line with the mass of the chisel. I made a layout jig that I can easily reference against each face of the shaft of the chisel, and trace a series of lines up to the crown.

This allows me to lay out a rectangle on the crown that is directly centered on the chisel shaft, and corrects for any twist in the mortise during the burning in. Make a cardboard template of the oval shape and align it to your rectangle and trace around it. Then draw a larger oval, adding 1/8" to the diameter in all dimensions. Remove the handle from the chisel.

To fair the shape, clamp the handle between a pair of dog hole-seated heads, much like the headstock and tail stock of a lathe. (This design was copied from a similar device I saw at Colonial Williamsburg many years ago.)

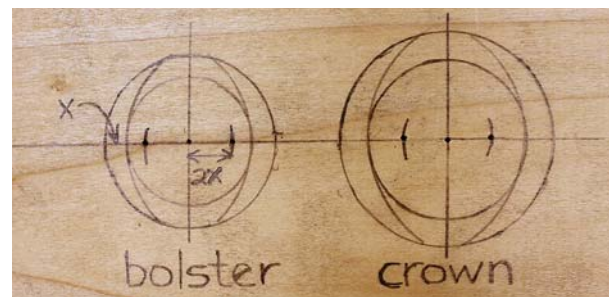
I use a drawknife, block plane and spokeshave to reduce the stock in a series of finer polygons until I achieve an evenly tapered oval handle.

The handle is driven onto the tang with a mallet blow.

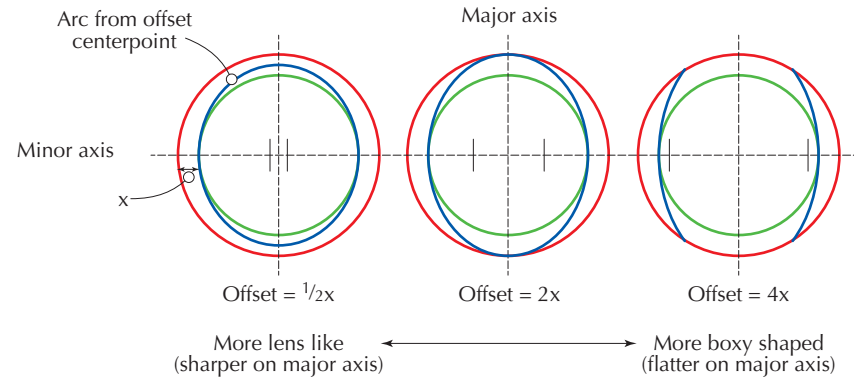
Lay out the crown by scribing a light line 1/8" down from the end of the handle. Rasp and sand from the line to the center of the oval to make a smooth crown when viewed from several directions.

Offset Turning

Offset turning is a technique that allows you to turn oval shapes – but it can be hazardous. It is critical to position your tool rest carefully and to have good tool control at all times. During this process, the stock will be seriously out of balance, so you need to carefully adjust the balance between speed of the lathe and stability of the piece between the chucks. Eye and face protection



Layout. *Use a compass to draw two concentric circles on each end of the handle (shown here on a piece of scrap).*



are necessary. You also need to know exactly where your fingers are at all times. With a piece of similar stock, do a "dry run" first to get a feel for the setup.

An oval can be said to be the synthesis of two circles, one based on the major axis of the oval and the other on the minor axis. For these chisels, the two axis dimensions are taken from the widest and narrowest dimensions of the bolster. At the crown of the handle, these circles are about 1/4" greater in diameter to account for the taper.

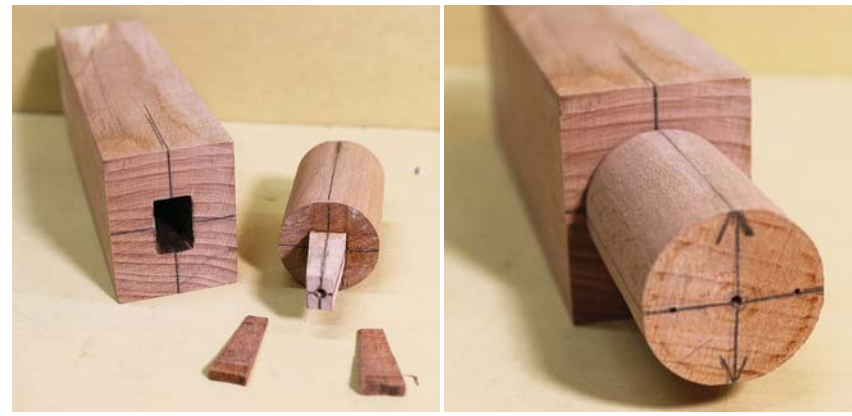
Lay out these circles concentrically on a piece of scrap stock using a compass.

A pair of off-center "centers" will be laid out along the minor axis of the turning stock. The exact position of these offset centers is determined by what the final shape of the oval is to be. The critical dimension to keep track of is the difference in diameters of the two circles (x in the illustration on page 52). The red and green circles in the illustration represent the major and minor axis circles, respectively, and the series of blue arcs represent how the oval shape will come out after being turned and faired out to the major axis.

The offsets are some fraction or multiple of x. If you make x a small fraction (1/2 x is shown), the offsets will be slight and the oval will have a more lens-like shape; it will be faired to the major axis. As you use a larger value for x (multiples of two and four are shown), the handle oval tends towards boxy. In general, setting the offset to be one and a half to two times the diameter difference is a good place to start.

You can get a general idea of the oval shape by setting one limb of a compass on one of the offsets, adjusting the other limb to the far diameter of the smaller circle and scribing an arc. Repeat this process from the other offset. You'll see that the arcs somewhat determine an oval. It is clear that at the two ends of the major axis, some shaping (sanding, spokeshave or scraper) will need to be done to fair out the oval shape to merge with the major axis.

The large rectangular mortise presents a problem for chucking the handle in the lathe for offset turning because the hole is larger than the location of the offset centers. I made a chuck device to solve this problem.



Chuck up. *The tapered tenon on this turning jig fits into the mortise burned into the workpiece; the wedges secure it in place. On the round end, mark your centerpoints and offset centers.*

I mortised a piece of square stock (the size of the smaller dimension of the burned hole) 1" deep into the end grain of a 2"-long billet and glued it in. Be sure to lay out centerlines from each face of the billet and the square stock so that these can be aligned when mortising them together. I then turned the device to the minor diameter of the bolster, and cut the tenon off to about an inch. Relieve each face of the tenon that is parallel to the major axis until the device slides into the mortise. To lock this device into the mortise, cut two small wedges to fill in the long axis of the mortise, and press the handle down onto the tenon and wedges. This will lock the handle in place. You can reuse this device for any mortise with the same narrow width.

Lay out your centerpoint and offsets on the opposite face of the jig.

Chuck it Up

Each end of the billet should have three centerpoints – one true center and two offset centers. These offsets should be pricked on the minor axis of the handle and be the same at both ends of the handle. Chuck the billet between the true center points. I use Steb centers for both the head and tail stock of the lathe, but a combination of a spur center for the headstock and a cone point for the tail stock might work just as well, unless the offsets are very close to the edge of the work.

Set two pairs of calipers to the two major diameters (crown and bolster ends of the handle). I make these settings just a bit fat so that I have room to sand or shave the oval to final shape after turning. Use a compass to draw the two concentric circles centered on the true centerpoint at the crown end of the handle for visual reference.

Hand turn the lathe to adjust the tool rest to as close to the work as possible. Because the billet is not square, this is a critical step.

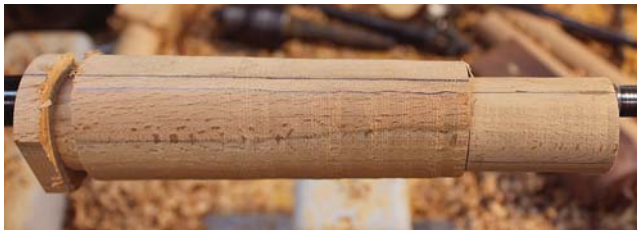
Turn a narrow section of each end of the handle to its major diameter using a bedan or other parting tool.

Connect these two diameters using a small roughing gouge followed by a skew chisel. After turning off the lathe, check the straightness of the taper with a straightedge. I evaluate my progress

Centerpoints. *Lay out one true center and two offset centerpoints on each end of the handle billet.*

Major diameters. *Use a bedan or other parting tool to turn each end to a shade more than the final diameter.*

Still centered. *Use a roughing gouge and skew to turn the equivalent of a tapered cylinder. After turning is complete on the true centers, connect the major axis lines down the length of the billet before resetting it in the near offset centers. The lines will help guide your next cuts.*



Parting. *Use a skew to turn each side of the billet to close to the major axis line. Note that the edge of one face is penciled in for clarity of observation. Fair the profile to the axis lines by sanding (lathe on) or rasping (lathe off). After this last step, the handle is ready to be parted off.*

And done. *A couple coats of shellac and your old mortise chisel is ready for new work.*

by watching the "shadow" of the edges as I take the material down. At this point, you'll have the equivalent of a tapering cylinder.

From each end of the handle, pencil in a line to connect the two major axis lines down the length of the handle.

Reset the billet to the near pair of offset centerpoints, reset the tool rest then turn the lathe by hand to ensure the billet doesn't whack the tool rest throughout its rotation. The billet will be seriously off center at this point. Note that you will be turning one side of the billet with one pair of offset centerpoints, and the other side with the opposite pair of offset centerpoints.

I went right to the skew chisel because the roughing gouge is too aggressive for this cut.

Stop the lathe periodically to gauge your progress; you want to approach the pencil lines along the length of the billet evenly. Stop when you are at the minor diameters on the ends of the billet and as close as possible to the lengthwise line.

Now reset the billet to the other pair of offset center points. Repeat as above, then return the billet to the true centerpoints. The transition between the minor axis and major axis faces (near the two midlines) may need to be faired. Depending on the shape of the oval, the shape can be faired by light sanding while the handle is turning on the lathe (remove the tool rest before sanding). Alternatively, for heavier fairing out, you could stop the lathe, rasp or spokeshave the transitional areas, then turn the lathe back on and fair out with sanding.

Part & Finish

The handle is ready to be parted off. In doing so, you can create the crown. Because the handle is an oval, the crown will have an arching arris around the edge, peaking in the middle. The least nerve-wracking solution, however, is to part the handle with it chucked in the true centerpoints, then hand-shape the crown to final appearance with a fine rasp (the work of a few minutes).

The tool will make intermittent contact with the wood as you part, so excellent tool control and support is necessary. I part using a combination of a skew chisel and a fine spindle gouge, clearing waste from the headstock end of the handle to give me tool leverage.

I sand my handles to #320 grit, then apply several coats of shellac (you may prefer an oil finish).

Which of the three techniques presented above do you think Benjamin Seaton used for his mortise chisel handles in 1796? You can either go to England to examine the chest, read "The Tool Chest of Benjamin Seaton" or get an answer right now. Seaton's chisel handles clearly show the marks of shaping by file: Burn then shape by hand.

Now seat the tang of your chisel in its new handle, and you're ready to put that old tool to work by chopping out some mortises. **PWM**

Willard is a retired research scientist who lives and works in Chapel Hill, N.C. Peter is a blacksmith in Siler City, N.C. Both teach classes at The Woodwright's School.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun14**

BLOG: *Read Derek Cohen's technique for rehandling an oval-bolstered chisel.*

BLOG: *Read about how Ray Iles puts handles on chisels on Joel Moskowitz's blog.*

ARTICLE: *"Workbench Clamping Jig" by Willard Anderson, from* Woodwork *magazine.*

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Application Problems

Solutions to a baker's dozen of common finishing difficulties.

It's easy enough to provide instructions for applying finishes. But in the real world, things go wrong; problems occur that you have to deal with.

With the combined goals of defining the problems, providing ways to avoid them, then fixing them after they occur, here are a baker's dozen of the most common application problems in alphabetical order.

Bleeding in oil finishes: the oil bleeds out of pores after any excess oil has been wiped off.

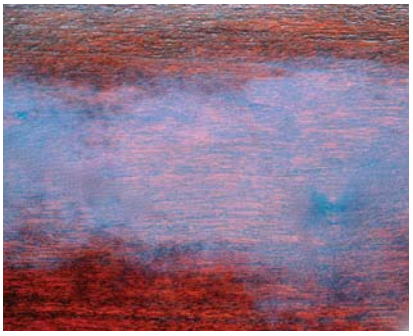
- To avoid, continue wiping off every half-hour or so until the bleeding stops.
- To fix, if the bleeding has dried, disguise it by sanding or rubbing with steel wool, and apply another coat – or strip and start over.

Bubbles dry in brushed alkyd or polyurethane varnish: more likely in hot weather.

- To avoid, work in cooler temperatures.
- To avoid, "tip off" (use light passes while holding the brush nearly vertical) after each couple of strokes to break the bubbles.
- To avoid, add 5-10 percent mineral spirits (paint thinner) to the varnish so the bubbles are more likely to pop out on their own.
- To fix, sand level and apply another (thinned) coat.

Blushing: a milky whiteness that appears in a lacquer or shellac finish on a humid day within seconds after application.

- To avoid, wait for a drier day.
- To avoid, add lacquer retarder (for shellac, use butyl cellosolve).
- To fix, mist on the retarder.
- To fix, rub with fine steel wool.



Blushing. *Lacquer and shellac can turn milky white in humid weather right after application. To avoid this, slow the drying of the finish by adding a retarder (a slower evaporating solvent).*

- The blushing often disappears on its own by the next day if you can wait.

Brush marks: ridges in the finish caused by the brushing.

- To avoid, add enough of the appropriate thinner to the finish to allow it to flow out level.
- To fix, sand level and apply another (thinned) coat.

Cotton blush: small white clumps appearing in a lacquer-type finish when it dries, caused by using too weak a lacquer thinner that is meant just for cleanup.

- To avoid, use a lacquer thinner meant for thinning lacquer, not for clean up.
- To fix, sand out and apply another coat using the proper lacquer thinner.

Dry spray: a sandy looking and feeling surface caused by spraying shellac or lacquer that is drying too fast. It's common when spraying the insides of cabinets and drawers.

- To avoid, add lacquer retarder (butyl cellosolve for shellac).
- To fix, sand level and apply another coat with retarder added.

Cotton blush. *If you add a lacquer thinner meant for cleanup rather than thinning to lacquer, the finish will come out of solution and show up on the wood as white fuzz resembling small pieces of cotton. Always thin with a proper thinner.*

Fish eye: the finish bunches up into craters or ridges (most common when refinishing, due to silicone from furniture polishes getting into the wood).

- To avoid, wash the wood thoroughly with any solvent, ammonia or trisodium phosphate.
- To avoid, seal the wood with shellac.
- To avoid, add fish-eye eliminator to the finish. When adding to alkyd or polyurethane varnish, thin the eliminator first with mineral spirits. Use an emulsified eliminator with water-based finishes.

Fish eye. *Finish doesn't flow out well over silicone (which has a low surface tension), which is often included in furniture polishes. So when refinishing, the finish may bunch up into craters or ridges if you don't first wash off the silicone, seal it in with shellac or add a fish-eye eliminator to the finish.*

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

Popular Woodworking Presents

Woodturning with Tim Yoder

— Starting April 5, 2014! —

Popular Woodworking Magazine is teaming up well-known PBS star Tim Yoder to launch a new online video show, filled with expert and friendly advice that will teach you how to become a better woodturner.

In each 30-minute episode, Tim will take you through the process of making beautiful woodturning projects, from wine stoppers and duck calls to platters and bowls. Along the way, you'll learn his favorite turning tips and techniques, and he'll offer reviews of the latest lathe tools, chucks and accessories to help you determine the best products to buy.

Whether you're an experienced woodturner who wants to improve your skills or you're new to the hobby and want to learn basic woodturning, *Woodturning with Tim Yoder* is a show you'll want to watch.

Visit **www.popularwoodturning.com** every other Saturday starting April 5 for the latest episode of *Woodturning with Tim Yoder*.

This show is brought to you by: Easy Wood Tools, Robust Lathes, Titebond Glue, Thompson Lathe Tools, Woodworkers Emporium, Rikon Power Tools and Cook Woods.

Tim Yoder, who starred in the Emmy Award-winning show *Woodturning Workshop* on PBS, is now teaming up with *Popular Woodworking Magazine* to launch a new turning show.

CONTINUED FROM PAGE 58

■ To fix, sand level and add fish-eye eliminator to the next and all following coats, or strip the project and start over.

Glue splotching: usually shows up as lighter areas around joints or from fingerprints, especially under a stain.
■ To avoid, put less glue in the joints.
■ To avoid, quickly wash off all the glue seepage and sand smooth.
■ To avoid if the glue has dried, sand or scrape it off.
■ To fix after stain application, sand out with sandpaper that is wet with more stain.
■ To fix after a coat of finish has been applied, disguise using markers or an artist's brush with colorants, and apply another coat.
■ To fix, strip the project or sand it to an even color and restain.

Orange peel: a sprayed surface that resembles the bumps on the surface of an orange.
■ To avoid, thin the finish more or increase the air pressure.
■ To avoid, watch what's happening in a reflected light and adjust your speed and distance to get an evenly wet coat just short of runs and sags.
■ To fix, sand level. Then thin the next coat, or adjust your speed or distance.

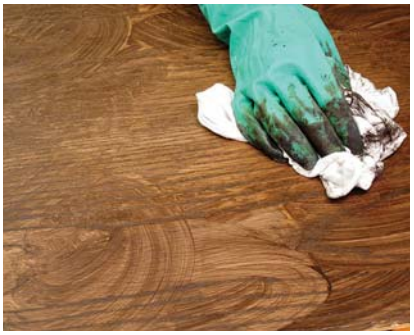
Pinholes: small bubbles in a sprayed lacquer finish that appear right over the pores on porous woods such as oak and mahogany. They are caused by air trapped in the pores coming into the finish and forming bubbles. These become pinholes when you sand them level.
■ To avoid or fix, "dust" with almost dry coats by holding the gun farther away and move it faster. Follow with increasingly wetter coats with plenty of drying time between each.
■ To avoid, fill the pores of the wood and avoid really wet coats at the beginning.

Orange peel. *The most common spraying problem is orange peel, which is caused by spraying too thick a finish with too little air pressure, or moving the gun too fast or too far from the surface. Knowing the causes makes the ways to avoid orange peel obvious.*

Pinholes. *On open-pored woods, air can come back out of the pores and cause bubbles in the finish. These turn into pinholes when you sand them level. The best way to avoid this problem is to spray "dust coats" to begin with until you get enough of a build to spray wetter coats.*

Runs & sags: areas where thick finish is applied and gravity causes it to droop.
■ Least likely to occur with lacquer-type finishes because they set quicker.
■ To avoid, watch what's happening in a reflected light during application, and brush out the sagging as it occurs.
■ To avoid if spraying, apply coats thinner on the wood.
■ To avoid if brushing, stretch coats out thinner.
■ To fix, sand or scrape level, then apply another coat.

Sticky finish: the finish is still tacky or gums up sandpaper after a reasonable drying time for that finish.
■ To avoid, work in a warmer temperature.
■ To avoid with a lacquer-type finish, add acetone.
■ To avoid on naturally oily woods, wipe over with naphtha or acetone just before applying the finish, or apply a shellac sealer coat.
■ To avoid with shellac, use more recently dissolved shellac.
■ To fix, raise the heat, or strip and start over taking one of the above precautions.



Stain streaks. *Water-based and lacquer stains dry very fast, especially in warm temperatures. To apply and wipe off the excess successfully, work faster or on smaller surfaces at a time, or get a second person to help.*

Streaking from stain application: occurs when some of the stain dries before it is wiped off and shows up as opaque streaks (most common with fast-drying lacquer and water-based stains).
■ To avoid, use a slower-drying stain, or work faster or on smaller areas at a time.
■ To avoid, have a second person wipe off quickly after you apply.
■ To fix, strip the wood and start over. You may be able to use the thinner for the stain or acetone, or even more of the same stain, if you catch the problem quickly. **PWM**

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

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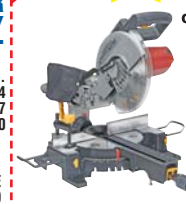

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POPULAR Woodworking MAGAZINE

Harness Leather on the Headstock

Childhood memories from 40 years in the past are rediscovered with a gift.

The old man winked and reached under his workbench to retrieve a rusty paint can. He whispered, "Your grandma back in the house?" I nodded yes. From the can he extracted a well abused pint of bourbon, took a nip and returned his stash to its hiding place. "Medicine. Whew. Now, let's curl some wood," he said, winking again as he lifted a jack plane from its perch. We were about to craft a sword fit for a 6-year-old swashbuckler's raid on a citadel of garden mulch.

Granddad was a railroad man before two heart attacks retired him to his backyard woodworking shop, a 10' x 20' lean-to with cypress shavings for the floor. And not one power tool was on the premises.

In his shop, he fashioned small furniture, lamps, bowls and other goods for family and appreciative customers. My favorite tool was his homemade lathe, its headstock driven by a pedal and a thin strip of harness leather.

He pedaled and steadied my hands on the roughing gouge as we shaped a rocket, sword hilt or any other creation I fancied. Despite granddad's patience, this aspiring pirate's attention deficit afforded little opportunity for the craftsman to impart his encyclopedic knowledge of turning, joinery and the use and care of hand tools. Before I turned 10, granddad's health deteriorated, and our visits to the woodshop ended.

Fast-forward 40 years, a span in which I seldom thought about those times with granddad. I owned no woodworking tools, and was so deeply immersed in my career that, if asked, I might have identified a dado as extinct poultry. Still, as we age, impressionable childhood memories have a way of breaking through cerebral cobwebs.

Feeling unusually nostalgic a few weeks before Christmas that year, I recounted a fond memory of granddad's woodshop to my wife. I had no intention of working with wood, and gave the matter no further thought.

Imagine my surprise when on Christmas morning I opened a gift from my wife to find a 1½-horsepower router and six high-speed steel router bits.

I said all the gracious things propriety dictates in such moments, but I was dumbfounded, thinking "what the heck am I supposed to do with this thing?" Nevertheless, to make a good show of appreciation, I took the router to my barn, read the operating instructions, chucked a straight bit in the collet then freehanded initials on a pine plank.

That did it! Once again, I could feel cypress shavings underfoot, hear the slap-slap of harness leather and catch a faint whiff of bourbon and newly worked pine. I could hear the old man's voice through time, "Hand me the rabbet plane." "No, no, chamfer the end grain first to avoid blow-out." Perhaps I had picked up more from his tutelage than I thought.

Within the year I converted half the barn into a shop and added another router, table saw, bench and ….

Last weekend my 4-year-old grandson ambled from workstation to workstation then stopped at a display case holding a careworn but lovingly restored jack plane. "What's that?" he asked. "Does it make loud noises, too?"

(There's no shortage of power tools in my shop.) "Let's see," I said. With his hands on mine, we were soon taking long curls of cypress to his exclamations of "Awesome! This is cool, granddaddy." And, indeed, it was.

I suspect that he, unlike his granddaddy, won't wait 40 years before he claims a router for his own. PWM

David, a retired newspaper editor and longtime hobbyist woodworker, lives in DeLand, Fla., where he operates a licensed service specializing in interior finish carpentry and woodwork repair.

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