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14" ANNIVERSARY BANDSAW

- Motor: 1 HP, 110V/ 220V, single-phase, TEFC, 11A/ 5.5A
- Table tilt: 45° R, 15° L
- Cutting capacity/throat: 13½" left of blade
- Max. cutting height: 6"
- Blade size: 93½" L (½"–¾" W)
- Blade speeds: 2500 & 3200 FPM
- Approx. shipping weight: 199 lbs.



G0555 ~~\$575.00~~ **SALE \$525.00**



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- Motor: 2 HP, 110V/ 220V, single-phase, TEFC, prewired 220V, 1725 RPM, 20A @ 110V, 10A @ 220V
- Table tilt: 45° R, 10° L
- Floor-to-table height: 37½"
- Cutting capacity/throat: 16¼"
- Blade length: 131½" (½" to 1" W)
- Approx. shipping weight: 342 lbs.

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AN ISO 9001
FACTORY**



G0513ANV ~~\$925.00~~ **SALE \$875.00**



10" CABINET TABLE SAWS

- Motor: 3 HP, 220V, single-phase, 12.8A • Table height: 34"
- Arbor: ½" • Arbor speed: 4300 RPM • Max. dado width: 1½"
- Max. rip capacity: 29½" (G0690), 50" (G0691)
- Capacity @ 90°: 3½", @ 45°: 2½"
- Approx. shipping weight: 530 lbs. (G0690), 572 lbs. (G0691)
- Includes a 3 HP Leeson® motor

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G0690 ~~\$1575.00~~ **SALE \$1495.00**

W/ Riving Knife & Extension Rails

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- Approx. shipping weight: 394 lbs.



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14" EXTREME-SERIES BANDSAW

- Motor: 1½ HP, 110V/ 220V, single-phase, 1725 RPM, 15A/ 7.5A, prewired 110V
- Table tilt: 45° R, 15° L
- Floor-to-table height: 44"
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½" to 93½" L (½" to ¾" W)
- Approx. shipping weight: 259 lbs.



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G0555X ~~\$859.00~~ **SALE \$795.00**



10" HYBRID TABLE SAW W/ RIVING KNIFE & IMPROVED FENCE

- Motor: 2 HP, 120V/ 240V, prewired 120V, single-phase, 15A @ 120V, 7.5A @ 240V
- Table height: 35½" • Arbor: ½"
- Arbor speed: 3450 RPM
- Max. depth of cut: @ 90° 3¼", @ 45° 2¼"
- Rip capacity: 30" R, 15" L
- Approx. shipping weight: 330 lbs.



FREE 10" x 40T Carbide-Tipped Blade

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12" COMPACT SLIDING TABLE SAW

- Motor: 7.5 HP, 220V/ 440V*, prewired for 220V, 3-phase, 20A/ 10A
- Main blade size: 12" Main blade tilt: 0–45°
- Main blade speed: 4000 RPM
- Depth of cut: @ 90° 3½", at 45° 2½"
- Scoring blade size: 4¾" (120mm)
- Scoring blade speed: 8000 RPM
- Footprint: 45" x 35"
- Approx. shipping weight: 996 lbs.



G0820 ~~\$5500.00~~ **SALE \$4695.00**



PLANER MOULDER W/ STAND

- Motor: 2 HP, 240V, single-phase, 10.8A, 3450 RPM
- Max planing width: 7"
- Max planing height: 7½"
- CPM: 14,000
- 2 HSS knives
- Approx. shipping weight: 324 lbs.



W1812 ~~\$1920.00~~ **SALE \$1650.00**



*To maintain machine warranty, 440V operation requires additional conversion time and a \$250 fee. Please contact technical service for complete information before ordering.

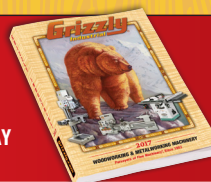
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- Motor: 2 HP, 110V, single-phase, 15A
- Max. cutting width: 13"
- Max. cutting height: 5 3/4"
- Max. cutting depth: 1/16"
- Feed rate: 26 FPM
- Knife size: 13 1/8" x 2 3/32" x 1/16"
- Cutterhead speed: 9000 RPM
- Number of cuts per inch: 87
- Approx. shipping weight: 80 lbs.

Includes Dust Collection Bag

G0832 ONLY \$355⁰⁰



New!

\$89 shipping

15" PLANERS

- Motor: 3 HP, 220V, single-phase, 15A
- Max. cutting width: 15", Depth: 1/8"
- Max. stock thickness: 8", Min: 3/16"
- Min. stock length: 8"
- Feed rate: 16 & 30 FPM
- Cutterhead dia.: 3", Speed: 4800 RPM
- Approx. shipping weight: 675 lbs. (G0453), 672 lbs. (G0453Z)



G0453Z shown

3 KNIFE CUTTERHEAD

G0453 ONLY \$1250⁰⁰

SPIRAL CUTTERHEAD

G0453Z ONLY \$1895⁰⁰

Free Shipping!
To Lower 48 States

6" JOINTER WITH KNOCK-DOWN STAND

- Motor: 1 HP, 110V/220V, prewired to 110V, single-phase, 14A/ 7A
- Table size: 6 1/2" x 47 1/2"
- Number of knives: 3
- Cutterhead speed: 5000 RPM
- Cutterhead dia.: 2 1/2"
- Max. depth of cut: 1/8"
- Max. rabbeting depth: 1/2"
- CPM: 15,000
- Approx. shipping weight: 252 lbs.

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G0813 \$545⁰⁰ SALE \$525⁰⁰

\$89 shipping

1 1/2 HP SHAPER

- Heavy-duty motor: 1 1/2 HP, 120V/ 240V, single-phase, prewired 120V, 12A/ 6A
- Floor-to-table height: 33 1/2"
- Spindle travel: 3"
- 2 interchangeable spindles: 1/2" and 3/4"
- Spindle openings: 1 1/4", 3 1/2", and 5"
- Spindle speeds: 7000 and 10,000 RPM
- Max. cutter dia.: 5"
- Approx. shipping weight: 221 lbs.



G1035 shown w/ G1706 optional wing



G1035 \$615⁰⁰ SALE \$575⁰⁰

\$89 shipping

15" HEAVY-DUTY PLANER

- Motor: 3 HP, 240V, single-phase, 14A
- Max. cutting width: 15"
- Max. cutting depth: 1/8"
- Max. stock thickness: 6 1/2", Min: 1/4"
- Min. stock length: 6 1/2"
- Feed rate: 16 and 30 FPM
- Cutterhead dia.: 3"
- Number of knives: 3 HSS
- Knife size: 15" x 1" x 1/8"
- Cutterhead speed: 5000 RPM
- Approx. shipping weight: 382 lbs.



New!

\$159 shipping

G0815 \$1150⁰⁰ SALE \$925⁰⁰

COMBINATION JOINTER/PLANER W/ FIXED TABLES

- Motor: 2 HP, 120V/ 240V, single-phase, 15A/ 7.5A
- Jointer table size: 7 1/2" x 45 1/2"
- Cutterhead knives: 3 HSS-single sided
- Knife size: 6 1/4" x 3/16" x 1/8"
- Cutterhead dia.: 2 1/8", Speed: 5400 RPM
- Max. planing height: 6"
- Planer feed rate: 11, 22 FPM
- Planer table size: 19 1/4" x 14 1/2"
- Approx. shipping weight: 418 lbs.



New!

\$169 shipping

G0809 \$1495⁰⁰ SALE \$1395⁰⁰

8" JOINTERS

- Motor: 3 HP, 240V, single-phase, TEFC, 9A
- Max. depth of cut: 1/8"
- Max. rabbeting capacity: 1/2"
- Cutterhead dia.: 3", Speed: 4800
- Cutterhead knives: 4 HSS; 8" x 3/4" x 1/8" (G0656)
- CPM: 20,000 (G0656), 21,400 (G0656X)
- Approx. shipping weight: 522 lbs.



G0656 shown

4 Knife Cutterhead

G0656 ONLY \$895⁰⁰

Spiral Cutterhead

G0656X ONLY \$1295⁰⁰

Free Shipping!
To Lower 48 States



2 HP SHAPER

- Motor: 2 HP, 120V/ 240V, single-phase, prewired 240V, 18A/ 9A
- Table size: 24" x 21"
- Spindle sizes: 1/2" and 3/4"
- Spindle speeds: 7000 and 10,000 RPM
- Max. cutter dia.: 5"
- Approx. shipping weight: 290 lbs.

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23 Modern Lounge Chair

This walnut-framed folding chair – inspired by Danish Modern master Hans Wegner – is built to last with solid joinery and shop-made brass hardware that fits to perfection.

BY CALEB JAMES

ONLINE ► Five Lessons from Mid-century Modern Furniture

Learn five features that help define this enduring furniture style.

popularwoodworking.com/jun17

33 French Polish Simplified

This historic and stunning finish is notorious for taking ages – but an unconventional technique speeds up the process. Plus, learn how to make a simple application pad from easy-to-find materials.

BY ALFRED SHARP

ONLINE ► The Finish Line

Read an interview with the author (and discover his love for European sports cars).

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38 Dovetailed Dustpan

The dovetails in this practical and stylish shop project are great practice for the novice dovetailer (but even if they're perfect, they'll end up in your dustbin).

BY CHRISTOPHER SCHWARZ

ONLINE ► A Sweeping Song

Learn about a Shaker hymn written to be sung while sweeping (because yes, the Dovetailed Dustpan is meant to be used).

popularwoodworking.com/jun17

42 Shedding Light On Compound Angles

Drill compound angles right every time using inexpensive line lasers and a simple setup. Plus, get instruction from Peter Galbert on grinding the perfect drill bit for the process.

BY GREG PENNINGTON

ONLINE ► Major Laser

Read about Jameel Abraham's souped-up laser mounts, which angle all the way to 45°.

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47 A School for Impractical Cabinetmakers

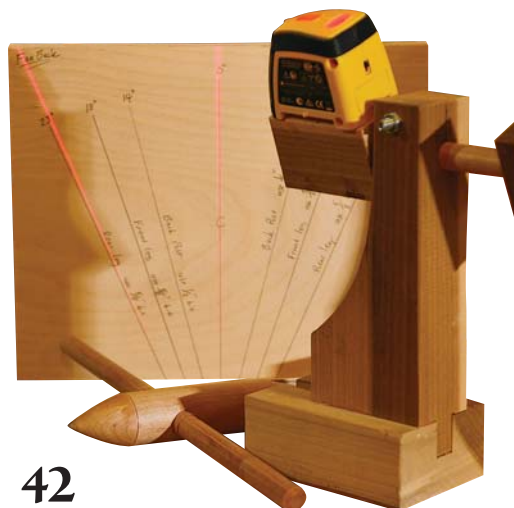
Step into Inside Passage School of Fine Cabinetmaking, Robert Van Norman's school in British Columbia that was inspired by the late James Krenov (who still teaches there through a unique collection of audio lectures).

BY ASA CHRISTIANA

ONLINE ► Craft Education

Visit Inside Passage online to check out a gallery of stunning furniture pieces.

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MAY 23



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(PRLV2)



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MAY 24



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MAY 28



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MAY 29



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Kit



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Card #120

MAY 30



Mini-Scraper



www.woodpeck.com
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MAY 31



\$100 Gift Card



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Card #89

JUNE 1



Dust Deputy
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Card #35

JUNE 2



WoodRiver #92
Medium Shoulder Plane



www.woodcraft.com
Card #49

It's time to give every Dad his due with a month full of top-flight woodworking prizes. From May 20 through June 18 (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 **Mirka DEROS Dust-Free Sanding System**.

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JUNE 4

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ENTER EVERY DAY AT WWW.POPULARWOODWORKING.COM/30DAYS

Popular Woodworking Magazine and its sponsors will award one prize each day from May 20 through June 18. 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: a Mirka Deros Dust-Free Sanding System.**

Registration starts midnight, EDT on May 20, 2017 and ends 11:59 EDT, June 18, 2017.

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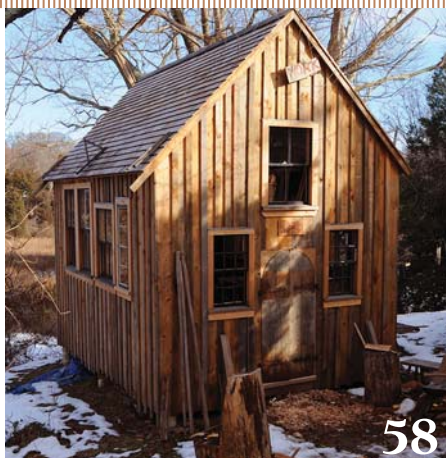
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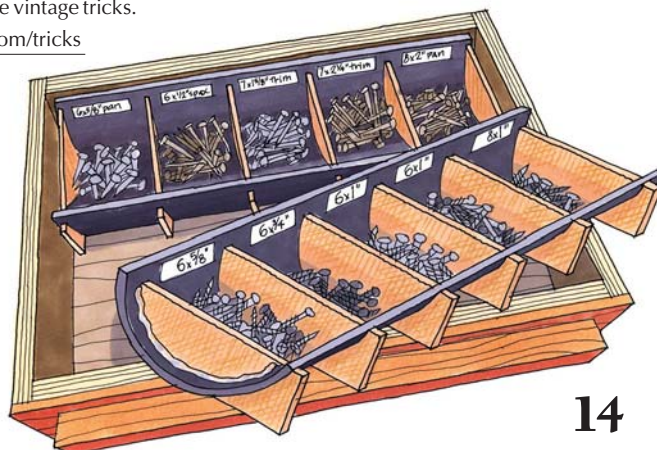
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POPULAR Woodworking MAGAZINE

Number 232, June 2017. *Popular Woodworking Magazine* (ISSN 0884-8823, USPS 752-250) is published 7 times a year, February, April, June, August, October, November and December, which may include an occasional special, combined or expanded issue that may count as two issues, by F+W Media. Editorial and advertising offices are located at 8469 Blue Ash Road, Suite #100, Cincinnati, OH 45236. Unsolicited manuscripts, photographs and artwork should include ample postage on a self-addressed, stamped envelope (SASE); otherwise they will not be returned. Subscription rates: A year's subscription (7 issues) is \$24.95; outside of the U.S. add \$7/year • Canada Publications Mail Agreement No. 40025316. Canadian return address: 2835 Kew Drive, Windsor, ON N8T 3B7 • Copyright 2017 by *Popular Woodworking Magazine*. Periodicals postage paid at Cincinnati, Ohio, and additional mailing offices. Postmaster: Send all address changes to *Popular Woodworking Magazine*, P.O. Box 420235, Palm Coast, FL 32142-0235 Canada GST Reg. #R132594716 • Produced and printed in the U.S.A.

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Welcome, Gentles All

I'm about to break a self-imposed rule about keeping "politics" of any sort out of the magazine. Avert your eyes and turn the page now if that rankles.

A recent social media post from Laura Mays, director of the fine woodworking program at the College of the Redwoods (which becomes the Krenov School on July 1), called attention to the lack of representation in woodworking magazines of people other than white men.

She is not wrong – in this and the other mass-market woodworking magazines, the majority of the articles are written by white men.

I can speak only for myself of course, but I suspect at least most of today's woodworking editors would agree:

We welcome queries from any excellent woodworker – women and men (cisgender, transgender, gay, straight, bi-sexual, asexual) of all ages, races, nationalities, religions and political persuasions. The queries we develop into articles reflect the best techniques and builds that are appropriate for our audience (and in our case, by those who can also supply high-quality digital photography, and a SketchUp model...or a good napkin drawing).

At every woodworking show or event I attend, I actively encourage queries from those who are underrepresented in our pages (as well as those who aren't). I contact women whose great work I see on Instagram and other social media, and invite them to talk with me about a possible article. After that – and perhaps a follow-up email or two – it is up to that woodworker.

If someone doesn't have the time and desire to write, I'm not going to beg. It's not that I'm too proud – it's that I've

never read an inspired and inspiring woodworking article by an author who wasn't excited about the subject. (I've read some OK ones by less-than-eager writers – but I want better than just OK.)

That's not to say all of our freelancers are stellar wordsmiths in addition to stellar woodsmiths (though many of them are); my job is to take a raw article and make it sing – and I do compare it to music. I'd much rather listen to someone with an interesting voice or unex-

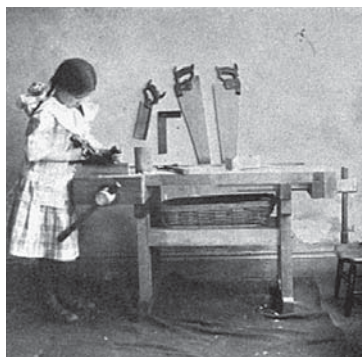
pected intonation or surprising approach or new sound than to a trained vocalist with a three-octave range who can hit notes perfectly but in a blasé or expected manner. (Why yes, I do like Bob Dylan.)

But for many people, "you can't be what you can't see."

That is, it is encouraging to see someone who looks relatively like you doing the thing you want to do – particularly if you feel unwelcome due to, say, eons of patriarchy or racism (or both). It's been a long time since the first woman or first non-white maker was featured in this and other woodworking magazines – but it does remain relatively rare.

So if you're an excellent woodworker from a group that is under-represented here, consider this your special invitation to step up...if you want. Again, I'm not going to beg.

We're going to continue buying the queries that represent the best in woodworking – no matter who writes them. But it would be nice to hear some new, interesting voices. **PWM**



Megan Fitzpatrick

PHOTO FROM "A CATALOGUE OF PLAY EQUIPMENT" JEAN LEE HUNT (1918)

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TRACK SAW MASTER PACK

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

W1835 Track Saw

Includes:

Accessory Pack &
55" Guide Rail



W1832 Track Saw Master Pack

7" 2 HP PLANER MOULDER W/ STAND

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

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



10" 2 HP OPEN-STAND HYBRID TABLE SAW

- 2 HP, 120V/240V, single-phase (prewired for 120V)
- Motor Amps: 15A at 120V, 7.5A at 240V
- Enclosed cabinet bottom w/ 4" dust port
- Precision-ground cast-iron table w/ steel wings measures 40 1/4" x 27"
- Rip capacity: 30" to right, 15" to left
- Quick removal/replacement system for blade guard and riving knife
- Weight: 243 lbs.

Includes a 10" x 40-tooth
carbide-tipped blade,
standard and dado table
inserts, miter gauge, push
stick, and arbor wrenches



W1837 10" 2 HP Open-Stand Hybrid Table Saw

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

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



PATENT OWNED BY
WOODSTOCK
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W1668 13" 3/4 HP, Bench-Top Drill Press

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

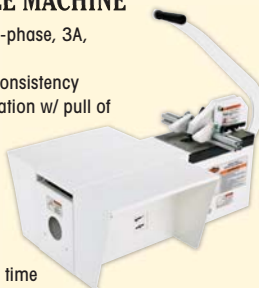
- Motor: 3/4 HP, 110V, single-phase, universal motor
- 12" swing over bed • 15" between centers
- Two spindle speed ranges: 500-1800 RPM & 1000-3800 RPM
- 1" x 8 TPI RH thread spindle size
- Spindle indexing in 15° increments
- Heavy-duty cast-iron construction
- Approx. shipping weight: 87 lbs.



W1836 Bench-Top Wood Lathe

POCKET HOLE MACHINE

- Motor: 1/2 HP, 120V, single-phase, 3A, 17,500 RPM
- Two flip stops for drilling consistency
- Auto start/stop motor actuation w/ pull of handle
- Auto adjust clamping foot mechanism for workpiece thicknesses between 1/2" to 1 1/2"
- Cuts both dia. holes for pocket screws at the same time
- Ideal for face framing



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W1833 Pocket Hole Machine

6" PARALLELOGRAM JOINTER W/ SPIRAL CUTTERHEAD

- Motor: 1 1/2 HP, 110V/ 220V, pre-wired 110V, single-phase, TEFC, 3450 RPM, 15A/7.5A
- Precision-ground cast-iron table size: 55 1/2" L x 6" W
- Floor to table height: 32 1/2"
- Max. cut (per pass): 6" W x 1/8" D
- Rabbeting capacity: 1/2" Spiral cutterhead dia.: 3"
- Cutterhead speed: 4,850 RPM
- CPM (effective): 19,400
- Fence system: positive stops @ ±45° & 90°
- Approx. shipping weight: 429 lbs.

Built-in mobile base!

W1755S

6" Parallelogram Jointer w/ Spiral Cutterhead



WALL DUST COLLECTOR

- Motor: 1 HP, 120V/240V, single-phase, prewired 110V, 7A/3.5A
- Air suction capacity: 537 CFM
- Static pressure: 7.2"
- Intake hole size: 4"
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- Bag filtration: 2.5 micron
- Dust level viewing window
- Height with bag inflated: 44"
- Approx. shipping weight: 55 lbs.



W1826 Wall Dust Collector

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Sliding Dovetail Waste Removal

I am building the “Shaker Candle Stand” from December 2016 issue (#229), and am having a problem removing the waste from the sliding dovetails on the base.

The bottoms of my sockets are wider than the top, and I’ve busted out some wood on the surface during waste removal. I tried to kerf the center of the waste with a dovetail saw prior to leveraging it out, but still am having the problem. I could use my powered router, however I prefer to use hand tools as Will does. Your insight would be most appreciated.

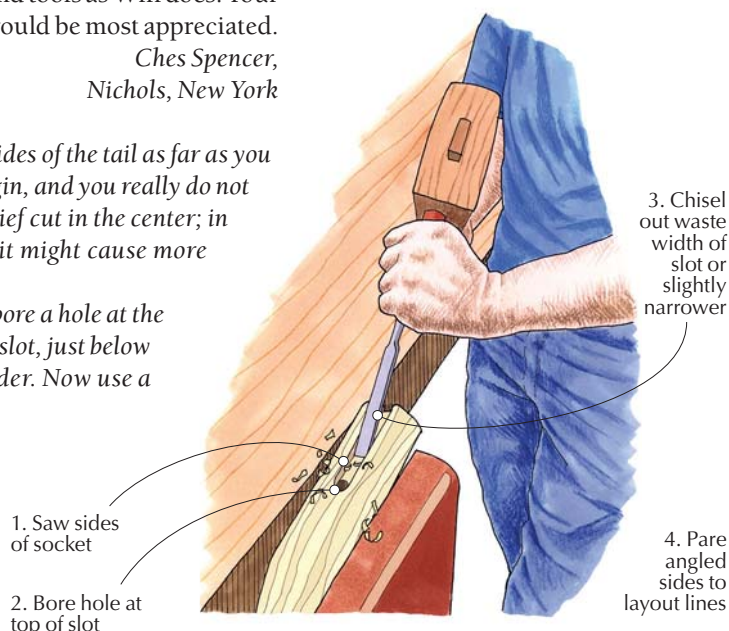
Ches Spencer,
Nichols, New York

Ches,
Saw the sides of the tail as far as you can to begin, and you really do not need a relief cut in the center; in this case it might cause more problems.

Then bore a hole at the top of the slot, just below the shoulder. Now use a

chisel that is the width or a little narrower than the narrow portion of the tail (I use a $\frac{3}{8}$ ") and chop a channel through the middle of the socket. Take small bites, especially as you get started; most of the waste is removed by splitting, and large chunks are hard to get out without damaging the shoulders. Once you get pretty much to depth along the full length, stop chopping and pare the angled sides of the socket up to your layout lines.

Will Myers, contributor



Drawer Lock Chisel: A Correction on Its Use

I enjoyed Christopher Schwarz’s “Good Chisel Sense” article in the April 2017 issue (#231). I wish, though, to correct one fact: A drawer lock chisel is not used for the lock; the lock is pretty accessible. It is used for the strike mortise, above the lock. On a 3", 4" or 5" drawer opening, you can’t get a chisel

in there, to say nothing of a hammer. That’s where your space is limited, and the lock chisel is a necessity.

Anonymous,
via email

How to Toughen Wood

I have an old section of a pine log that’s about 6" in diameter; it has 35-40 growth rings per inch. I would like to

saw $\frac{1}{2}$ "-thick pieces from it to make some coasters for a friend who appreciates old-growth wood.

Although the pieces would probably not break if I sealed them with a good oil finish, I would like to toughen them up a bit for durability.

Are you aware of a product I could apply or soak them in that would bind the grain together? Perhaps a thin epoxy or another product to not only seal the end grain but guard against breakage?

Terry Miller,
via email

Terry,
I’ve never tried it myself, but one can infuse wood with acrylic – it’s commonly called “stabilized wood.” Dave Jeske offers round mallets from Blue Spruce Toolworks that use this wood, and they are tough. (I’ve been using one of his resin-infused mallets for eight years now, and it has barely a scratch on it.) Resin-infused pen blanks are also commonly available.

There are a number of videos on YouTube that explain the process – the key to all of them is a vacuum press (either shop-made or commercial) so that you can remove the oxygen.

But I don’t know of any topical treatment that will soak in enough to do what you want.

Megan Fitzpatrick, editor

Aumbry Moulding Profiles

I’m building Christopher Schwarz’s “American Gothic” aumbry (from the February 2015 issue, #216), and am ready to cut the beads on the four long edges of the front pieces.

Is there anything sacred about the profile in relation to the original piece? Could I change the layout to use a router bit that leaves a $\frac{1}{4}$ " radius, or does the original have just slightly rounded corners on the bead?

Or should I buy a hollow plane?
Maybe I’m over-thinking this....

Andy Garello,
via email

Andy,
The radius can be formed with a hollow

CONTINUED ON PAGE 12

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plane or any rabbeting plane. If I remember correctly, I plowed out the edges of the detail with a table saw. Then I formed a chamfer with a shoulder plane and finished it up with a hollow plane.

You don't, however, have to have a hollow plane to make the profile. A shoulder plane will do it quite well.

Doing it with a router would be really tricky in comparison.

But there is nothing sacred about the profile.

Christopher Schwarz,
contributing editor

Eggbeater Hand Drill Restoration Resources

I have an old Millers Falls 77A hand drill, and I am having some issues getting a properly sized chuck to put this tool back into action. I was wondering if you might know the shaft size on this model.

Ron Walsh,
via email

Ron,
For restoration advice on vintage eggbeater drills, I recommend contacting Ted Hoeft at Lone Pine Toolworks (lonepinetoolworks.com) or Wiktor Kuc at WK Tool (wktools.com).

Megan Fitzpatrick, editor

Reader Commentary on 'You Own a Table Saw?'

Editor's note: We received more emails about David Shapiro's *End Grain* from the April 2017 issue (#231) than for any other article in recent history – and all of them positive. Here are just a couple (edited for length and style).

As an owner of a new table saw, this article really resonated. I've always had a healthy respect for taking your time, not getting wrapped up in distractions and using all safety guards.

Sometimes, however, it's difficult to rip wood, so long ago I had removed the blade guards to make that easier. I know a number of other woodworkers who have also done this.

But David Shapiro reminds us just

how dangerous table saws can be and how permanently they can change one's life.

Thank you for publishing this article. I put the guard back on my table saw today.

Harry Turner,
via email

I just sold my table saw and am planning to replace it soon. I read the article by David Shapiro with interest and thought carefully about his statement that, having seen hundreds of table saw injuries, he has never seen an amputation from a table saw with an appropriate blade guard and splitter.

That made me wonder if "flesh sensing technology" is oversold. However, while a blade guard can be used in the vast majority of table saw operations, it cannot be used with a dado set or a tenon jig, or to cut a cove by putting the stock through at a diagonal. Undoubtedly there are other situations where it would be difficult or impossible to use a blade guard.

For that reason, I believe I will stick with my original plan: to spend more and buy a SawStop cabinet saw.

And, because kickback can be just as hazardous as sticking your hand in the blade, I will also put JessEm table saw guides on the fence. **PWM**

Brian Maris,
Rockport, Texas

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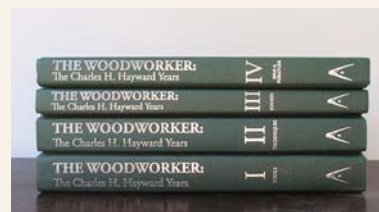
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— Megan Fitzpatrick

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THE WINNER:

Shop Organization For Fasteners

Here is a handy, inexpensive way to organize your shop screws and other small bits of hardware.

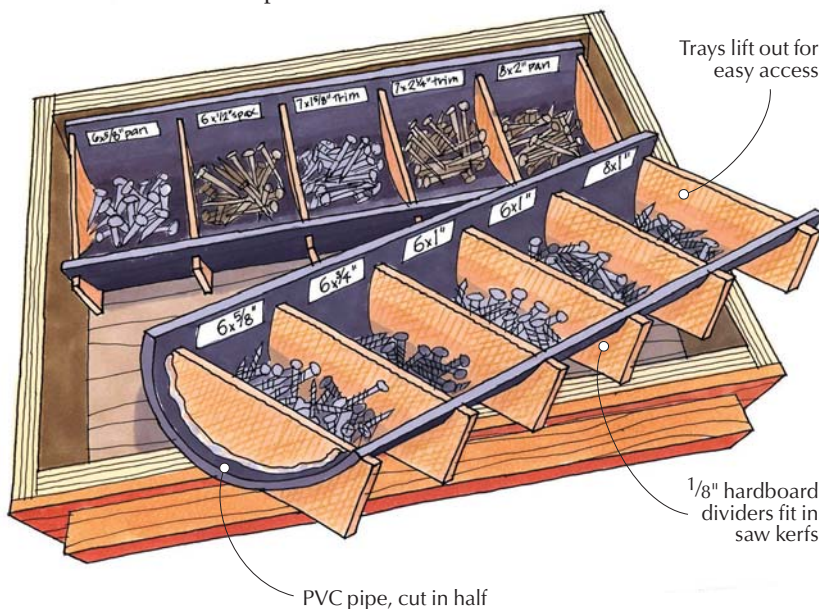
I cut an old section of black PVC pipe lengthwise down the middle, then into sections to fit my workshop drawer width.

The 1/8" kerf from my table saw blade created an exact space for the

1/8" hardboard dividers, which I hot-melt glued in place.

One drawer width section is easily lifted out and moved where needed. The curve to the PVC makes it easy to scoop out one or many screws, washers, nails, etc.

Mike Garrett,
Paradise Valley, Arizona



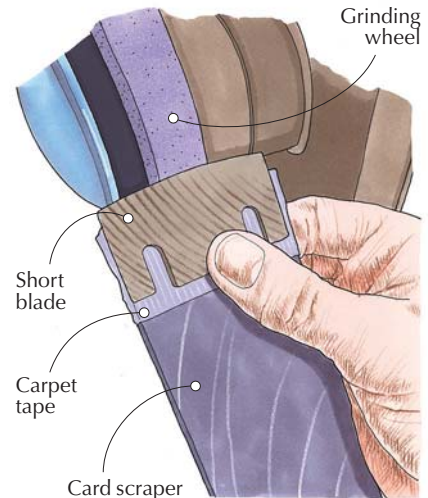
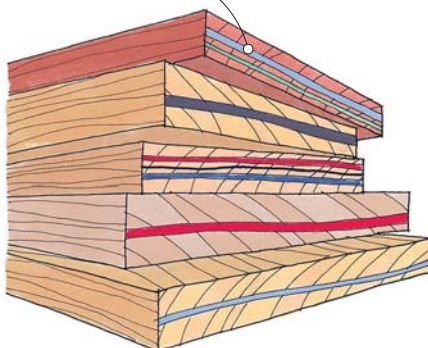
Color-coded Convenience For Grain & Color Match

Before milling boards that I plan to rip, I color code the ends so that I can easily group pieces that are ripped from the same boards. That makes it easier to make my part selections for matching grain and color.

All it takes is an array of Sharpies or other permanent markers in various colors (available at any art-supply store).

Darrell Peart,
Seattle, Washington

Mark board ends with permanent markers before ripping



Sticky Trick for Grinding Narrow or Awkward Tools

It can be quite tricky to grind short blades, such as those in a spokeshave, or blades with odd shapes, such as blades for moulding planes or plow planes.

The solution: a card scraper and carpet tape.

Use the carpet tape to stick the iron to the end of a card scraper. The card scraper offers a wide and smooth surface and slides on your tool rest with complete control. When grinding, you can pinch the blade up near the edge with one hand and use the other to press the scraper to the tool rest.

The carpet tape is more than strong enough to hold the tool during grinding (so, no, the blade won't fly off). The tape is generally waterproof, so you can even dunk the whole thing in water to cool it during the grinding process.

Christopher Schwarz,
Ft. Mitchell, Kentucky

Add Alcohol to Your Planing

Worried about sending highly figured wood through a planer? Spritz some alcohol on the board's surface (and take light passes). The alcohol softens the surface and minimizes tear-out (just as it softens end grain for handplaning).

Brian Geunther,
Edmonton, Alberta

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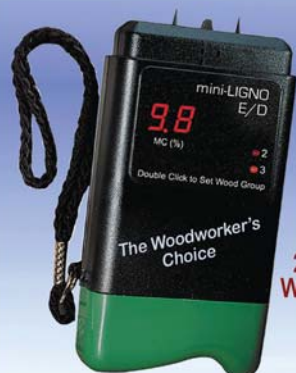
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Shop-made Arc Scriber

I needed to scribe some simple arcs on the bottom of some bench stretchers. I've done this a number of ways: beam compass, commercial plastic drawing bows, a thin wood strip tied with a string. None worked particularly well for me, and solutions were often cumbersome; I got my arcs but not without a fuss. So I was not looking forward to that task.

While laying out the stretchers, I recalled some instruction to use a quar-

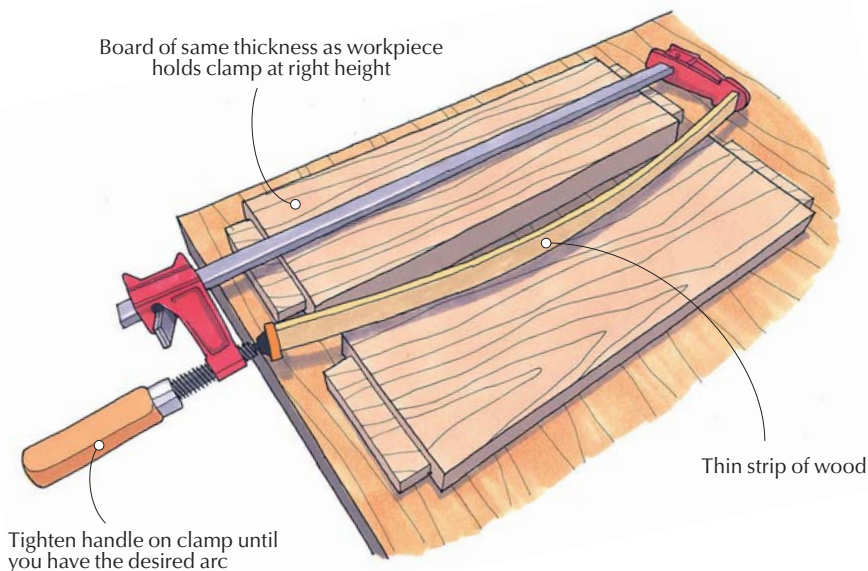
tersawn strip tied with a string to form the bow or arc. Thinking about that, and knowing how fussy the string setup can be to get the desired arc, I thought, "Why not tension the bow with a clamp instead of a string?"

My offcut pile had a number of thin strips – I found a quartersawn one, trimmed it to fit the clamp's widest opening, screwed in the clamp handle and, ta-da, found my desired arc. I marked my four stretchers and went

on with my life. This was really easy and a much more secure and sure way to find and mark an arc. I was also very pleased with the bent stick's arc symmetry. I think the quartersawn strip contributed to that.

This particular stretcher workpiece was 16³/₈" long, so an 18" F-style clamp worked fine. I used a wood strip that happened to be about 5/32" thick – that seemed to be about right for the poplar that I was using. I think clamps of various sizes would accommodate many, if not most, arc-scribing needs.

Cordell Roy,
South Jordan, Utah



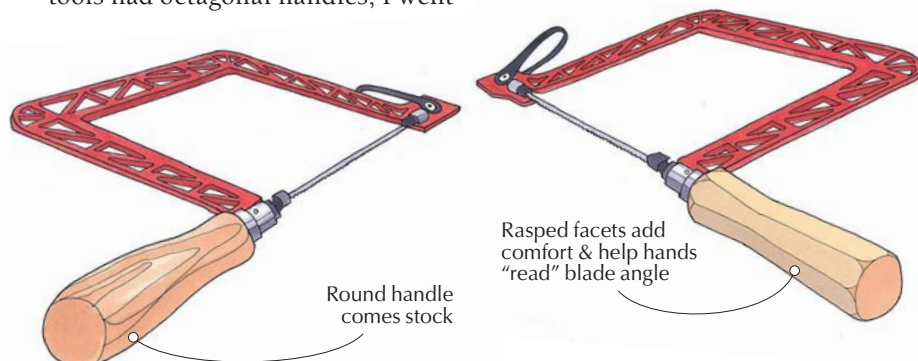
Facets Make Coping Saw Handle More Comfortable

I recently upgraded to a high-quality coping saw. While I am impressed with the saw's performance, the round handle made my hand cramp and fatigue.

Remembering some of my favorite tools had octagonal handles, I went

to work with a rasp. In a few minutes, I filed eight equal facets on the saw handle. The new profile gives me a better grip, and I've found it gives me a good feel for the blade registration. **PWM**

Bob Glenn,
Vincennes, Indiana



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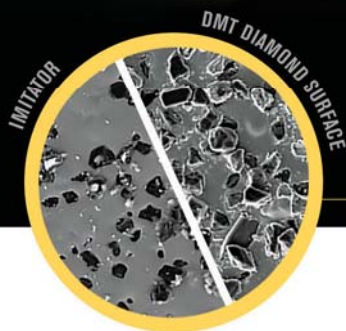
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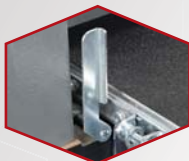
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These full-sized carbide tools are beautiful and overbuilt in almost every way. The fit, finish and balance of the tools are superior to most turning tools I’ve handled, and the tips come in familiar configurations (if you’ve used other carbide turning tools): square, round and diamond. The square tool ships with a radiused cutter installed, but included in the package is also a true square cutter – nice bonus.

Every tool has its limitations so let’s start there. My only difficulty wasn’t a fault of the tools themselves but a matter of geometry.

The tools are large and while the size of the cutters allows them to do a lot of work and remove material quickly, I found that it sometimes limited the level of detail possible on more intricate patterns. Bowls and simple spindles were no problem, but more delicate Windsor-style balusters posed a challenge. Carter Products has confirmed plans to release an expanded line of tools in different sizes that will complement the full-sized line and go a long way to making these more detailed



Better feedback. The handles on the Axe woodturning tools and the flats on the back of the shafts are improvements on replaceable carbide-tip turning tools.

forms accessible.

The other limitation often leveled against carbide-tipped turning tools is their inability to equal the crisp, burnished surfaces left behind by a sharp skew chisel or gouge. In response to this challenge, both the square- and round-tipped tools in this line feature a round tool bar with a machined 1/2" flat on the bottom. Smooth, beveled transitions between the two surfaces allow the tools to be rolled into a supported shearing cut and light passes in this skewed position, which significantly decreased the amount of sanding necessary for a finish-ready surface. I found this technique to be very effective with the square cutter, but I still needed some #220-grit sandpaper nearby on hand for final sanding.

The shape and size of the handles

looks a bit unorthodox, but they’re comfortable and they make perfect sense in practice. The flats provide tactile feedback about the angle of the tool to give me precise control at the cutting edge, and the color-coded ferrules keep me straight about which tool I am grabbing.

All told, this is more than just “another” set of carbide turning tools. The superior quality and innovative features set them apart and the price also makes them attractive. At just under \$100 each (at Woodcraft), a full set of these carbide-tipped turning tools is still a significant investment, but they present a meaningful value over other tools in this class. (Replacement cutters start at \$14.99). And, they’re made in the United States. Recommended.

—James McConnell

CONTINUED ON PAGE 20

Axe Carbide Lathe Tools

Carter Products ■ carterproducts.com or 888-622-7837

Street price ■ from \$99.99

■ VIDEO Watch the author use these tools at his lathe.

Prices correct at time of publication.

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3M Convolute Deburring Wheel

Someone saw this deburring wheel on Instagram and clued me in to it; sold. It's really a metal-working tool for knocking off sharp edges and small bits of metal. But if, like me, you have rusty old tools sitting around your shop (say inherited chisels that haven't been used for probably 40 years), it's a godsend for the first steps in getting them back in working order.

This 3M convolute (which means rolled up in a spiral in case like me you didn't know) 6" wheel has a maximum 6,000 rpm rating, and is comprised

of dense layers of nonwoven nylon impregnated with silicon carbide abrasive with a density rating of nine. The wheel resists loading, and breaks down fairly quickly (faster than aluminum oxide) to expose fresh abrasive. It's intended for light to medium edge deburring on carbon steels, stainless steel and soft metals (as well as plastics, glass and composites, though I doubt I'll ever use it for that) – but it does an excellent and fast job of removing rust, leaving a nice shiny surface behind, albeit with a noticeable scratch pattern. You can see the difference easily in the business end of my grandfather's fish-tail chisel and the still-rusty bits – that level of shiny was achieved in about 60 seconds (and with barely any heat buildup). To remove the scratches, I can move up to a finishing wheel, or



just live with them where it doesn't matter – better than rust.

Of course, you do have to be a bit careful – the wheel removes metal, so if you have surfaces that need to be dead flat (say, a plane sole or back of a paring chisel), this is not the rust-removing technique for that job.

But because I hollow-grind my chisels, I wasn't worried in this case.

—Megan Fitzpatrick

3M Deburring Wheel

Scotch-Brite ■ 3M.com or
866-279-1235

Street price ■ from \$54.74

■ **BLOG** Read about other ways to remove rust from old tools.

Price correct at time of publication.

Buck Bros. Professional Wood Chisels

If you're frugal when it comes to tool purchases, check out the U.S.-made Buck Bros. "Professional Wood Chisels," available at Home Depot. A set of three ($\frac{1}{2}$ ", $\frac{3}{4}$ " and 1") is less than \$20. (I bought several sets from three locations for comparison purposes.)

While nowhere near the fit and finish of a high-end chisel, these are awfully good for the price – and with a little work can be set up to perform at a high level. Eight of the nine I bought had flat backs, but with significant finish marks. It took about 30 minutes

on stones to get the backs polished to an acceptable scratch pattern, and I had to grind the cutting edge straight on a couple of them. But none of that is difficult. (The ninth chisel had a small concavity on the back – still usable.)

No, I'm not a fan of the feel of the "high-impact acetate" handles, but these are well-balanced and of a comfortable size.

But what I like about these Buck Bros. chisels in comparison with other hardware-store brands is the lands – the flats on the sides between the bevel and back. On the Buck Bros. sets, these are remarkably narrow, which makes them great for getting safely (no crushing) into corners when dovetailing. And the high-carbon steel holds a decent edge – I chopped two sets of dovetails (four tails each) before the chisel started



crushing the pine rather than cutting it – no problem; just stop and hone.

You can also buy a $\frac{1}{4}$ " chisel on its own for about \$9 – but here's a weird thing: The lands on the smaller chisel (shown at top above) are quite a bit larger. I talked to a representative about it, and he agreed it was odd – the parent company (Great Neck Saw) is now looking into machining the smaller tool with smaller lands (so hold off on buying that one for a while). **PWM** —MF

Buck Bros. Wood Chisels

Buck Bros. ■ buckbrostools.com or
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■ **VIDEO** Watch a video comparison of these chisels vs. select other brands.

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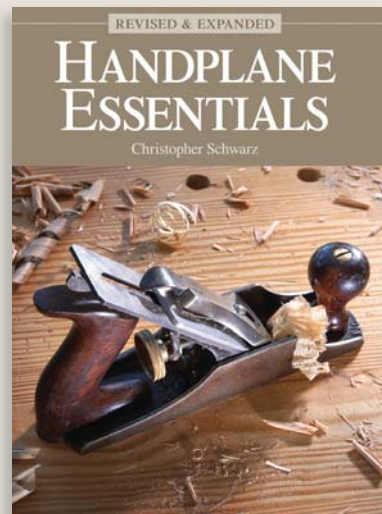


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A photograph of a wooden folding lounge chair in the process of being built. The chair is positioned on a light-colored wooden workbench. It features dark-stained wooden legs and a light-colored wooden seat and backrest. The backrest is currently folded down. The background is a wall made of horizontal wooden planks.

Modern Lounge Chair

BY CALEB JAMES

Shop-made hardware and precision joinery are the foundation for this Danish-inspired folding seat.

Danish furniture is making a comeback these days. It's been a favorite of mine from the moment I discovered the style. It had all the hallmarks I wanted in furniture: simple, beautiful design and construction. Nothing fancy, just good, honest furniture I could put to use that would stand the test of time and only

look better with age. I loved Shaker and Arts & Crafts furniture and, unknown to me at the time, these styles had a huge influence on Danish designers.

Hans Wegner set much of the tone for that era; his 512 folding lounge chair was one of his most imitated designs. Inspired by the Shakers – who hung chairs on the wall when not in use –

this chair was to be stored on a wall hook and brought out when one needed extra seating for guests. It turned into permanent seating, however, for most owners.

The Danes didn't seem to hold back from taking cues from one another when it came to designing a new piece. Many considered Wegner's design to



Classic. The folding lounge chair by Hans J. Wegner spawned a Danish classic that still fits right in the modern home – it's still manufactured today, by PP Møbler (PP512).

be influenced by Ludwig Mies van der Rohe's Barcelona chair, which in turn was thought to be an extrapolated form of the Grecian Klismos chair and/or the Roman Curule chair. The roots of the Danish folding lounge chair do indeed even reach back to the classical forms.

I designed a chair that incorporates the classic folding chair of the Danes and their love of paper cord as a weaving material. If you have ever wanted to learn how to weave Wegner's CH25 lounge chair, this is virtually the same pattern. I hope you enjoy building my version of a Danish classic and make it a classic in your home.

Frame, No Panel

The body of the chair is just two frames hinged together. And rather than a wooden panel, you'll fill in those frames with woven Danish paper cord.

To make this chair, download and print the patterns at full scale at a local printshop. Don't "fit to page" – and bring a ruler to confirm they got it right. (Or, carefully draw them yourself, working from the gridded illustrations on the following pages.)

To start, make the curved sides of the frame. Using the side patterns, you have two options for how to go about doing this:

One is to simply adhere the patterns to the stock with spray adhesive, cut out the shape and refine with hand tools. If that's your preference, work from both the right- and left-hand patterns through the steps that follow.

Or, if you prefer to use power tools, use one set of patterns to make a routing template and the other set for a mortising template – the method I use.

Adhere the pattern to $\frac{1}{2}$ " x $6\frac{1}{2}$ " x 38" MDF with spray adhesive. Cut out and shape the patterns as perfectly as possible. Any deviations will be reflected in every part you make, so take your time.

The side frames should be made in your primary wood choice. Here I've used walnut, but beech or white oak would certainly be in the Danish tradition. Select a rough board suitable for final dimensioning to $1\frac{1}{8}$ " x $6\frac{1}{2}$ " x 76". Cut this in two 38"-long sections, which will make one side frame pair each.

There are a number of ways to adhere the routing patterns to the stock and it's largely dependent on your particular setup.

I have a shaper cutterhead with segmented carbide inserts, thus I can rout all in one direction. My preference, therefore, is to simply drill $\frac{1}{16}$ " holes in the patterns at the mortise locations and tack them on with 1" #17 finish nails, with the heads left proud for easy removal. One at each location will work, but also secure the end of the pattern where there is no mortise. If you don't mind a hole as evidence of the manufacturing process, use the same nails or a pin nailer, or even double-sided tape.

Flip the patterns for the opposite side pair so you don't end up with holes on the outside of one of your frame pairs. Trim the stock no more than $\frac{1}{16}$ " oversize to the pattern at the band saw. Now rout with a pattern bit (preferably at a router table).

Hardware Meet Frame, Frame Meet Hardware

For a properly functioning and long-lasting foldable chair you'll need your hinge hardware tightly and accurately



That was easy. Adhere the pattern to $\frac{1}{2}$ " MDF, cut it out, tack it on, trim off the excess and rout with a pattern bit.

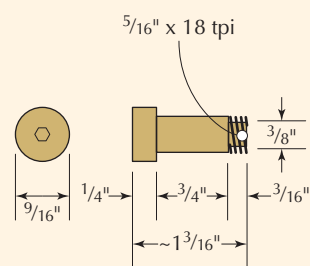
HARDWARE MONEY CAN'T BUY

The heart of this chair lies in its fold-ability. This hinge hardware isn't off-the-shelf stuff; make your own – it's much easier than you think. It starts with some flat brass bar stock $\frac{7}{8}" \times \frac{3}{16}" \times 4\frac{1}{16}"$ per hinge. It's about as easy as drilling four $\frac{1}{4}"$ holes and tapping one to accept $\frac{5}{16}"$ -18 threads. (A note of caution: Always securely clamp down brass when drilling; otherwise, a standard drill bit will grab and send the stock spiraling with the bit. Not pretty.) The other three holes need to be countersunk for a standard 82° wood screw head.

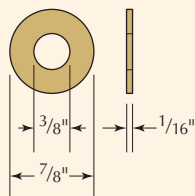
Use the hinge pattern at right and directly adhere it to the brass with some spray adhesive. Let the brass extend slightly beyond the pattern. Center punch the drill points and get to drilling. Countersink the lower three holes so that a #14 screw sits slightly below the surface. Thread the upper hole for the shoulder screw. To make sure the threads are square to the brass bar, I do this with the tap mounted in my drill press. Lower the tap while turning the chuck manually by hand.

The shoulder screw threads will extend beyond the opposite face of the bar stock so this will need to be trimmed flush. Saw off the excess with a hacksaw. Flatten this side with some #80-grit sandpaper adhered to a flat surface such as a granite surface plate. Now install the washer on the shoulder screw as a reference to guide you in shaping the round end. Use a file or a powered sander to accomplish this. Finish all surfaces to #180 grit. Remove the screw and flatten the inner face and sides as well. Once I've finished all the surfaces, I put blue painter's tape on the outer face to avoid scratching it up while fitting the hardware.

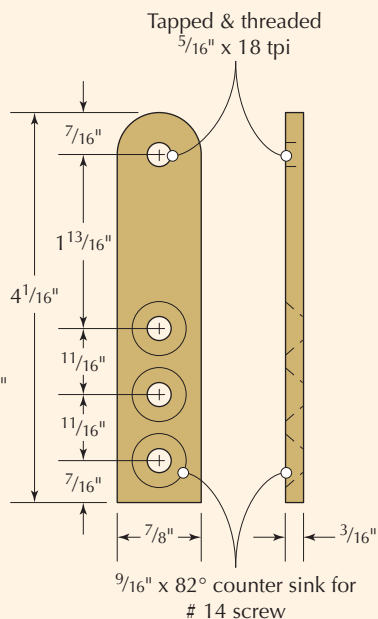
While you're at it make a pair of seat support pins and weaving bars. The pins are made from $\frac{1}{2}"$ outside-diameter (OD) brass round rod stock cut to $1\frac{3}{4}"$ in length. Chamfer the ends and use #180-grit sandpaper to give the sides a consistent surface finish. The weaving bars are $\frac{5}{16}"$ OD stainless steel round rod cut to 14" lengths.



HINGE BOLT



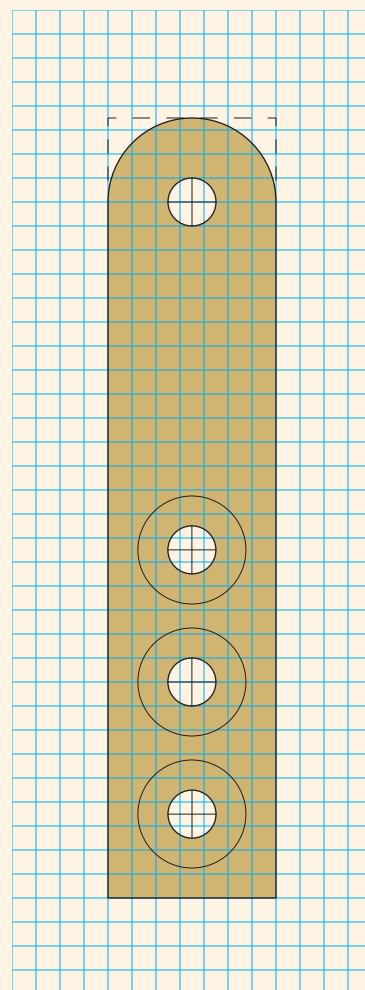
WASHER



HINGE LEAF



When you can't buy it... Here's all you need to make the hinge hardware: brass bar stock, a punch, $\frac{1}{4}"$ drill bit, $\frac{5}{16}"$ -18 tap, countersink, #14 1" screws, brass shoulder screw and brass washers.



HINGE LEAF PATTERN

Shown at full size
One square = $\frac{1}{8}"$

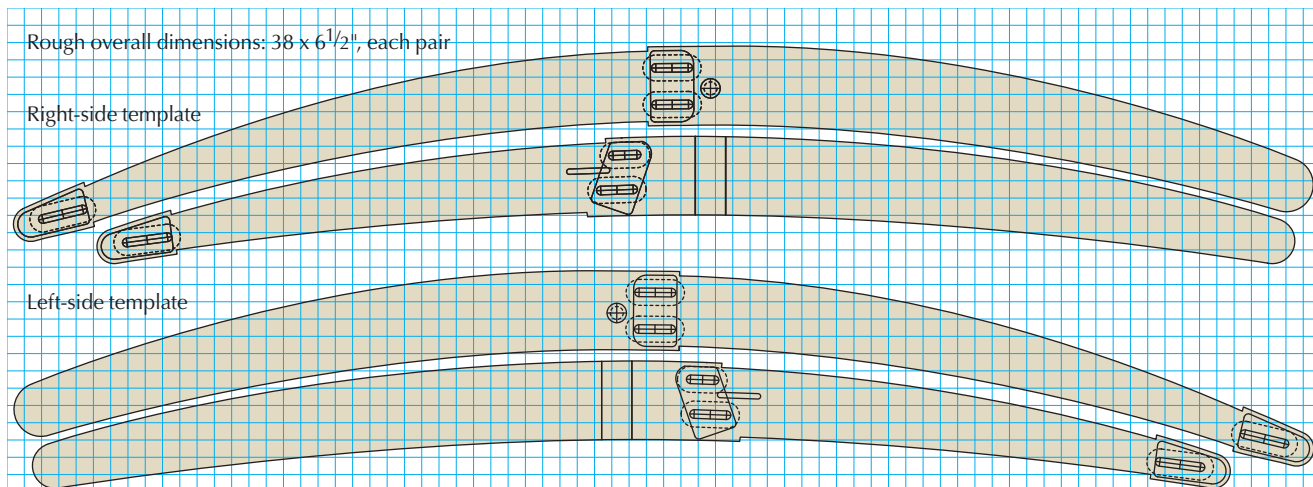


Before you go. Mark the center point of the hinge pin before removing the pattern

Modern Lounge Chair

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
2	Side frames	1 ¹ / ₈	6 ¹ / ₂	38	Walnut
1	Seat front rail	1 ¹ / ₁₆	2 ¹ / ₁₆	23 ³ / ₄	Ash*
1	Seat back rail	1 ¹ / ₄	2 ⁹ / ₃₂	23 ³ / ₄	Ash
1	Back top rail	1 ¹ / ₁₆	2 ¹ / ₁₆	21 ³ / ₈	Ash
1	Back bottom rail	1 ¹ / ₄	2 ¹ / ₁₆	21 ³ / ₈	Ash

Seat: Overall frame width 24"; rail shoulder to shoulder 21³/₄". Back: Overall frame width 21⁵/₈"; rail shoulder-to-shoulder 19³/₈". *Any hardwood will do



SIDE PATTERNS
One square = 1/2"

fit to your frame – there's no room for "personal space" in this relationship. The backrest needs a hinge bolt hole drilled through its side while the seat frame needs a shallow dado for the hinge leaf to nest into. Careful transferring of these locations from the patterns to the parts is important.

For the backrest frame, transfer the center point for the hinge bolt onto

the part. Because the pattern needs to be reversible, I drill a 1/16" hole in the pattern at the drill press to keep it dead square. I mark the center with the same nail as I tack the pattern on with. Once it's marked, remove the pattern.

At the drill press, countersink a hole 15/32" deep with a 9/16" drill bit to match the screw head's diameter. With the part still clamped in place, remove

the bit and install a 3/8" bit and drill a through-hole for the shoulder of the screw. Do a practice run on scrap so you know you have the right clearance to remove one bit and install the other.

For the seat frame, transfer the hinge-leaf dado lines across the edge of the pattern onto the stock to the depth of the hinge (which is 3/16"). Do this on both edges. Then remove the pattern and connect one side of the dado lines.

Align your hinge hardware to this line and knife in a line on the opposite edge of the hinge to define the exact width. With a backsaw, carefully saw to the lines just as you would saw a tenon shoulder.

Excavate with a chisel, followed by a router plane, to level the bottom. Set the hinge leaf about 1/64" below the surface. Because much stress is exerted in this area, make the fit dead on. You don't want any wiggle room, so take your time.

One more time.
Transfer the hinge dado location before removing the pattern





Consistent spacing is key. Make a spacer to maintain the correct distance between frame parts when installing the hinge hardware.

Spaced Out

To make things work together properly you need a precise offset of $\frac{5}{16}$ " between the seat frame and backrest frame sides at the hinge location. To achieve this, make a $\frac{5}{16}$ "-thick spacer that straddles the hinge leaf.

Put the hinge bolt in the backrest frame side and mount the hinge leaf on the bolt. Set the hinge leaf in its corresponding dado.

With the spacer in place, mark the screw centers and drill pilot holes. I suggest doing one or two at a time in case you don't get the center dead on. You can correct the hinge location slightly by offsetting the other pilot holes. Then remove the hardware and label each part to match its location.



Let your block be your guide. Perfectly square is your aim, because the pattern will need to be reversible.

Take the Plunge...Or Don't

You're ready to make your mortises. You'll need a plunge router equipped with a $\frac{3}{4}$ " guide bushing and $\frac{1}{4}$ " upcut spiral bit.

Another approach is to use the router template patterns to transfer the center points of the mortise locations, then mark a centerline and drill out the mortise waste along it.

Using the second set of frame side patterns, make a template guide for your plunge router. Adhere this pattern to an oversized piece of $\frac{1}{2}$ "-thick MDF that measures approximately $11\frac{1}{2}$ " x 41" – this size provides plenty of support for the router.

Notice that the $\frac{1}{4}$ "-wide mortise locations on the pattern are outlined by a $\frac{3}{4}$ "-wide dashed line. This line is what the $\frac{3}{4}$ " guide bushing on the router will follow when making your mortises. Use a $\frac{3}{4}$ " Forstner bit to drill out both ends of this guide area. Using a smaller bit, drill out the waste in between. Then use a chisel along with a 90° guide block (to help keep your chisel perfectly vertical) to remove the remaining material. It's critical to keep the walls vertical because the template will be reversed in use.

You'll need to create some registration pins to align your side frame parts to this pattern. I use $\frac{1}{4}$ " dowels, but other sizes would work, too. Again, because this pattern will be reversed and must be dead-on, drill the registration

pin holes at the drill press at locations close to what is shown below, center.

Initially, drill three registration pins on the pattern: one at the tip of each side frame and one above each mortise location at the frame edge. Register the side-frame part on the template against the pins and use the edge of the part to locate the exact locations for the remaining pins – one below each mortise and one at the opposite end at the "foot." Now you should have a nice tight fit all around.

With your side frame parts in place, turn the workpiece over and clamp it to the benchtop. You're ready to rout.

If your template slot has any play, make sure to keep the guide bushing pressed against the side nearest you. Now plunge a series of slightly overlapping holes at full depth from left to right. Then take one full-depth pass from right to left. This will give you a clean mortise with a consistent width.

To rout the opposite side, simply push the dowel pins through and flip the pattern over then repeat the process. The beauty here is that even if your template is slightly out of alignment, both sides of your frame parts will have the same error, thus virtually eliminating any twist in the final assembly.

Paper Cord at Play

Danish paper cord – the seat and back material in this chair – is most often recessed in such a way that the sur-



Like a rat in a cage. Let the dowel pins "trap" the part in place.



Plunge away. With the parts "trapped" in place, flip the workpiece over and clamp it down.

Boundary marks.
Use your patterns to locate the boundaries of where the weave recessed area will stop.



Connect some of the dots. Knife in the weave recess boundary lines on the backrest, but not on the seat just yet. Then extend the lines down each edge, registering your knife on a straightedge.



Inside the lines. The cord recess in the seat frame follows a specific pattern; mark it carefully.

rounding wood is approximately level with the cord. In other words, the paper cord is flush to the wood. Note that the edges of the frame patterns are already “notched out” to allow for this.

The sides of the frames need a corresponding $\frac{1}{8}$ ”-deep recess. Using your routing pattern, transfer the locations of the “notches” on the side frame as shown in the photo at left to create boundary lines.

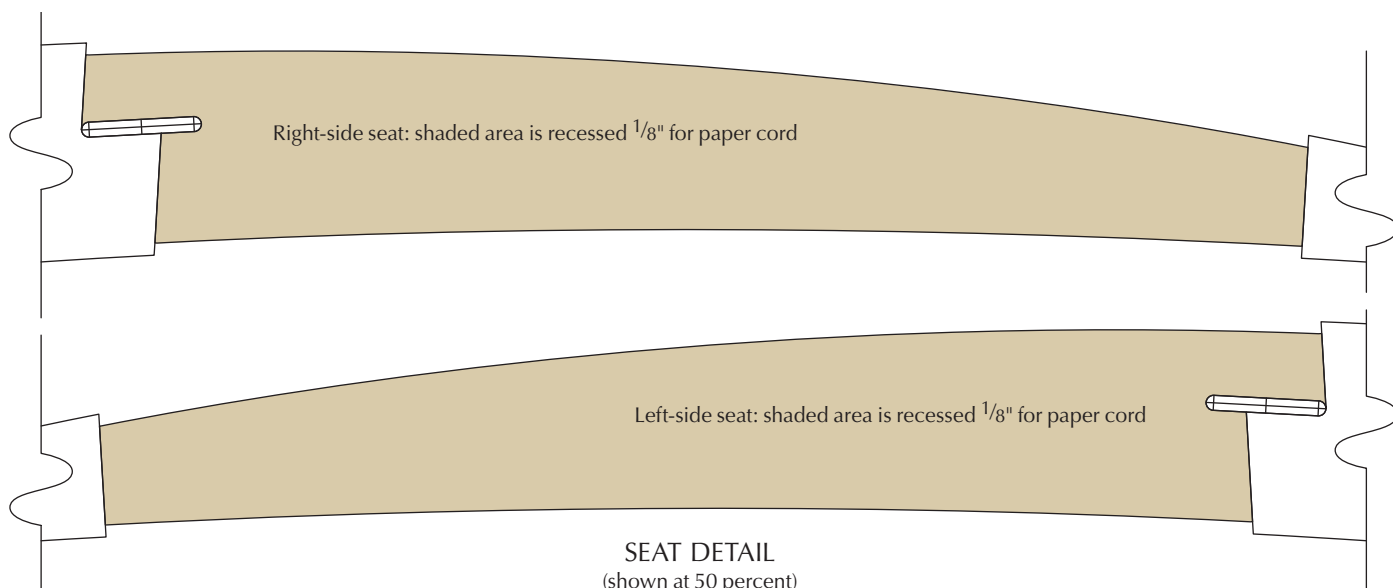
For the backrest, simply connect these marks with a knife to determine the boundaries of the recessed area on the frame sides. Now transfer these lines down each edge, registering your knife against a square.

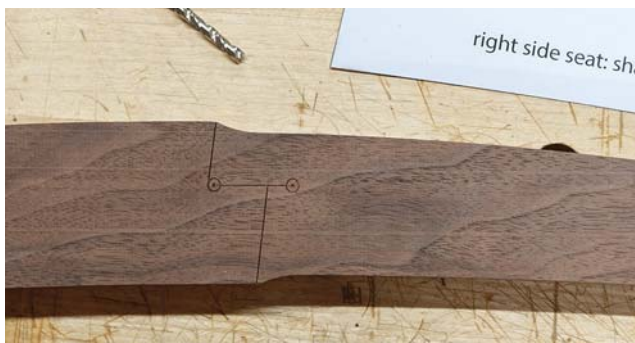
The seat frame is a bit more complex. Download and cut out the full-size seat pattern (or use a copier to enlarge by 200 percent the Seat Detail drawings below) for the paper cord weaving recess. I recommend adhering this pattern to card stock.

Align the pattern’s corners with the weaving boundary lines you marked from the routing pattern. Lightly knife in a line to mark off the boundaries of the recessed area. Using a straightedge, deepen the knife lines accordingly. (See the photo at left.)

The seat side frames need a $\frac{3}{16}$ ” slot in the side for weaving through.

Align the pattern with your boundary lines and prick the center points for both ends of the slot. Drill two $\frac{3}{16}$ ” holes at the drill press. Align a small





Prick & drill. After pricking the centers of both ends of the weaving slot, use a $\frac{3}{16}$ " bit to drill two holes.

Drill guide. Any scrap of hardwood with a square edge will give you a nice reference to drill out a straight slot.



guide block with the edges of these holes and glue it in place with a couple drops of cyanoacrylate glue. Use this as a reference to drill a series of holes. Clean up the holes with a chisel. When you're done, break off the block (easily done with a tap of a hammer).

Rounding the Bend

Don't remove any material from the areas you defined just yet; leave it as support for routing. Most of the edges will be rounded over with a half-round router bit. The exceptions are where the

cross rails meet the side frames; these areas must remain square because paper cord will butt against them once the chair is woven. The area 1" back from the hinge dado up to the back seat rail is also left square (see photo below). Using a $\frac{3}{16}$ "-radius roundover bit, rout all edges on both sides except the "no-go" areas on the insides of the frames.

Now you're ready to remove the recessed material from the sides of the frames. Set up a $\frac{5}{16}$ "-radius roundover bit in the router table with its corner $\frac{1}{8}$ " above the table surface. Use a starting



No go. Leave the areas marked in white untouched by the roundover bit.

Controlled entry. Pivot off a starting pin at your router table to control the start and stop of the cuts.



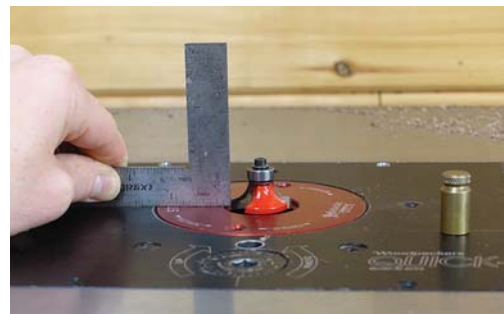
"Simplicity is the ultimate form of sophistication."

—Attributed to Leonardo da Vinci (1452-1519), Italian polymath

pin to pivot from, enter and exit the cut between the recessed weave boundary lines on the sides of the frames. This will simultaneously round over the edge of your weaving area and set the depth of the recess.

To remove the bulk of the remainder of this material, set up a straight bit in the router table $\frac{1}{8}$ " above the table surface. Pivot off the starting pin to remove this material in a sweeping motion from right to left. Start near the end and work your way toward the middle of the frame, a little at a time.

What little waste remains can be removed with a saw and chisel. Saw down $\frac{1}{8}$ " at your cord boundary lines. A few additional crosscuts will aid in chiseling out the rest. Follow with a router plane for a consistent depth if needed.



Critical depth. Set the corner edge $\frac{1}{8}$ " above the table.



Two in one. Rout the cord-recess area to round over the edge and set the depth all in one go (you'll remove the remaining rabbet waste with a straight bit). Stay between the weave boundary lines while routing.



Level weaving field. After routing, remove the remaining material with saw and chisel. A rasp can help remove the material the round-over bit couldn't reach in the corner.



Ease up. Insert some cloth-backed sandpaper into the slot, and ease the top edge.

The inside corners of the recess along the edges of the frame need to be squared. Following the knife line you carried across the edge, saw and chisel out this bit of material.

There will be a square corner remaining that the $\frac{5}{16}$ " roundover bit didn't reach. Use a rasp to round this area up to the inside corner of the recess.

Before you move on, ease the edge of the $\frac{3}{16}$ " weaving slot so that the cord won't have a sharp edge to wrap around.

On the Rails

Because the rails will be covered with paper cord and won't show, you can use just about any hardwood for them. I typically use poplar, but I had some ash lying around that was just the right size so....

The rail at the front of the seat and the rail at the top of the backrest are the same except in length; the seat rail is longer. Dimension $\frac{5}{4}$ lumber to $1\frac{1}{16}$ "

x $2\frac{1}{16}$ ". The seat rail is $23\frac{3}{4}$ " long; the backrest rail is $21\frac{3}{8}$ ". The $\frac{1}{4}$ "-wide tenon is offset $\frac{5}{16}$ " from one face.

Mark out and saw these tenons as show in the drawing on page 31, making sure both ends have the tenon offset to the same side. Shape the edges of the tenons round with a rasp rather than squaring the mortises.

Fit the tenons to their frames while keeping the offset oriented according to the patterns. Note which tenon goes to which mortise, and mark it directly on the parts for future reference.

It's important that the tenons on both ends are coplanar, otherwise your frame will be twisted once it is assembled. I like to use a router plane to reference off one face of the stock to adjust the cheek of each tenon to the exact same plane. Then I adjust only



Measure twice, slot once...I mean twice. Shown here are the weaving slots for the top and bottom rail of the backrest.

SUPPLIES

McMaster-Carr

mcmaster.com or 330-995-5500

1 ■ Brass bar, $\frac{3}{16}$ " x $\frac{7}{8}$ " x 1"
#8954K12, \$13.47

1 ■ Stainless rod, $\frac{5}{16}$ "-dia. x 3'
#89535K86, \$6.93

1 ■ Brass rod, $\frac{1}{2}$ "-dia. x 6"
#8953K174, \$11.99 Each

1 ■ Brass washers, $\frac{3}{8}$ "
#92916A405, \$8.18 per pack

2 ■ Brass shoulder screws, $\frac{3}{8}$ ", $\frac{5}{16}$ "-18
#95446A656, 3.40

1 ■ Stainless steel wire
#92705K17, \$18.01/coil
(Used for weaving; coming in next issue)

Any Hardware Store

6 ■ #14 x 1" stainless steel wood screws

Prices correct at time of publication.

the opposite cheek of each tenon to fit its mortise.

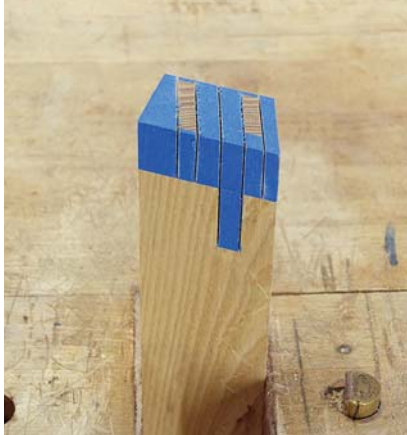
Cut a 10° bevel along one side per the drawing, but wait to round over the edges until all the rails are completed.

The lower rail of the backrest is straightforward. Dimension $\frac{6}{4}$ stock to $1\frac{1}{4}$ " x $2\frac{1}{16}$ " x $21\frac{3}{8}$ ". Mark out and cut 1"-long tenons.

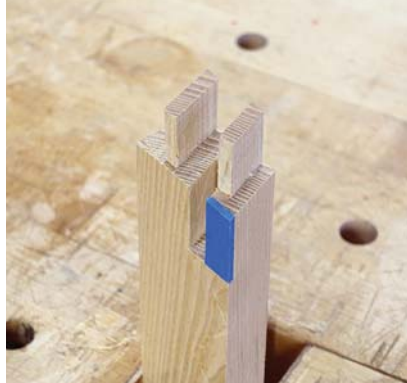
The top and bottom backrest rails need a weaving slot. Technically, it doesn't matter which side these are on, but my measurements below are from the right side as if you are sitting in the chair. Measure $3\frac{1}{8}$ " from the shoulder of the rail and mark out a $\frac{5}{16}$ " x $1\frac{1}{2}$ " slot. This slot is centered front to back on the bottom rail. On the top rail, it is offset $\frac{3}{8}$ " from the unbeveled side. Drill out this slot and clean it up with a chisel, then ease the inside corners.

Now that you've sharpened your sawing skills on the other rails, you're ready to tackle the seat's back rail. It's a complex joint because it includes a weaving slot.

Dimension $\frac{6}{4}$ stock to $1\frac{1}{4}$ " x $2\frac{9}{32}$ " x $23\frac{3}{4}$ ". Cut a 21° bevel along one edge as shown in the Rear Sear Rail Profile drawing (next page). Using this beveled side as a reference face, mark off the tenon locations. I use a marking gage with a double cutter set to the exact width of my tenon; I find marking two



Saw the tenon & slot cheeks. The blue tape defines the waste material to remove.



Cord shoulder. Short saw strokes and sawing at a steep angle will get you most of the way there in removing the cord pass-through waste. Clean up what's left with a chisel.



Step by step. The joint looks complicated, but approach it in steps and it's actually quite easy.

measurements to be more accurate than marking four measurements.

In double-tenon joints it's critical that the distance between them match your mortises exactly. Measure the actual distance between mortises on the chair frame and adjust the lower tenon if needed to correspond.

With the tenon's horizontal locations set, mark an offset $\frac{1}{16}$ " from both sides of the lower tenon to define its overall width. The top tenon will be

offset $\frac{1}{16}$ " on the obtuse side of the bevel and $\frac{5}{16}$ " on the acute side. Mark these tenons at 1" long.

Now it's time to define the weaving slot. One side will be the cheek of the upper (smaller) tenon. Mark a parallel line $\frac{3}{8}$ " down from the inner face of the top tenon cheek. Carry this slot down $2\frac{1}{4}$ ". Now cut the cheeks of each of these tenons and slot. See photos above.

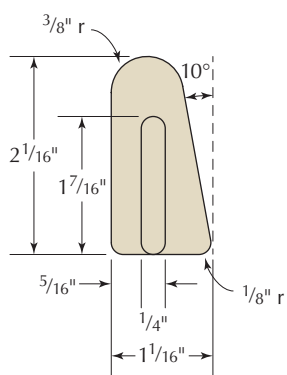
Remove the outside shoulder material with a crosscut saw. Remove the weaving-slot material by freehand-drilling from the bottom of the slot halfway through from each side with

a $\frac{5}{16}$ " bit. The piece should break out easily. Clean up the bottom of the slot with a narrow chisel. What remains in the middle next to the lower tenon can be cut out with a coping saw. Now remove the small amount of remaining waste on either end of each tenon down to the shoulder. Shape the edges of the tenons round with a rasp and test the fit to the frames.

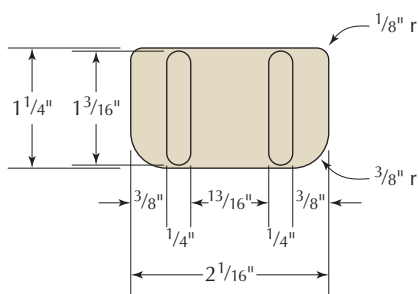
There is a small bit of material – $\frac{1}{8}$ " wide – that must be removed near the weaving slot. This will allow the paper cord to pass through without getting pinched when the chair is unfolded. See photo above, center.

Round over the acute corner of the bevel with a $\frac{3}{8}$ "-radius roundover bit. While you're set up, round over the corners of the other rails according to the drawings. Now ease the edges of the slot with a rasp and blend them into the roundover.

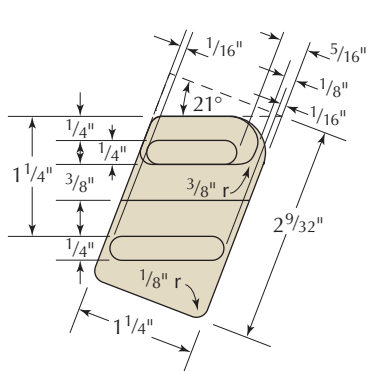
With an $\frac{1}{8}$ "-radius roundover bit finish easing all the remaining edges on the crossrails as indicated in the drawings.



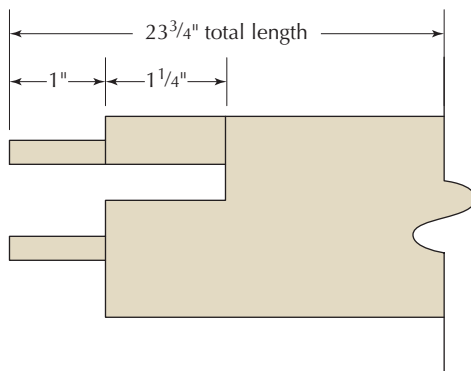
FRONT SEAT RAIL & BACKREST TOP RAIL PROFILE



BACKREST BOTTOM RAIL PROFILE



REAR SEAT RAIL PROFILE



REAR SEAT RAIL ELEVATION

Twist & Shout

Here's where the rubber meets the road. If you did a good job on the joinery, it will show here. Dry assemble both the frames and lay them on a flat surface, such as your table saw. There's no simple solution to fixing a twist in a frame, but likely issues will be found in tenons and/or mortises that are not coplanar. Also, make sure your sides are parallel so they don't rub when the frames are opened and closed.

Once you're happy with the fit of the frames, it's time install the two stainless

steel weaving bars on the seat frame.

These bars run from the front rail to the back rail, one on both sides of the seat. On the back rail, measure $33\frac{27}{32}$ " from the inside of the frame and $\frac{3}{4}$ " up from the bottom edge, and mark a point to start your drill bit.

Do the same on the front rail, but measure $\frac{7}{16}$ " up from the bottom edge.

Now drill a $\frac{3}{8}$ "-diameter x $\frac{7}{8}$ "-deep hole, keeping the drill in line with the hole location on the opposite rail.

Sand all the parts now, but be careful to not remove material from the areas where the cross rails meet the

side frame. Completely dry-assemble the chair with the weave bars and hinge hardware, then check to ensure everything moves freely. Make sure to include the washers between the hinge leaf and the backrest frame.

When you're happy with the results, glue each frame assembly separately and set them aside on a flat surface to dry—and don't forget the weaving bars.

A Little Support, Please

To reduce the stress on the hinge, install the two support pins you made earlier. These go in the backrest legs and make

contact with the rear seat rail's bottom edge when the chair is opened. Thus, the seat's downward force is partially supported on these pins.

To find the pin locations, assemble the chair completely, including the hinge hardware, and unfold the assembly.

Insert a $\frac{1}{32}$ "-thick wooden spacer between the back rail and the leg of the backrest frame on both sides. Locate the pin hole's center point by simply resting a $\frac{1}{2}$ " bit against the bottom edge of the seat rail and marking the center of the backrest leg.

If your drill bit is long enough, you can simply free-hand drill this hole by aligning the drill shaft with the rail's bottom edge. If not, you'll need to make a drilling angle guide out of a piece of wood approximately $\frac{3}{4}$ " x $\frac{1}{4}$ " x 6". Align this with the bottom edge of the seat rail and clamp it against the leg of the backrest. Partially open the frame and drill this hole 1" deep while using your angle guide to keep the correct orientation. Glue the pins in place, close the frame and let them dry.

Separate the seat and backrest then finish as desired. I've taken a liking to Osmo hard-wax oil floor finishes. For light-colored hardwoods such as white oak or beech, a traditional Danish soap finish is lovely.

Now get in the shop so you can build the frame before the next issue is published; in it, I'll show you how to weave a traditional paper cord seat. **PWM**

Caleb is a toolmaker and furniture maker in Greenville, S.C.

Follow the arrow. A bit of painter's tape with an arrow to align your drill with is a big help



Support pin support. A thin spacer and a stick of wood will aid in drilling your support pins. The stick is the angle guide.



Angle guide. Open the frame and drill using the angle guide for orientation.



Interior view. Here's what the frame looks like from the inside, with the weave bar and seat support pin installed.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/jun17

WEBSITE: See more of the author's furniture – and his wooden handplanes and other tools – on his website: calebjamesmaker.com.

PATTERNS: Download full-size patterns for this folding chair.

IN OUR STORE: "Chairmaking & Design," by Jeff Miller.

Our products are available online at:

■ ShopWoodworking.com



FRENCH POLISH SIMPLIFIED

BY ALFRED SHARP

Plus: Add a touch of glaze to create a century (or more!) of wear.

Shellac forms the basis for one of the finest wood finishes ever devised—French polish. The soft, smooth luster appears to be more like highly polished wood than a thick, plasticity coating. Add some judicious glazing, and you can create a finish that rivals the patina of a fine old antique. Much has been written about French

polishing, and a lot of that material makes the process seem more difficult than it really is. Some nontraditional procedures I'll introduce can make the process go a lot faster. I'll try to cut through the mystique and convince you to give it a try.

First you must obtain shellac—and here's where some of the confusion be-

gins. There are a dozen or more varieties of shellac, ranging from not very refined to highly refined. If you're just starting out, it's better to go with the more highly refined varieties. These range from orange shellac, which imparts a distinct amber cast to your finish and can be very nice on darker woods, to super platinum, which is nearly clear

and suitable for lighter woods (or any situation where you don't want the finishing material to impart any color).

Among the refined types, there are waxed and de-waxed varieties. There are advantages and disadvantages to each – see “Waxed vs. Dewaxed Shellac” on page 35. By now, most of you probably know that shellac is not, as legend has it, the fecal matter of a beetle, but rather its nesting material. Conceptually it's closer to silk, or a spider's web.

It's much better to dissolve your own shellac flakes. Liquid shellac goes bad after three to six months, and fresh shellac works much better. Zinsser makes a high-quality pre-mixed shellac, but it's difficult to determine how

long it has languished on the store shelf. If there's any question as to the age of shellac you're about to use, here's how to test it: Dip a stick into the shellac, wait 15 minutes and dip it in again. Set the stick aside for 45 minutes or so. After that if the shellac coat is not hard or is able to be marked with your fingerprints, it's no longer useful.

Methanol, or wood alcohol, was formerly used to dissolve shellac, but it has been determined to be quite harmful to your health, so now denatured ethanol is commonly used. Buy a quality brand of alcohol because some brands have too much water in them. Industrial-grade isopropyl alcohol is a better solvent. And don't use common rubbing

“Whatever it takes to finish things, finish. You will learn more from a glorious failure than you ever will from something you never finished.”

—Neil Gaiman (1960-),
English writer

alcohol – it has far too much water in it.

I mix my shellac to a 1½-pound cut, which means that 1½ pounds of shellac is dissolved into a gallon of alcohol, or the proportional equivalent. The solid shellac flakes are mixed into the alcohol and allowed to dissolve overnight, with occasional stirring. Filter the resulting liquid carefully, because all sorts of foreign material (including bug parts!) generally makes it through the manufacturing process. The liquid will seem to be no more viscous than water, but it contains plenty of covering power. I keep my shellac in an old wine or beer bottle; you'll see why later.

French polish is applied with a pad. The nature of the pad is another source of voodoo shellac lore. Many sources recommend linen with a wad of natural wool in the middle. I've found all this unnecessary. Use 90-pound weight, lint-free cheesecloth and forget the wool. Make a very firm, crease-free ball between the sizes of a golf ball and a baseball, depending on the area you're going to polish. Make two pads: one for the pore-filling steps, and another for the polishing steps.

Fill the Pores

Usually on open-pored woods such as mahogany, walnut, ash or oak, you'll need to at least partially fill the pores so the final surface is smoother. One of the great advantages of French polish is that you can accomplish this step without resorting to paste wood-grain fillers – a product I find disagreeable to work with.

To fill the pores, I rely on three materials – shellac, boiled linseed oil and pumice or rottenstone. I prefer pumice because it is more abrasive than rottenstone, and thus smooths the wood as you work. The tiny wood fibers created by this abrasive action mix with the



Just add alcohol. Liquid shellac goes bad after about six months, so I recommend dissolving flakes in denatured alcohol as needed.



Polish pads. Make two pads out of tightly folded 90-pound lint-free cheesecloth; secure the pads with rubber bands.





Shake it out. I dispense the tinted pumice from an inexpensive salt shaker.



Bottled & ready. I dispense the shellac from a beer or wine bottle; that makes it easier to control the amount that goes onto the pad than dipping into a Mason jar.

other components and become part of the slurry that fills the pores. Pumice is white in color, though, and because it is part of the pore-filling material, you'll need to color it. I do this by adding a little bit of brown, alcohol-soluble aniline dye powder to it, and put the mixture in a salt shaker.

To start, dampen one pad with some alcohol. It doesn't need to be very wet at all; if you can press on it and any liquid oozes to the surface, then it's too wet.

Add a light smear of boiled linseed oil to the working surface of the pad, then place the pad tightly over the mouth of the shellac-filled wine or beer bottle and tip the bottle, holding it upturned for a second or two to add some shellac to the pad. Sprinkle a little pumice on the wood surface and, using firm pressure, work the pad around in a circular motion, covering about six square inches.

Increase your pressure and go over and over the covered area. If the pad seems to start dragging, just press on.

After a couple of minutes, move on to an adjacent area and repeat the process, lapping your strokes over the previous area. Don't worry if you see some build-up of slurry on the surface, but try to reincorporate it into the surrounding areas.

This process continues until you've covered the entire surface. Each time you move to another area, add a touch more oil, shellac and pumice. If you want a truly poreless surface, you'll probably need to repeat this entire

process after 20-30 minutes.

Once this process is complete, wait 30 or 45 minutes, then, if any residual sludge remains on the surface, sand with #280- or #320-grit sandpaper. Work carefully and remove any slurry that has built up too much on the surface of the wood. Wipe down the results with a clean, soft rag.

Polishing Out

After the pores are filled, it's time to begin building the polish. Put the pumice away; you're done with it. If you're using waxed shellac, you can put the linseed oil away as well. The natural wax in the shellac acts as a lubricant in the process. If using dewaxed shellac, you'll need to keep adding small amounts of linseed oil to your pad.

Let's assume you're going to use dewaxed shellac (see "Waxed vs. Dewaxed Shellac" below). Start with a fresh pad. Dampen it with alcohol,

add a touch of linseed oil and use the upturned bottle of shellac just as you did when filling the pores. This time, however, you're not going to use a circular motion while applying the polish.

The proper application of French polish takes some practice. The stroke is somewhat like landing, then taking off an airplane. You want to swoop down on to the surface in a pendulum-like motion, slide along the surface, then swoop off in the same way at the end of the stroke. Ideally, the touch-down and take-off points are right at the beginning and end of the part you're polishing. This motion is best done in a straight line with the grain wherever possible.

Go over the same area two or three times before advancing the pad by about three-quarters of its width, then doing the same thing again. At the beginning, use light to moderate pressure. Once you begin to feel the

WAXED VS. DEWAXED SHELLAC

So how do you choose between waxed and dewaxed shellac? As noted above, waxed shellac offers enough lubrication to the process that no other oil need be used. A downside to waxed shellac is that it's somewhat more prone to watermarking and heat-related damage. Also, if you plan to use any other finish over a shellac sealer coat, waxed shellac is likely to interfere with the adhesion of that finish – so definitely use dewaxed shellac if that's the case. The disadvantage of dewaxed shellac is that it needs oil in the polishing process. As the coats build up, so does a hazy oil "slick" that obscures the appearance. When you're finished applying polish, you have to "spirit off" the oil with nothing but alcohol, a process that has a chance of marring your perfect surface.

—AS

pad starting to drag a bit, don't stop, but lighten your pressure and increase your speed across the surface. After a stroke or two, the pad will begin to skate as if it's on ice, and the polish will begin to shine. Rejoice!

Depending on the length of the area you're polishing, you should be able to advance the pad two or three times before you begin to run out of shellac. Recharge your pad with shellac, but no oil, and proceed across the surface you're working on. Work back across the area you've already covered as well, blending in all the strokes. Add a touch more oil after three or four applications of shellac.

Too much oil won't hurt the process, but will make spiriting off more arduous at the end. With too little oil, you'll begin to see the finish galling up as you stroke. It's a feel thing that comes with practice.

So now you have one or two pore-filling coats and a polishing coat. It's at this point you would want to do any glazing (described below). The thickness of everything you've put down is probably less than a half-mil (one thou-

sandth of an inch). This is why a good French polish often takes 12-20 coats.

Time-saver

If time is short, here is where I introduce an unorthodox time-saving step: Spray on two or three coats of shellac. A 1½-pound cut sprays just fine with any type of apparatus. The spraying technique is the same as you would use for any other material. (See "Guerrilla Guide to Spray Finishing in issue #224 if you need instruction.)

Shellac's fast drying time means it won't pick up much trash, but you can sand with #320- or #400-grit paper between coats if you feel the need.

Shellac blushes easily in humid conditions, or if there's too much moisture in the air lines, so plan accordingly. It's fairly easy to polish out blush using the pad technique and a little alcohol. Let the spray coats dry overnight, then sand the last spray coat well with #320- or #400-grit paper.

Finally, pad polish the surface two or three more times and revel in the beautiful glow you've created.

However, if you've been using boiled



Just add color. Light tan in color in its basic form, heavy-bodied glaze can be colored to suit your needs. Note: Untinted glaze is available from professional paint and finishing stores.

linseed oil to lubricate the process, you may have a hazy "oil slick" left on the surface. Remove as much as you can with mineral spirits or turpentine, then "spirit off" the rest.

This is done with a fresh pad, lightly dampened with only alcohol, using the same padding motion used to apply the shellac. Be careful not to spend too much time on one area, because that might begin to mar and remove the polish. It might take more than one session, waiting a couple of hours between them, to completely remove all the residual oil. Like the polishing, this takes some practice.

Glazing

Glazing adds character to a finish, visually pops any carving and can create the appearance of an old patina. It's done with a product called heavy-bodied glaze, which is very finely ground silica in a slow varnish vehicle. (This product is different from gel stains or toners, in that it has body that the others don't.) The basic material is light tan, but you can color it with Japan colors or other coloring products. I usually have black, brown, red-brown, yellow and grey glazes mixed up. You can also buy ready-mixed tinted glaze.

Glaze is such a versatile medium, that this article can't begin to cover all of its possible applications – so I'll



Take off & touch down.

Padding on shellac involves a motion that might take a little practice. Swoop down from off the end of the board, move the pad in line with the grain and swoop off at the other end.





Brush on. Apply a heavy, wet coat of glaze using a natural-bristle brush.



Wipe off. After 10-30 minutes, rub vigorously with a clean rag to remove as much glaze as possible from the high spots, allowing it to remain in low spots and crevices.



Dry brush. This process is done with an artist's dry brush, one with particularly soft and poufy bristles. The brisk motion is very much like dusting something, the brush just barely touching the surface. Like padding on shellac, this technique takes practice – but the visible results will tell you a lot about your progress.

just get you started with using it to add contrast to your work.

As mentioned above, the glazing step takes place after you have put down the first polishing coat of shellac – and when the glaze is dry, you'll finish with several more shellac coats.

First, scoop out some of the silica from the can you bought it in. Add mineral spirits, naphtha or turpentine (I prefer turpentine) until you have the consistency of cream (the kind you pour in your coffee). Then add your color. You'll want a pretty strong contrast with the background wood – dark brown is my most used hue.

In most situations I apply glaze with a soft natural bristle brush. Apply a generous amount to the entire

surface, and rub it into all the crevices and deep spots of any carving. Wait 10 to 30 minutes, depending on ambient temperature and humidity, until the glaze has lost its glossy appearance (that is when it has “flashed off”).

Then vigorously wipe off most of what you applied, being careful not to pull too much out of the deeper spots of carving or transitional areas such as where mouldings shift planes. The goal is to remove all the glaze from the high spots, creating an enhanced contrast.

Don't worry if what you have at this point still looks a bit raw and cartoonish. After another 10 to 30 minutes, dry-brush all the areas with your remaining glaze, merging and softening the transitions from glaze to ground.

At this point the glaze should present a very matte appearance and your overall results should look quite – maybe too – dramatic. Subsequent finish coats will serve to soften the effect.

After eight to 12 hours, apply more polished or sprayed layers of shellac – finishing up with at least a polished coat or two.

While dewaxed shellac is less prone to watermark, any shellacked surface will mar if liquid is left to sit on the surface long enough. So top off your work with a thin coat of quality paste wax.

Congratulations; you have mastered a beautiful, time-honored finishing technique (and learned how to save a little time in the process). **PWM**

Alf is an award-winning furniture maker. His work is in numerous museums and he's been featured in (and written for) many publications.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/jun17

WEBSITE: Visit the author's website at alfredsharp.com for a look at his museum-quality work in both traditional and contemporary styles.

INTERVIEW: Read our interview with Alf Sharp.

IN OUR STORE: “Create a Newport Tea Table with Alf Sharp,” available as a video download or on DVD.

TO BUY: “Router Tricks for the Period Woodworker with Alf Sharp,” available as a video download or on DVD.

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Dovetailed Dustpan

BY CHRISTOPHER SCHWARZ

Forget plastic or metal pans – a wooden one looks nicer and works better.

Some time during the last 25 years of prowling around workshops, museums and antique stores, I spotted a wooden dustpan. The encounter made me slap my forehead – why do I have a plastic pan when I could build a wooden one from scraps?

After studying commercial dustpans and making a prototype, I settled on this design. It's lightweight, easy to build, stands upright on its own and the pan pivots snappily on an axle that runs between the two sides.

It's also a great way for a beginning dovetailer to practice the joint. Whether your joints are perfect or perforated, they will end up in the dustbin.

How it's Built

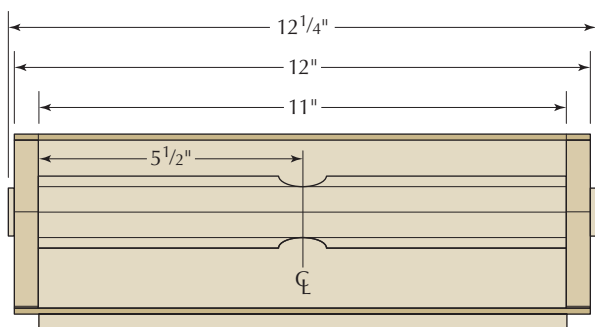
The two sides are joined to the back piece with through-dovetails. An axle passes between the two sides. The dustpan's handle is tenoned and wedged into the axle.

The assembled sides and back are then clad with $\frac{1}{8}$ "-thick hardboard. The bottom of the pan is beveled on its front edge so you can pick up fine dust. A half-dowel on the underside of the pan ensures the front edge of the pan will contact the floor.

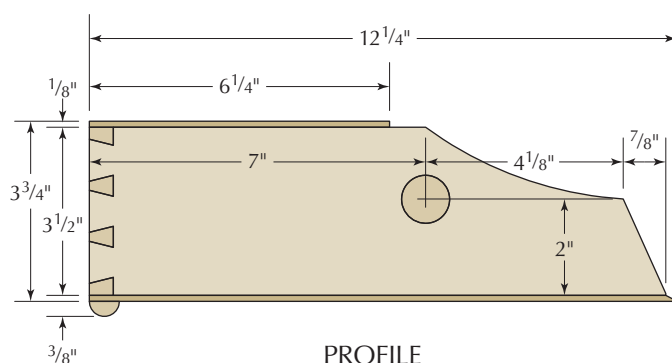
Sides & Axle

After you cut your stock to size, lay out and cut the cove and bevel shape on the

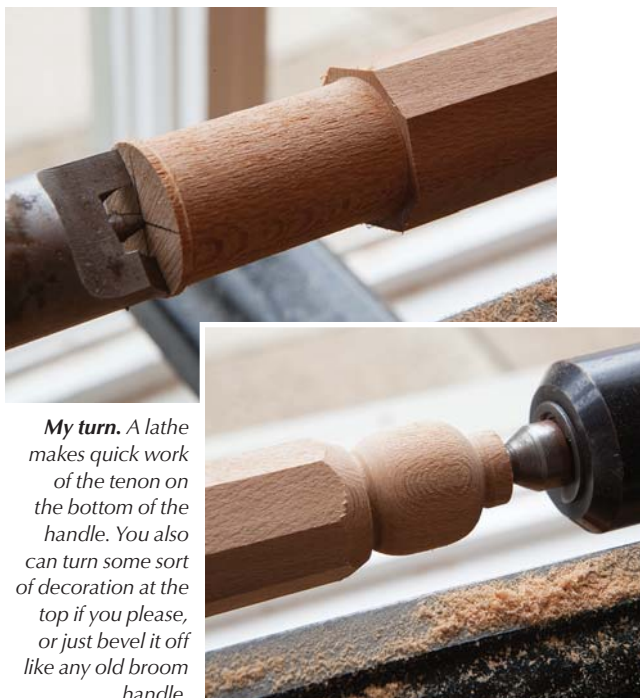




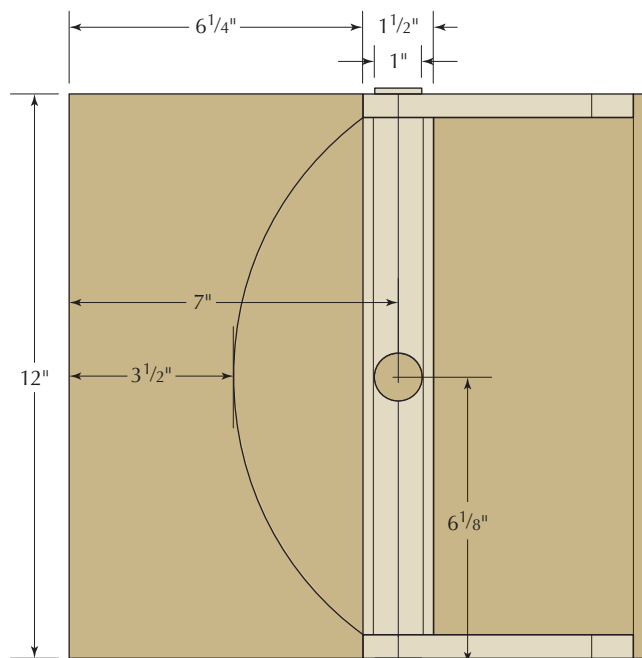
ELEVATION



PROFILE



My turn. A lathe makes quick work of the tenon on the bottom of the handle. You also can turn some sort of decoration at the top if you please, or just bevel it off like any old broom handle.



PLAN

sides of the pan, using the construction drawings as a guide. Drill the 1"-diameter hole through both sides that will accept the axle. It's best to bore the 1" hole through both pieces simultaneously to ensure they align.

The axle is a scrap that I cut to an octagon (I like facets). Then I turned 1"-diameter x 5/8"-long tenons on both ends. These tenons will rotate in the holes in the side pieces.

If you don't have a lathe, a simple solution is to make your axle 11" long and bore 1"-diameter holes into each end of the axle. Then glue 1"-diameter dowel pieces into those holes— instant tenons.

Now drill a 1"-diameter hole through the midpoint of the axle to accept the tenon on the handle.

Handle

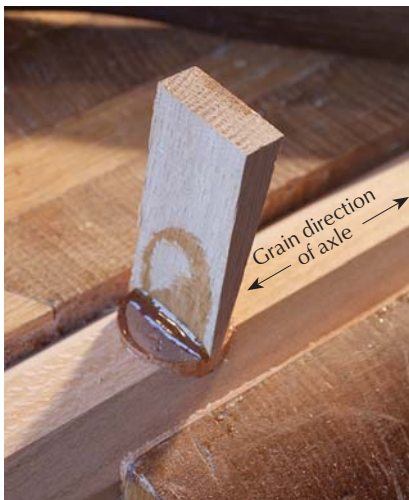
My handle is a scrap of sycamore that I cut into an octagonal profile with a jack plane (followed by a smooth plane), then I turned a 1"-diameter x 1 5/8" tenon on one end, and a decorative sphere on the other. If you don't have a lathe, you

can buy a replacement broom handle. These usually have a tenon that is 1 5/16" in diameter or 1 1/8". So you'll need to make a different-sized hole through the midpoint of the axle if you go for the store-bought handle.

Now assemble the axle and handle.

Dovetailed Dustpan

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
2	Sides	1/2	3 1/2	12	Walnut	
1	Back	1/2	3 1/2	12	Walnut	
1	Top	1/8	6 1/4	12	Hardboard	
1	Bottom	1/8	12	12 1/4	Hardboard	
1	Axle	1 1/2	1 1/2	12 1/4	Hardwood	5/8" tenon, both ends
1	Handle	1 1/4	1 1/4	33 1/2	Hardwood	1 5/8" tenon, one end
1	Dowel	5/8 dia.		11		



Permanent wedgie. Note that the wedge is oriented across the grain of the axle. If you orient the wedge 90° in the other direction, you'll split the axle.

I sawed a kerf through the length of the tenon. Then I glued and wedged the tenon into the axle. When the glue dried, I trimmed the wedge and cleaned up the joint.

Dust to Dovetails

There are thousands of tutorials on cutting dovetails out there. So I'm not going to waste precious ink and paper explaining fundamentals you can find in almost any book. But I would like to point out what I consider to be the critical aspects of the joint – so read the captions in “The Finer Points of Dovetails” below.

After the joints are cut, bevel off the interior corners of the tailboard to make the joint easier to assemble. Paint hide

“There are two men inside the artist, the poet and the craftsman. One is born a poet. One becomes a craftsman.”

—Emile Zola (1840-1902),
from a letter to Paul Cézanne

glue on the mating surfaces of your joint. Put the axle in place between the side pieces and knock the dovetails together. Clamp the joint if necessary.

Don't worry too much about square-ness yet. If the pan looks square-ish, let the glue dry.

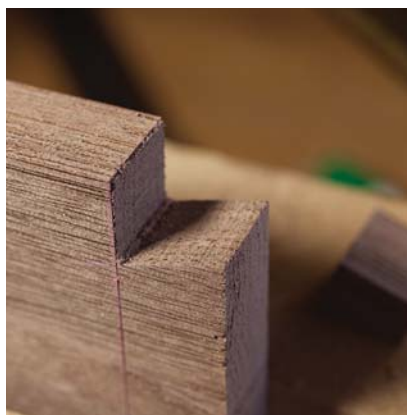
Clad the Pan

After the glue is dry, plane up the sides and back to level the joints and remove

THE FINER POINTS OF DOVETAILS



Gang of two. I gang-cut my tailboards whenever possible. This saves a lot of time and – for beginners – results in the tails' walls being more square. I think three tails looks nice here.



Go for broke. Don't be timid when sawing the half-pin away. Split the baseline so you aren't paring all afternoon.



Start fretting. With thin stock, I use a fretsaw to remove the waste between the tails. Thick stock demands a coping saw or bowsaw. If you cut slowly, you'll be able to saw close to your baseline – saving lots of chopping.



See the side. Chopping the last bit of waste is all about keeping your chisel 90° to the work. So sit to the side of the chisel so you can see when you are at 90°.



Don't be a pinhead. Most dovetail mistakes happen when transferring the shape of one joint to the other. Take your time and take great care. Even after 25 years of cutting this joint, I focus 100 percent at this step.



Slow is much faster. Again, take your time when fretsawing away the pin waste. A little care will save lots of boring chopping.

any bruising. Then check the inside of the pan to see if the corners are square. If they aren't, use a clamp to bring the pan into square (as shown at right) before adding the top piece.

The top and bottom of the pan are tempered hardboard, a friendly engineered panel product made (usually) from exploded wood fibers and boiled linseed oil. You can saw, chisel and plane it like wood (because it is wood).

The top piece of hardboard is curved to allow the handle to pivot a bit more, which makes the dustpan easier to use. Cut the curve with a coping saw and clean it up with a rasp and sandpaper.

Attach the top to the pan with hide glue and #6 x 5/8" panhead screws.

The bottom of the pan is also hardboard. The front edge is beveled off and sticks out in front of the sides 1/4". The bevel allows you to capture fine dust. I planed the bevel on the front edge of the bottom. First I stuck a piece of painter's tape 1/4" from the front edge. Then I used a block plane to create a sharp bevel.

Attach the bottom to the sides and back with hide glue and #6 x 5/8" wood screws.

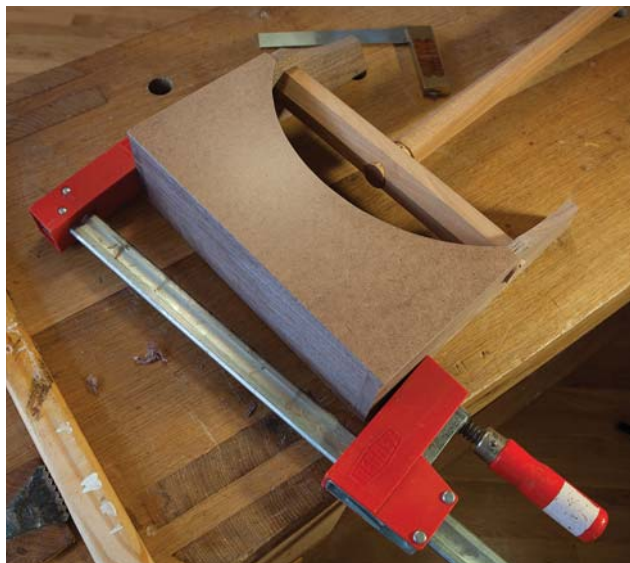
The final construction step is to glue half of a dowel to the underside of the bottom. The dowel ensures the bevel on the front of the dustpan reaches the floor and isn't sitting on debris. I made my half-dowel by planing down a 5/8"-diameter dowel with a jack plane. Then I glued the dowel to the underside of the bottom, right below the back piece.

Finish & Finishing Touches

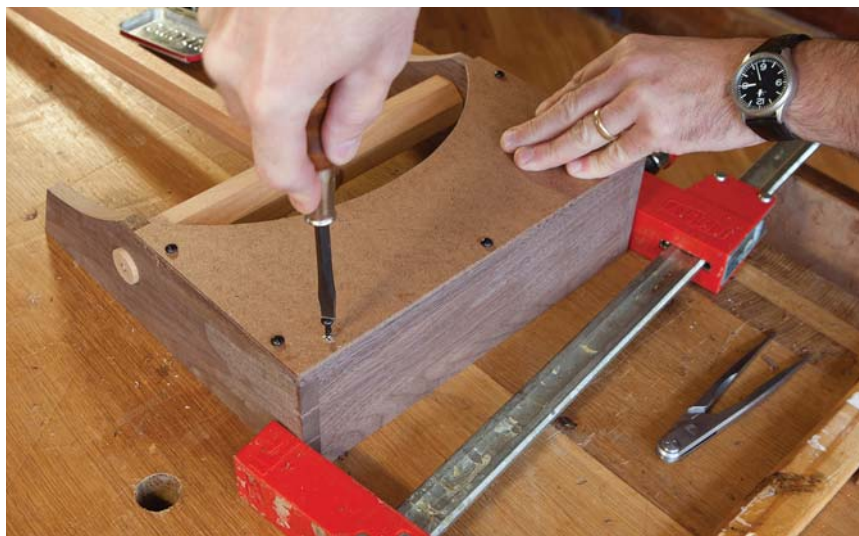
If you want to hang your dustpan on a peg, drill a 1/4" hole through the handle and tie a string through the hole.

If you are going to use this dustpan in the shop, you probably don't need to apply a finish to it. However, I thought the dustpan would look nice enough for the home if I applied an oil finish. Two coats of boiled linseed oil and wax did the trick. **PWM**

Christopher is the editor at Lost Art Press and a bit of a neatnik (though not when it comes to personal grooming).



Offset clamping. Use a clamp to bring your pan into square. For the pan shown here, the joint at the bottom of the photo was more than 90°. The cocked clamp brought things into square.



Screws hold it square. After you drive screws into the back and sides of the pan, you can release the clamp. The screws will hold the pan square.



Bevel edge. A strip of tape helped to guide me as I used a block plane to bevel the edge of the hardboard bottom.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/jun17

BLOG: "Coming Clean About Being Clean," by Christopher Schwarz.

BLOG: A Shaker song for sweeping.

MODEL: Download the SketchUp model for the dustpan from the Popular Woodworking 3D Warehouse.

IN OUR STORE: "The Practical Workshop," by Christopher Schwarz and the editors of Popular Woodworking.

TO BUY: "Good Clean Fun," by Nick Offerman.

Our products are available online at:

■ ShopWoodworking.com



Shedding Light on Compound Angles

BY GREG PENNINGTON

Affordable line lasers and a simple setup make for perfect angled drilling.

I'm a 21st-century Windsor chair-maker. I build chairs using mostly hand tools: froes, drawknives, spokeshaves, travishers, scorps, an adze and other tools that, even in the fast-paced computer age, still comprise the most efficient way to follow the inherent strength of fibers in a tree.

I also drill lots and lots of holes. An average Windsor can have up to 40 holes, and most of these holes are drilled at compound angles, which in part give a Windsor strength, stability and grace. Compound angles can be achieved many ways, such as tilting the table on a drill press, and employing various jigs or bevel gauges and mirrors using sightlines. It's this last method—sightlines—that I have been using for years to drill my chairs, which in turn sparked a method of drilling compound angles with lasers. Yes “lasers.” Not the kind that get you in trouble on airplanes, but very inexpensive line lasers.

Several years ago, I was teaching a student to build a Windsor stool. And as we were setting up the bevel gauges and mirrors to drill the stool's top, he mentioned how hard it was to look at both mirrors and focus on the bevels in two directions. We talked about how nice it would be to look at one spot while drilling these holes, and that's when line lasers popped into my head. Off to the hardware store we went and, sure enough, they had what we needed.

Teaching has been the biggest gift to my career—it keeps me focused on practicing and fine-tuning my methods while bouncing ideas off students who are usually smarter than I am. They always have great input. So in early February 2011, my technique for drilling compound angled holes with lasers was born.

For someone not used to looking at sightlines and bevel gauges, consistently drilling or reaming at the proper geometry is a huge challenge. We used to get close—and for chairs most of the time close is acceptable—but now with the help of lasers my students simply look at two intersecting laser lines on the drill or reamer with a confidence that I've never before seen. And a laser guide setup is inexpensive and simple



Sightlines. Sightlines are based on the rake and splay of a chair leg or arm post.

to set up – believe me, if it were not simple I wouldn't fool with it.

Sightlines

Chairmakers use sightlines to determine compound-angled holes. A sightline is a line that passes through a leg when it appears 90° (vertical) to our eyes. Yes, a right angle in chairmaking! The resultant angle is how much the leg leans forward or back along the sightline. These are based on rake (front to back) and splay (side to side) angles – concepts explained in detail in Peter Galbert's "Chairmaker's Notebook" (Lost Art Press) and Christopher Schwarz's "Compound Angles, No Math" (June 2015 *Popular Woodworking Magazine*, issue #218).

Build Some Laser Bases

First, head to your local hardware store and purchase two cheap line lasers. Your new lasers will have a small magnet on the bottom that will hold them to the bases, and out of the package I had to lap the plastic casing on the bottom of each laser on sandpaper to keep them from rocking. (Did I mention they were cheap?)

I built the rotating bases from scrap hardwood salvaged from the kindling bin. The laser works best sitting 9" off the workbench. Build the base thick for stability. I use a 5/8" dowel that slips

through a slotted hole in the neck with a pinch bolt, and the laser sits magnetized on a metal nut embedded and glued into the pivoting head. I also glued some rubber to the bottom of the base to keep the unit from sliding on the workbench. Once you've built your bases, you are ready for some sightlines.

Make an Angle Gauge

Using a simple 10" x 12" bit of plywood cut nice and square, draw a vertical 90° centerline. Now map out your resultant angles in both directions, on either side from center, with a bevel gauge and label each angle you want to drill above each corresponding line. This is what we will be using to set the lasers before drilling. I like to make a dedicated angle gauge for each type of chair I make.

Layout

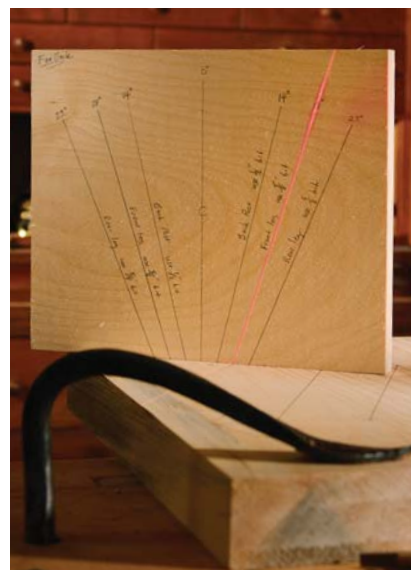
Now it's time to lay out your seat pattern (or whatever you are drilling) with the leg hole locations and sightlines. At the location of each hole to be drilled, draw a short perpendicular line. Set the first laser down the sightline toward the hole at 90° to the seat. Place the second

"There are two things that everyone loves: cats and lasers."

— Bill Hader & Andy Samberg, "Laser Cats" (Saturday Night Live, 2006)



Scrap bases. Rotating bases position the lasers 9" off the top of the workbench, where the laser guides work best.



Angle gauge. Make a plywood angle gauge marked with each angle a project calls for.

laser down the perpendicular line set to the resultant angle. (Just be sure you are leaning in the correct direction.) That's it – simple! This creates the crosshatch – two laser lines – to follow down the hole.

Drill

I use a grind on the tip of my high-speed steel twist bits to give me a long lead point. This creates clean holes and allows lots of freedom to lean the drill for angles without the bit walking across

GRINDING DRILL BITS

This is the process for transforming standard machinist's twist bits into wood-cutting brad-points. I start with high-quality high-speed steel twist bits I purchase from a machinist supplier, Victor Machinery, in New York.

Then I use my wheel dresser to make a shape on the edge of my grinding wheel that will correspond to the wing of the brad-point. Using a coarse wheel for the initial grinding will speed the removal of the material, but any wheel can be used as long as it is well-dressed and used with light pressure. I always make sure that the corner is lower than the flat of the wheel that I use for general grinding. The sharper the corner, the deeper the wings on the resulting bit.

Another factor that determines the function of the bit is the angle that the tool rest is set and the resulting relief behind the cutting edge. I measured the angle of a bit that I used for most tasks and found it to be about 35° (see right). The steeper the angle, the more aggressive the bit; at some point, the edge is too thin to be effective. I always use high-speed steel because it doesn't lose its temper until it is red hot, so a little bluing is fine.

At right is the jig setup that I use while grinding. The simple wood fence positions the bit about 4° off the axis of the wheel. As you can see, it is the side of the wheel that actually forms the center point. By adjusting the location that I clamp the block to the rest, I can adjust the length of the bit's center point. The farther that the fence is to the right, the longer the center point will be.

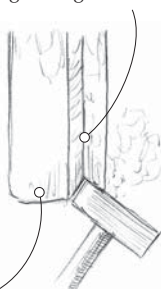
Below is the first cut. I make sure that the existing cutting edge is horizontal and proceed to grind. After a moment, I judge whether the position of the fence is set correctly (left to right) to form the proper point. Of course it's better to have the point be too fat and long because it's simple to move the fence left to remove more material.

Once the wings are formed, you will notice a thin sheet of metal on the parts of the bit that were vertical during the

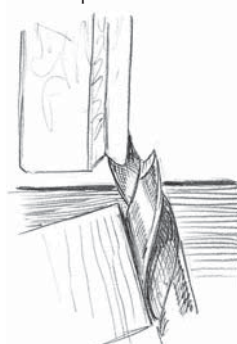
1. Start with a machinist's bit.



2. Dress a notch in the side of the grinding wheel.

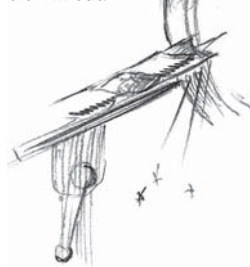


3. Clamp a block at 4° to the axis of the wheel to form the angle of the center spur.



The flat of the wheel is still accessible for other grinding tasks.

The angle of the tool rest determines the rate of feed that the bit will cut.



Steep for hardwoods



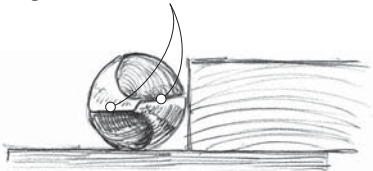
Shallow for softwoods.



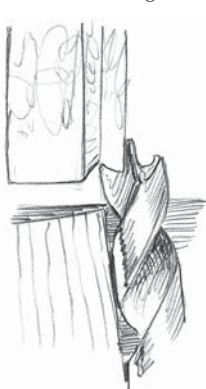
Block control. The block on the tool rest controls the angle that the bit is presented to the wheel.

grinding process. I call these webbing. These are removed using the same setup as the wings, but have a couple of other concerns to be aware of. To start grinding, position the webbing so that it is now in the horizontal position that the cutting edges were in the first step.

For the first cuts to establish the wings, rotate the bit until the cutting edges are horizontal.



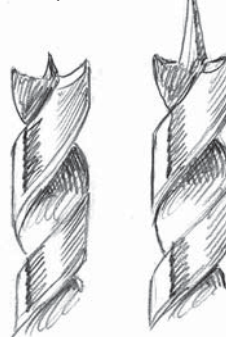
1. Push the bit into the wheel to establish one wing.



2. Rotate it 180° to cut the other wing.



Moving the fence left or right will give a longer or shorter lead spur.



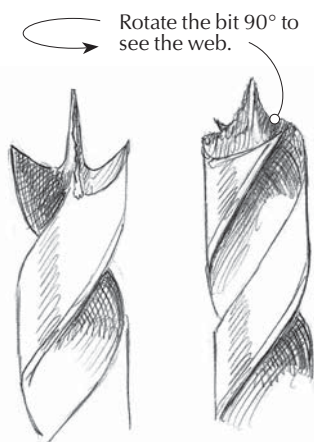
To the point. The first cuts on the bit form the brad point.

The tricky part about grinding away the wings left by grinding the center point is that the wing that is pointing down is dangerously close to the grinding wheel and the slightest encounter will send you back to the beginning. It's not a big deal, but it's better avoided. I avoid hitting it by keeping the wing that is pointing up a little past vertical (toward the grinding wheel). By keeping the wing that I can easily see close to the grinding wheel, I can generally keep

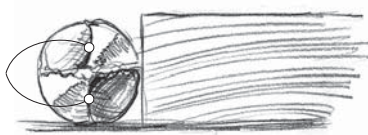
the other one in the clear. The other key to grinding the web is that as I proceed to push the bit into the wheel, I let it come off of the block a bit. This happens quite naturally because as I push into the wheel, the amount of metal that is cut gets greater and the bit wants to slide to the side. You can see the result of this in the drawing numbered 3 below.

—Excerpted from “Chairmaker’s Notebook,”
by Peter Galbert (Lost Art Press)

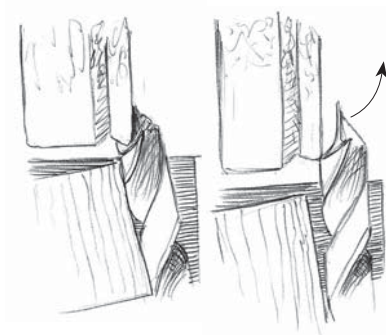
1. After the wings are ground, there will be a thin web of material in the other plane.



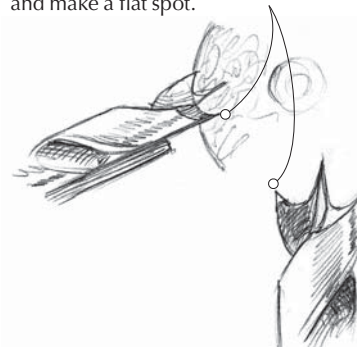
2. Put the bit back on the tool rest and this time rotate the bit so that the cutting edges are vertical.



3. Push the bit into the wheel the same as when grinding the wings, but at the end of the cut, let the bit come slightly off the fence.



4. Extra care must be taken not to let the bottom spur contact the wheel and make a flat spot.



5. Then grind where the webbing was.

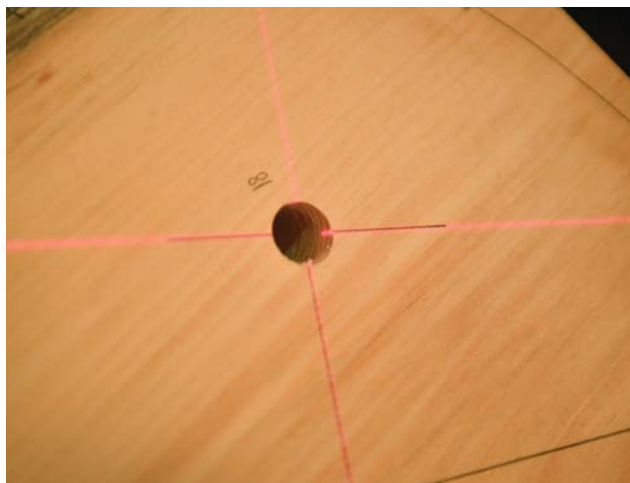


De-web. At right is the bit with the wings ground. All that remains is to remove the web (you can see it in the center of the bit) that has been left by the grinding.

the wood. See “Grinding Drill Bits” at left and above to learn how to achieve this grind yourself.

I use the drill’s casing to help find the center axis of the bit while drilling. You can also draw or create a bull’s-eye on the back of the drill to find center.

Now line up on your crosshatch and pull the trigger. If you do not hear me mention anything else, remember this phrase: “High speed, slow feed.” The drill bit must enter clean at full cordless-drill speed while holding back its full weight and power all the way through the hole. Trust me, this will



Lay out the seat pattern. Use the lasers to create a crosshatch at the angle your drill will follow down the hole.



Bull's eye. Use the drill's casing to find the center axis of your bit.

make much happier holes. Think of it as full throttle on your car while standing on the brake: great control. Practice in scrap wood to get the feel. Finish the hole while watching the crosshatch the whole time. It gets easier each time you perform this operation.

Reaming

The accuracy you achieve drilling with lasers is amazing and simple. It's a confidence builder. But the true magic in Windsor-chair construction is the tapered, reamed leg and arm joint. Laser-guided reaming can fine-tune any misdrilled hole to perfect rake and splay. The setup is exactly the same as

drilling straight holes, but a benefit of hand-powered reaming is greater control in each turn, while still being able to easily see the crosshatch on the reamer's top. Every twist can perfect your alignment. And while perfection isn't critical on a regular chair, for rockers it's beneficial to keep things the same on each side. Same goes for stools with a box stretcher design – balance keeps the box nice and square.

What's Next?

Now that you've drilled and reamed holes with lasers, what else can you do? How about finding true center of a chair before drilling the back? Just

set the laser down the center of the seat positioned 90° to the surface, dividing the chair in two – true center. It floats a line nicely across everything that crosses its path.

Lasers are also handy for finding the center axis of legs and stretchers when drilling. Just shoot the laser from one drive center to the other on the turning, and it indicates at which point to place the tip of the drill, and helps keep the drill perpendicular.

There are many more areas of use waiting to be explored, and I seriously hope you give lasers a try. They may not be for everybody, but a couple of lasers are not a big investment – if you don't like them, just pass them on to a friend. Happy drilling! **PWM**

Greg is a Tennessee-based Windsor chairmaker with more than a decade of experience. He works and teaches classes in a one-room timber frame shop.



Get centered. Lasers can also help you find the center axis of legs and stretchers.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/jun17

WEBSITE: Check out Greg Pennington's website, including his blog, gallery and class schedule.

BLOG: Read Jameel Abraham's unique take on Pennington's laser-guide technique.

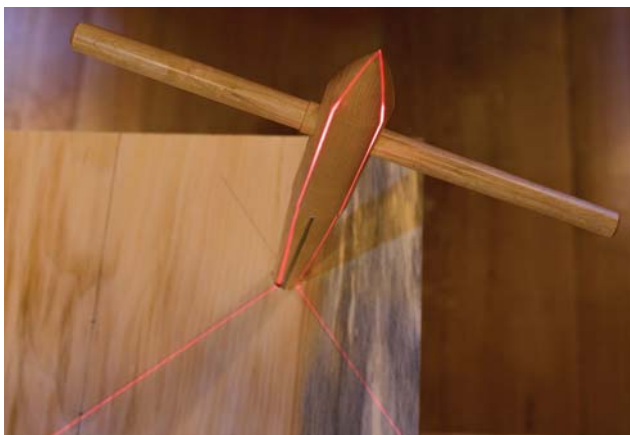
VIDEO: "No-Fear Chairmaking," by Christopher Schwarz.

IN OUR STORE: "Make a Windsor Chair with Mike Dunbar" book.

Our products are available online at:

■ ShopWoodworking.com

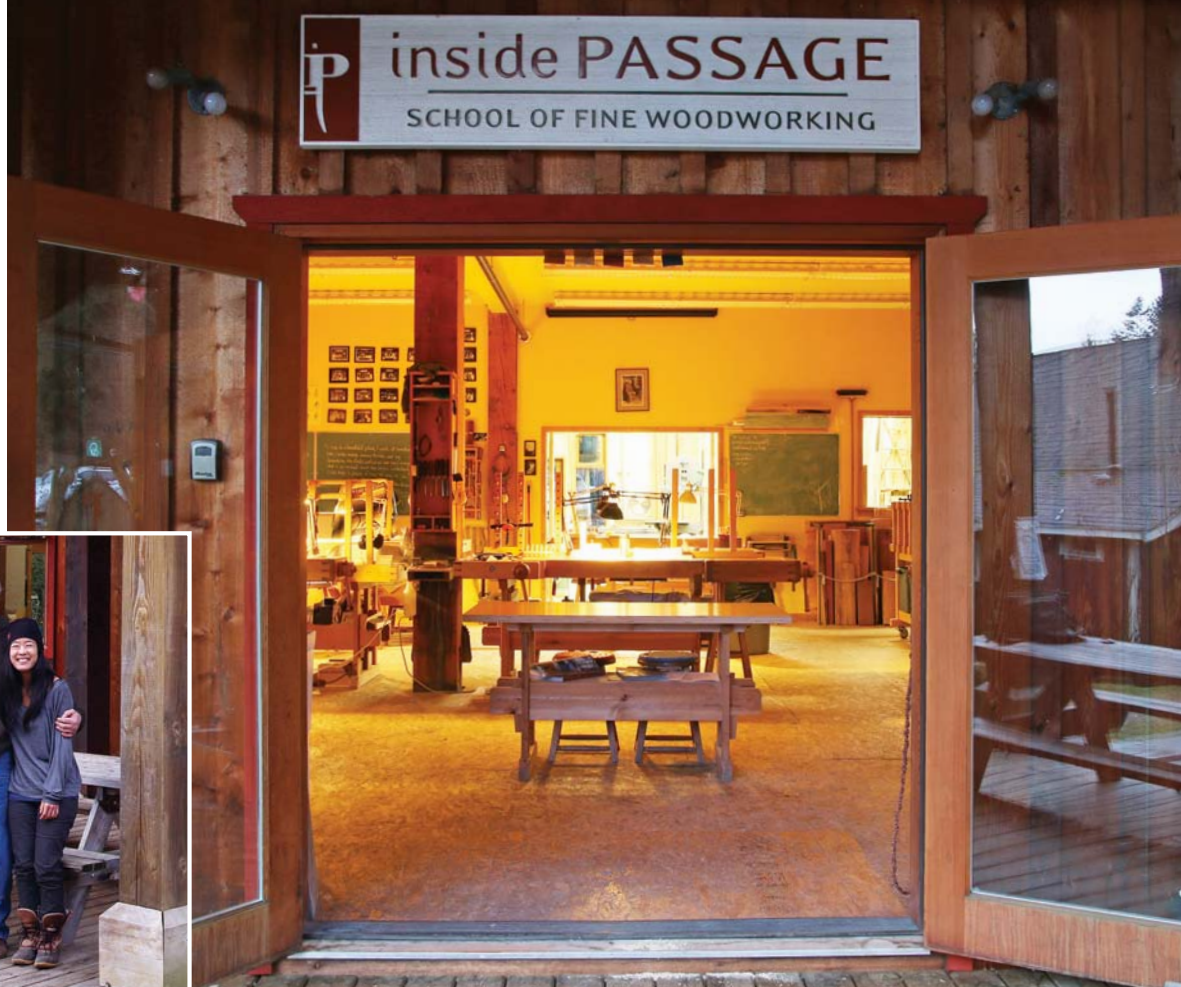
The perfect ream.
Laser-guided reaming can correct misdrilling by setting the perfect rake and splay. Note the crosshatch on the top of the reamer.



**Met with open doors
& a smile.**

At Inside Passage, the doors are open 24 hours for students. The school's founder, at center, is Robert Van Norman; at left is his wife, Yvonne.

At right is Caroline Woon, an exceptional former student, originally from Singapore, who now runs the afternoon sessions at the school.



A School for Impractical Cabinetmakers

BY ASA CHRISTIANA

A gifted teacher
preserves and shares
the legacy
of James Krenov.

To reach the Inside Passage School of Fine Cabinetmaking, you head northwest from Vancouver, B.C., leaving behind the glass-towered city to board the ferry at Horseshoe Bay. Pull up your collar and stand alone on deck as the vessel threads between snow-capped mountains to tie up near the little town of Roberts Creek. For more than a decade now, students from 37 countries have made this brief but beautiful journey, navigating a piece of Canada's vast coastal waterway to

pursue an inner path, one marked out by the late cabinetmaker and educator James Krenov.

The school's founder is Robert Van Norman, a gifted maker and teacher who forged a deep friendship with the older man. When Krenov's eyes began to fail, he so believed in Van Norman's venture that he donated his workbenches, hand tools, machines and entire archive of photos and slides to the school.

"I know the people there," Krenov said at the time. "I like what they are doing and I like very much the way they are doing it. The emphasis is on hand skills, not primitive methods but efficient skills. Work that can be traced to the maker, the hand, the eye and the heart."

Unable to be at the school when it opened but eager to help, Krenov acted as an adviser and gave weekly lectures via speakerphone, which Van Norman recorded for posterity. Today those recordings are a core part of the curriculum, accompanied by slides from the archive.

On the Friday I visited, I sat with students in the bench room, with morning sun flowing in, listening to Krenov's high rasp cover the fine points of solid-wood construction, laughing together at his wry asides, as if he were still with us.

It got quiet when the old master moved from the how to the why: "It's just something that you want to do, do with your hands, your mind and your heart. What we need is more heart in our work. Just live the way you want to live."

Later that morning, Van Norman visited each bench, checking progress and offering guidance. "Robert has this ability to gently help you diagnose your problem and help find a solution, without hurting your self-esteem," said first-term student and "recovering lawyer"

Dave Rush. "He is an incredible teacher."

With four terms running simultaneously – just a few students in each – the rest of the day was a dance of quiet work and collaboration, with students of different levels helping and supporting each other. Occasionally Van Norman gathered a group to his bench for a lesson targeted to their term.

It's a formula and environment he has refined each year since 2005, and the results are undeniable. The student work coming out of this little school is among the best worldwide. Considering that many students start with no experience, the results are even more impressive.

How the school came about is just as unlikely, a story of one life mirroring another and a legacy carried forward.

Van Norman Finds His Calling

Abrupt and standoffish to some, Krenov could be just as supportive and kind to those with the passion to do great work. He must have recognized that spark in the young man who called him from Saskatchewan in 1987.

Working as a shop teacher for at-risk kids, Van Norman had discovered "A Cabinetmaker's Notebook" (Linden), Krenov's collection of profound, personal reflections on working wood that inspired a generation of woodworker-artists. When Van Norman cold-called him, the renowned Swedish-American educator was still at the helm of the woodworking program he founded at College of the Redwoods in Fort Bragg, Calif., but not too busy to encourage a stranger.

Following his role model, who had trained with Carl Malmsten, a founder of Scandinavian furniture design, Van Norman found his own local teacher, a German cabinetmaker in Alberta. Although the commercial cabinetshop was off the path Krenov describes in "The Impractical Cabinetmaker," Van Norman stayed three years, soaking up what knowledge he could and supporting his young family. Finally, he summoned the courage to go it alone, taking commercial jobs at first but soon making only speculative work, starting with a rocking chair that sold for twice what he expected.

Robert and his ever-supportive wife, Yvonne, who ran a house-cleaning business, lived the life of the self-employed for more than a decade, when a 1998 fall left the cabinetmaker with a serious back and leg injury and chronic pain. Once again, he turned to his mentor for the answer.

In the foreword to "A Cabinetmaker's Notebook," Craig McArt recalls Krenov – still in his small workshop in Sweden – musing about teaching when he got too old for "lifting heavy planks" and other rigors of full-time furniture making. "A light went off for me," Van Norman said.

By then, he had been talking regularly with his far-off friend for 12 years, and Krenov invited him to College of the Redwoods to meet face-to-face. Once



Independent study. Students spend the bulk of their week working on their own in the beautifully appointed shop, with assistance from instructors or other students as they need it.

The lectures live on.

Once a week, students gather to listen to lectures Krenov gave to Inside Passage students before he died, paired with slides from his archive, many of them unseen outside the school.





Vintage & storied.

Some of Krenov's original cast iron is employed at the shop. The yarn doll sits over the throat plate when the machine is not in use, reminding students to lower the blade before walking away.

together in Fort Bragg, they hatched a novel plan. Already a masterful woodworker, Van Norman would apply, with the stated purpose of becoming an educator in the mold of his mentor.

After graduating, Van Norman took a variety of teaching jobs, most notably at Rosewood Studio, a woodworking school now in Perth, Ontario, founded by a former student of Robert's. But still, the pure path eluded him. To find it, Van Norman would have to start his own school, just as Krenov had done.

Beginner-friendly Instruction

Along their journey, Robert and Yvonne had lived and worked in Vancouver, B.C., and they wanted to return west to start their school close enough to the city for student access but far enough to find solitude. A friend suggested Roberts Creek, a tiny town on the "Sunshine Coast," a gorgeous but less-traveled place accessible only by ferry.

Sitting by the woodstove in the Gumboot Cafe, the town's only eatery, Van Norman knew he'd found his new home. It took months of permitting and rezoning and a second mortgage on their house, but in 2005 the school opened in a beautiful building in the tiny town center, surrounded by the restaurant, post office and a handful of small shops. It was just as Van Norman had dreamed it: a roomy bench room and fully outfitted machine room, with high ceilings, tall windows and space for 10 students, in a place Krenov would have loved.

With a network of former students, Van Norman was able to fill classes from the beginning, and he and Yvonne finished raising their kids in a small homestead a few hundred yards up the road. Living without a car these days, they walk into the next town to buy groceries and take the bus home.

Distinguishing the school from

College of the Redwoods was never a problem. Location helped, as a number of students would come from Canada, but there were other factors. For one, Van Norman was willing to take beginners, designing a first term, Impractical Studies, in which students build a small wall cabinet called "Wabi Sabi" and are introduced "to a way of working, not to make a living, but an approach to the work, and to life," Van Norman said. And the small class sizes mean there is never a lack of individual attention.

Also, by the time Inside Passage was born, Krenov had retired, and as new teachers and administrators had arrived with new ideas, the program inevitably evolved – still wonderful, but not the pure path Van Norman could offer.

Inside Passage also offers shorter programs than its California cousin: a series of four 11-week terms that can be taken in one year or spaced out as life permits.

Being small means being flexible. Inside Passage recently admitted a student plagued by debilitating migraines, who could not promise to be there every day. Keith Lewis was just finishing his first term when I visited, and he was smiling every time I looked over. "This is the best I have felt in a decade," he said, crediting the meditative work for keeping his headaches at bay. "[The school] is one of the nicest-feeling places I've ever been, warm and supportive, and way more inspiring than I even expected."

"The school gives you the time and space to become so immersed in what you're doing," said Leanne Fleming,



Two from the teacher. This double rocker was the first custom piece Van Norman sold. The wenge armchair is his version of Vidar's Chair.



Mentor & student. James Krenov (left) and Robert Van Norman met in person in 1998 at the College of the Redwoods.



Group lesson. Van Norman gathers first-term students for a demonstration on lock mortises.



Show & tell. Students gather at the end of each week to report on their progress and lessons learned. Part of the school's formula is students of all levels sharing their frustrations, victories, advice and inspiration.

who is finishing her second term. "People come with no experience and Robert takes the time to make sure every student is successful."

Senior students were just as passionate. "I was looking for a school that worked in a tradition, not just a trade school," said third-term student Tim Andries.

During the weekly show-and-tell, held every Friday afternoon, fourth-term student Refael Greenblatt, at the school by way of South Africa and Israel, spoke seriously and profoundly about wrestling with the construction of his piece. "The design started with a spark, a fixed starting point, as Krenov says. In this case it was the curve of the doors." From there he designed the joinery by look and feel. "Ask yourself, 'What can the wood do?'" he suggested. "It's been quite satisfying to get back into this deep sort of work, to be in this zone again."

On Friday night the school held a reception for a past student, Juan Carlos Fernandez, who ran a successful shop in his native Venezuela before coming to the school, and now lives and works in Roberts Creek with his wife, also an artist. "I came here to get my master's in cabinetmaking," he said. "I loved be-

ing here at the school. You get so much feedback and information from your fellow students. I learned sharpening and hand tools. Those were a mystery to me. Everything is so considered in this work, even the back panel that never gets seen. And it's worth it—loving things to the last detail."

If You Go

If you are ready to set sail along the Inside Passage, here are a few more facts and thoughts. The small school is usually full, so you might be wait-



One-on-one. Instructors make the rounds to help with problem-solving, drawing out answers rather than giving them.

"I made one object at a time because of the wood, because of the tools, with a certain idea and hope, and somehow these objects won friends and gradually, gradually, my confidence and experience increased. But for a very long time, it was touch and go. Even now, although people may think that I've got it made and things are going fine, even now I am only carrying my end of the plank. Someone else who is sharing life with me and has believed from the beginning in what I am trying to do is carrying the other end of that plank."

—James Krenov,

Read at every graduation at Inside Passage as an acknowledgement of Robert's wife Yvonne, who has supported Robert throughout his career as a craftsman and teacher, and now serves as the school's administrator.

listed for a bit. When you arrive, you'll find that materials are provided, as are hand tools for those who are lacking. Doors are open 24 hours, and nights and weekends are favorite times, cementing strong bonds between students.

Regardless of skill level, everyone starts in Impractical Studies, where they are introduced to the school's tools, techniques and philosophy. Rush was grateful for the first-term help he received. "It takes a village for me to build a cabinet," he said during the afternoon show-and-tell, drawing a big laugh.



Krenovian inspiration. Refael Greenblatt, a fourth-term student, cited a pair of Krenov's curved doors as the jumping-off point for his own cabinet on stand.



Third-term project. Here, Tim Andries works on the back splat for Vidar's Chair. "This [the school] was exactly what I had been looking for without being able to articulate it."



Guarding the legacy. In his own small shop, just up the road from the school, Van Norman has the rest of Krenov's machines, his entire archive of slides and prints, plus Krenov's own workbench and one from the school run by Carl Malmsten.

Upward Spiral is next. Here students build one of five pieces made by Krenov in the late 1960s. "By removing the design component, students are able to focus on developing their skills as craftsmen," Van Norman said. "In his three years at Malmsten's school in Stockholm, Jim did not build pieces



A cabinet comes home. After Krenov died, one of his cabinets came on the market. Van Norman's wife bought it sight unseen. It turned out to be one that he helped Jim glue up at College of the Redwoods, and one of the last he built.

of his own design, but pieces that were designed by Carl," Van Norman said. "When he set up his workshop and began composing, he began to make his own music."

The third term focuses on one specific project, Vidar's Chair, designed and made by Vidar Malmsten, the son of Carl Malmsten. "While Krenov did not make chairs, he liked this one very much, and he did make beautiful stands for his cabinets," Van Norman said. "This exercise prepares our students for that, by focusing on grain lines, shaping and compound-angled joinery."

Last comes Composing, where students still work from one of Krenov's pieces, but only as a starting point. "There is no set design; it is more of an evolutionary process. The wood speaks, and we do our best to listen. Using sketches and mocking up, student and teacher work together, looking at each step and making decisions along the way," Van Norman said.

Coming Full Circle

Wherever you turn at the school, you find the life and legacy of James Krenov. His words, pictures and methods are everywhere. His beautiful vintage machines are tuned and whirring in the machine room. Lyrical cabinets stand by the workbenches in various states of completion, built by new hands. And he is alive in Van Norman, a quieter, gentler version of his hero.

Just up the road from the school, in the Van Normans' small sitting room, is a cabinet that completes the circle.

Before Robert left College of the Redwoods, Jim called him over to help glue up a cabinet-on-stand, one of the last he completed. Years later, after Krenov died, Yvonne got an email about one of his cabinets being for sale in Texas. It was the same piece Robert and Jim had glued up in 1999.

I have read James Krenov's words, seen his work in photos and edited articles by his fellow teachers and best students, but it wasn't until I met Van Norman, spent time at his school and ran my hands and eyes over that lost-then-found-again cabinet that I really understood the revolution Krenov started. Maybe it took a devoted disciple to follow the path to its end, in a little town along Canada's vast Inside Passage. **PWM**

Asa is the former editor of Fine Woodworking magazine; he now lives, builds and writes in Portland, Ore.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/jun17

BLOG: See more of the author's photographs from his visit to Inside Passage.

WEBSITE: Visit the school's website at insidepassage.ca to find out about classes and instructors, and to see more student work.

BOOK: The author's "Build Stuff with Wood," is due out later this year – find out more at buildstuffwithasa.com.

IN OUR STORE: "The Impractical Cabinet-maker," by James Krenov.

Our products are available online at:

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INSIDE PASSAGE STUDENT GALLERY

Clockwise: Lael Gordon wall cabinet and interior detail; Barbara Shelton wall cabinet and drawer inlay detail; Marjolein Hermans cabinet-on-stand and door detail; Juan Carlos Fernandez cabinet-on-stand and knot-carved detail.



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More Windows than Walls

Determining patterns of work in a new shop.

I'm in the last stages of building my workshop. When I first planned the building, I knew where the workbench, lathe and tool chest would go, but all the minor details were left until the building was ready. Every workshop is different, so for me there's no real point in reading those "how to set up your workshop" articles. And this ain't one of them.

My previous shop was a museum exhibit, so the museum visitors were the priority. I had my bench facing the audience, and my back to the windows. The new shop uses natural light, so the bench goes along a wall containing four windows. I'll get great raking light across my carvings all the time now; none of that overhead light for me anymore.

There are a lot of windows, probably too many. That means few uninterrupted walls, making shelving scarce. Working with green wood puts most of my stock outdoors, which simplifies wood storage.

After being in one shop for 20 years, I'm slowly developing new patterns to my work. I had two temporary setups, which further complicated matters. Now I'm training myself each time I work at the bench. The goal is to unlearn old movements, and replace them with new ones.

I'm not talking about the basics such as tool use; how I work with the hatchet, saw, plane and so on remains the same. But the unconscious movements don't – for example, when I finish with the hatchet, it now hangs up in front of me, not behind me the way it used to.

This sort of thing tends to slow me down, which is frustrating. After being out of furniture making for essentially two years, I'm eager to get back to it full time. I expect to be right up to speed



At home. After 20 years of working on display, a new shop means revising some work habits.

and, for multiple reasons, I am not. But it will come.

Tool Storage

As soon as I could, I added racks both on the bench and just above it for chisels, saws and layout tools – and I'm work-



Racked & ready. With tools stored in racks within easy reach, work goes more smoothly (as long as I remember to put them back).

ing to get in the habit of using these as tool storage while working.

Like many of us, I gather a conglomeration of tools on the bench during the day. I'm working at putting them in the racks as I go, trying to keep the bench clear. This makes work go more smoothly. I never had a rack attached to the far edge of my bench before because tools in it would have been too inviting, either for handling or thievery. Another benefit of putting the tools in racks is they are less liable to fall from there, where sometimes things can get bumped off a crowded benchtop.

I use a shelf under the bench for bulky tools such as wooden bench planes, mallets and bench accessories. This area gathers ridiculous amounts of shavings and chips; small things would easily get lost down there.

The tool chest I built after reading Christopher Schwarz's "The Anarchist's

CONTINUED ON PAGE 60

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Steps away. My tool chest, in which I keep the tools I need less often, is only steps away from my bench.

Tool Chest” (Lost Art Press) sits about four steps to the right of where I stand at the bench. Hanging from the loft joists are some squares, braces and other things. These are trials to see what works and what doesn’t. Just like when I build furniture, setting up the shop is partially trial and error. I have no qualms about trying tools here and there, plugging the wrong holes, and making new ones.

I never bothered to work out on paper, or even in my mind, these many small decisions. I knew they weren’t worth it. In some cases, I got lucky. I had a dovetailed carcass of a shallow cabinet project that I abandoned some time ago. It was going to be for the kids (don’t anybody tell them). I found it was just the right size to tuck between the

corner and the first window along the long wall. Turns out I could fit six or seven hatchets in it, once I got doors on it.

The doors were, in my mind, a problem, though. I got greedy and wanted to make the doors with the same format: dovetailed boxes on edge, with a panel in them for the front. My thinking was that I could then hang drawknives and spokeshaves on the inside of the doors. But if I made them that way, there wouldn’t be enough room to open them fully, and they would bump against the timber frame in the corner. It was that tight.

Enter the carpenter’s mind. My friend Pret, who taught me how to build this timber-framed shop, said, “Just make them solid-board doors,

with hinges on the surface.” Perfect. The drawknives and spokeshaves will go elsewhere, but it’s all right. In the meantime, my large spoon hooks are just the right fit on the doors’ inner faces.

Turning tools are my next problem to solve. Right now I’m thinking of a similar cabinet right across the shop. For now they’re still in a box, and there they can stay. I have joinery and carving coming up.

But first, the stove installation. Winter is coming. **PWM**

Peter has been involved in traditional craft since 1980. Read more from him on spoon carving, period tools and more at pfollansbee.wordpress.com.



Just there. When I’m done hewing, I can simply reach up to put away my hatchet.



Hatchet job. A cabinet meant for my kids provides ample hatchet storage.



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The EPA & Paint Strippers

Is this government agency overreaching the bounds of its evidence?

This article is an opinion piece on the Environmental Protection Agency's (EPA) proposed regulation on the paint strippers we have available; I think the government agency is going too far. If you wish to learn more about the differences in strippers and how to use them, I recommend my articles from the June 2000 (#115), August 2000 (#116) and April 2012 (#196) issues (they're free online; see "Online Extras" at the end).

On Jan. 19, the EPA published a proposed rule that would remove all methylene-chloride (MC) and n-methylpyrrolidone (NMP) strippers from the consumer market, including from paint stores and home centers. The ruling would continue to make these solvents available to professional refinishing shops but only in 55-gallon-or-larger quantities, which would effectively eliminate smaller shops.

You can read the 277-page rule as a PDF from several websites by searching for "federal register methylene chloride."

MC strippers have dominated the market since the early 1970s. They are available in two strengths. High-percentage MC strippers are non-flammable and weigh noticeably more than other strippers, which are easy ways to identify them. They are also not a volatile-organic compound (VOC), which is damaging to the environment. Low-percentage MC strippers contain solvents that are flammable and are VOCs.

NMP strippers are packaged in plastic instead of metal, which makes them easy to identify, and are much slower acting than MC strippers. But they also evaporate much slower, so you can leave them for hours or even overnight to remove difficult coatings.



Solvent strippers. These are examples of all the solvent stripper types discussed in the article. From left: high-percentage methylene chloride; low-percentage methylene chloride; acetone/toluene/methanol stripper; acetone/toluene/methanol refinisher; n-methylpyrrolidone; dibasic ester; benzyl alcohol.

NMP strippers always contain other solvents to reduce the cost, but they are still non-flammable and not VOCs.

MC strippers have a strong, unpleasant odor. NMP strippers have much less odor, so they are more agreeable to work with.

Background

In 1986 a published study concluded that MC causes malignant tumors in laboratory mice. This led to the EPA initiating an effort to ban MC. When the EPA considers regulating a product, it studies the impact the regulation will have on society. It also looks for possible replacements to mitigate the impact.

In 1991 the EPA sponsored a two-day conference in Washington, D.C., to study the issue. The entire "stripping" industry was represented, from raw-materials and equipment manufacturers to stripper suppliers to small-shop professionals to consumer representatives – more than 200 people. There were more than 50 presentations, and a book with these presentations was published at the end.

I was invited to attend the conference, and it made a big impression on me. At that time I had been refinishing

furniture for 15 years. I was pretty familiar with the products and methods for stripping paints and finishes from furniture.

I came away from the conference with the strong view that the EPA had not proven its case for cancer and that its representatives weren't listening to what was being said in opposition: that doing away with MC strippers would have a debilitating impact on the industry, and there weren't any equivalent replacement solvents.

Furthermore, there were at least four large human studies involving major companies and 6,000 employees exposed over their working lifetimes to varying concentrations of MC vapor all day long, every working day, that contradicted the results of the mouse study.

No evidence was found in these studies to indicate a higher risk of cancer from exposure to MC, and there are no comparable studies elsewhere that I knew of (or know of now) that do show a link. In other words, while it is known that MC can cause malignant tumors in laboratory mice, there's no evidence MC causes the same in humans.

In the EPA's defense, and to bring this discussion up to date, it's fairly

standard practice to extrapolate from mouse studies to humans, but in the case of MC further research has shown that mice metabolize the solvent differently than humans, through a different pathway. Using mouse studies to establish rulings banning MC is highly questionable.

Nevertheless, the attention given to the possibility of health problems plus a broader consumer movement away from using smelly solvents opened the way for alternative strippers to enter the market. The one that got the most traction was NMP, even though it was suspected at the time of causing reproductive problems in pregnant women.

Balancing Act

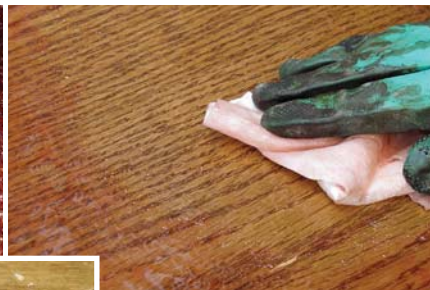
Regulating is a balancing act between making us all safer and taking away things that work well and we like. An obvious illustration is motor vehicles.

Traffic accidents kill more than 30,000 people a year, yet we don't ban cars and trucks. They are just too valuable and useful to society (we try to make them safer, but we don't get rid of them).

You may think I'm stretching, but it's not beyond imagination that the EPA might want to ban internal-combustion vehicles because they pollute the atmosphere.



Biodegradable. The marketing of all brands of NMP, DBE and benzyl alcohol strippers I've seen stress that they are biodegradable. This may be true but it is misleading. It doesn't take into account the coating being stripped, which may contain lead. There may be local laws forbidding the disposal of lead still in liquid form due to the stripper's extremely slow evaporation rate.



All work the same. All the solvent strippers work the same, just at different speeds. Depending on the coating being removed, it blisters (top, left), dissolves (above) or breaks its bond to the wood so it can be lifted off with a putty knife (left).



Contrast vehicle deaths with MC deaths. The EPA estimates there have been 40 deaths caused by MC since 1975. (The Center for Public Integrity estimates 56 since 1980.) That's between one and two a year! The causes that could be identified were due to acute exposure. A major cause is people stripping bathtubs in a closed bathroom. MC metabolizes to carbon monoxide in the bloodstream, which replaces oxygen and can cause a heart attack, especially in people with heart problems.

You should never use a MC stripper (or any solvent for that matter) without good air movement in one door or window and out another, or outside.

Replacement Solvents

Just as cars and trucks don't have adequate replacements (though electric vehicles may soon solve the pollution problem), neither do MC or NMP.

One alternative that has been around as long as MC is a combination of solvents similar to lacquer thinner: acetone, toluene and methanol (or their equivalents). This stripper works fairly well on most finishes and some paints, but it's hardly safe to breathe, it's highly flammable and toluene and methanol are VOCs. ("Refinishers" are this type, but without the added wax to slow evaporation.)

Two newer strippers are based on dibasic esters, abbreviated DBE (dimethyl adipate and dimethyl glutarate) or benzyl alcohol. These are not VOCs and aren't flammable, but they work extremely slowly and, because they are combined with a lot of water, they may lift veneer if left in contact long enough to remove tough coatings.

There's also lye and other strong caustics. These work well on most coatings, but they are difficult to use safely, and they damage wood and dissolve glue.

In conclusion, I don't think the EPA has presented sufficient evidence for removing MC and NMP strippers from the consumer market when adequate replacements don't exist. **PWM**

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

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Individualists Unite!

After a woodworking course, this student has tools, a chest – and friends.

Last spring I took my first woodworking course, an “Introduction to Hand Tool Woodworking.” The class promised to teach students to fix up some tools and build a tool chest – but I learned more than that.

Mike Siemsen, of “The Naked Woodworker” infamy, taught the course, and for a week in June I was one of a dozen students camped out on his rural Minnesota lawn. We’d brought mismatched kits of tools: new, old, cheap, high-end. We were a mismatched bunch—an East Coast journalist and her surfing New York-lawyer husband, an Air Force officer, a Mandan Indian roughneck and his survivalist son, a food co-op clerk, a grad student, a recently quit-his-job photography professor and a pair of architects – but we all wanted to make things out of wood. And we didn’t know how to start.

So we did – we started. And we suffered. Like most old things, our old tools needed some reviving. That first day, we wore holes in our thumbs on plane totes. We ground century-old steel and squinted over saw blades. We moved arms and bodies back and forth until enough life had gone into our dying tools to bring them back to usefulness.

We also learned to trust our hands, take a firm grip and push metal into spinning rock. To ask for help and to just keep going. To not look for shortcuts. Often, Mike pointed out our foolishness, then helped us overcome it.

The second day, we started using our tools. Shavings spilled out of the planes, piling up around us. We found the rhythm of all good learning. Mike would explain, demonstrate. We would step back to our benches to try it, and find ourselves challenged. We’d ask neighbors, puzzle out a measurement or layout together and ask for reminders



on the next step. Slowly, the pieces of our chests emerged. We had lids, sides and tills. We cut rabbets, nailed the thing together, added cleats and becketts.

On Thursday, Mike showed us how to cut dovetails for our tills. I’d never tackled this, but Mike deflated my fear: He cut his sample dovetails with a hacksaw and a sharpened screwdriver. His marking gauge was a screw in a block of wood. He told us that an earnest student once asked a teacher, “What sort of pencil are you using?” The teacher had glared and answered, “A pencil!” Point taken. Don’t blame your tools.

But away from the benches, something else happened: We got to know each other. Evening sweats in the hand-built sauna helped people get comfortable – Mike’s not called the naked woodworker for nothing. Breakfast morphed from silent food intake to witty political sparring matches. Banter filled the shop. Jokes piled up faster than shavings.

The thing about making stuff is that it sets you free. Not free as in being able to do what you want – our days were ordered, and we worked our skin off to get everything milk painted by Friday. But we were following an ancient

tradition of making stuff, and making stuff sets you free from worrying over what other people will think – if your chest works, it’s good work. We weren’t fetishizing the past, just building a chest that looked nice and would last.

(I gave my chest to my brother for his wedding present. He and his wife keep it at the foot of the bed, and it holds zero tools. I have no idea what’s in it – probably board games.)

This newfound freedom yielded us more than tools and a chest. We gained a community – we grew up as woodworkers and as friends. **PWM**

Daniel studies and teaches American literature at the University of Nebraska-Lincoln.

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