

ADVENTURES IN TURNING: Turn a Decorative Celtic Shield

Popular Woodworking

AUGUST 2021 | #260



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- Motor: 1/3 HP, 120V, single-phase, 4.2A
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WARNING! †¹

G0572 ONLY \$395⁰⁰

1/2 HP BENCHTOP MORTISING MACHINE

- Motor: 1/2 HP, 110V, single-phase, 6A
- Spindle speed: 1725 RPM
- Spindle taper: JT #2
- Spindle travel: 3 1/4"
- Chuck size: 3/8"
- Collar size: 5/8"
- Max. stock width: 8 1/2"
- Max. stock thickness without extension block: 4 1/4"
- Max. stock thickness with extension block: 6"
- Max. mortising depth: 3"
- Max. chisel travel: 4 5/8"
- Max. distance column to chisel: 5"
- Chisel size range: 1/4" - 1/2"
- Overall dimensions: 13 3/4" W x 29" D x 32" H
- Approx. shipping weight: 76 lbs.



WARNING! †¹

G0645 ONLY \$389⁰⁰



14" 1 HP DELUXE BANDSAW

- Motor: 1 HP, 110V/220V (prewired 110V), single-phase, 11A/5.5A
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Table size: 14" x 14" x 1 1/2"
- Table tilt: 10° left, 45° right
- Floor-to-table height: 43"
- Blade length: 92 1/2" - 93 1/2"
- Blade width: 1/8" - 3/4"
- Blade speeds: 1800 & 3100 FPM
- Overall size: 27" W x 30" D x 67 1/2" H
- Approx. shipping weight: 246 lbs.



WARNING! †¹

G0555LX ONLY \$829⁰⁰



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- Horsepower range: 1 1/2 - 3 HP
- Drum size: 20" diameter x 22" H
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- 7" - 6" Outlet reducer
- 6" Inlet with 2 x 4" "Y" adapter
- 16-Gauge steel construction
- Overall dimensions: 25 1/2" W x 22" D x 67" H
- Approx. shipping weight: 287 lb.



WARNING! †¹

G0863 ONLY \$449⁰⁰

12" VARIABLE-SPEED BENCHTOP DRILL PRESS WITH LASER

- Motor: 1/3 HP, 120V, single-phase, 5.1A
- Swing: 12"
- Spindle taper: MT #2
- Spindle travel: 3 1/2"
- Spindle speeds: Variable, 400 - 2700 RPM
- Drill chuck: 1/32" - 5/8", JT3, keyless
- Drilling capacity: 5/8" mild steel
- Max. distance from spindle to table: 13 1/4"
- Table dimensions: 9 5/8" x 9 5/8"
- Table tilt: 45° left/right
- Table swivel around column: 360°
- T-slots: (x4) 1/2", X pattern
- Overall dimensions: 13" W x 22" D x 36" H
- Approx. shipping weight: 93 lbs.

MADE IN
AN ISO 9001
FACTORY



WARNING! †¹

T31739 ONLY \$394⁹⁵



17" 2 HP BANDSAW

- Motor: 2 HP, 110V/220V (prewired 220V), single-phase, 19A/9.5A
- Cutting capacity/throat: 16 1/4" left of blade
- Max. cutting height: 12 1/8"
- Table size: 17" x 17" x 1 1/2" thick
- Table tilt: 10° left, 45° right
- Floor-to-table height: 37 1/2"
- Blade length: 131 1/2"
- Blade speeds: 1700 & 3500 FPM
- Overall size: 73" H x 32" W x 32" D
- Approx. shipping weight: 342 lbs.



MADE IN AN
ISO 9001
FACTORY



WARNING! †¹

G0513 ONLY \$1395⁰⁰



1 1/2 HP PORTABLE CYCLONE DUST COLLECTOR

- Motor: 1.5 HP, 110V, single-phase, 15A
- Intake hole size: 6"
- Impeller: 12 3/4" aluminum
- Airflow capacity: 868 CFM @ 1.8" SP
- Max. static pressure: 9.7"
- Filter surface area: 28.1 sq. ft.
- Filtration rating: 1 micron
- Collection size: 20-gallon drum
- Overall dimensions: 27 1/2" W x 44" L x 70" H
- Approx. shipping weight: 278 lbs.

LIFT HANDLE & ROLL
DRUM EASILY FOR
SAWDUST DISPOSAL!



MADE IN AN ISO
9001 FACTORY

WARNING! †¹

G0860 ONLY \$975⁰⁰



20" FLOOR DRILL PRESS

- Motor: 1 1/2 HP, 120V/240V (prewired 120V), single-phase, 15.8A/7.9A
- Swing: 20"
- Drill chuck: 3/64" - 5/8"
- Drilling capacity: 1 1/4" steel
- Spindle taper: MT #4
- Spindle travel: 4 3/4"
- Spindle speeds: 12 speeds from 180 - 3240 RPM
- Quill flange/collar diameter: 3.642"
- Table T-slot size: 5/8" wide, 4/4" on centers
- Table size: 18 3/4" x 16 3/4"
- Footprint: 23" x 18"
- Overall height: 70 3/4"
- Approx. shipping weight: 317 lbs.

MADE IN
AN ISO 9001
FACTORY



WARNING! †¹

G7948 ONLY \$875⁰⁰



16" X 46" WOOD LATHE WITH DRO

- Motor: 2 HP, 110V, single-phase, 14A
- Swing over bed: 16"
- Swing over tool rest: 13 1/2"
- Spindle taper: MT #2
- Spindle thread size: 1" x 8 TPI RH
- Tailstock taper: MT #2
- Spindle speeds: variable, 600 - 2400 RPM
- Headstock rotation: 0°, 60°, 90°, 120°, and 180°
- Overall dimensions: 72 1/2" W x 19" D x 48" H
- Approx. shipping weight: 354 lbs.

MADE IN AN
ISO 9001
FACTORY



WARNING! †¹

G0462 ONLY \$1029⁰⁰



*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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13" 2 HP BENCHTOP HELICAL PLANER WITH GRANITE TABLE

NEW!

- Motor: 2 HP, 120V, single-phase, 15A
- Max. cut width: 13"
- Min. stock length: 6"
- Min. stock thickness: 1/8"
- Max. stock thickness: 6"
- Max. cut depth full width: 1/32"
- Cutterhead speed: 8500 RPM
- Feed rate: 25 FPM
- Overall dimensions: 25 1/2" W x 28" D x 19" H
- Approx. shipping weight: 82 lbs.



MADE IN AN
ISO 9001
FACTORY

WARNING! †¹
G0940 ONLY \$755⁰⁰



6" JOINTER W/STAND & V-HELICAL CUTTERHEAD

- Motor: 1 HP, 110V/220V (prewired 110V), single-phase, 14A/7A
- Table size: 47 3/8" x 6 5/8"
- Table type: Precision-Ground Cast Iron
- Table adjustment: Dovetailed Ways
- Table adjustment type: Handwheel
- Cutterhead diameter: 2 1/2"
- Cutterhead type: V-Helical
- Max. depth of cut: 1/8"
- Max. rabbeting depth: 1/2"
- Fence size: 4" x 29 1/8"
- Approx. shipping weight: 260 lbs.



WARNING! †¹
G0814X ONLY \$1325⁰⁰



72" 2-DOOR STAINLESS STEEL INDUSTRIAL CABINET WITH WOOD TOP

- Cabinet measures: 72"W x 37 1/2"H x 18 1/8"D
- Bottom Panel: 18 gauge
- Back and side panels: 21 gauge
- Door Panel: 22 gauge
- 1 1/2" solid rubberwood top
- 2 sliding doors with ball bearing guides
- 1000 lb. capacity
- Approx. shipping weight: 223 lb.



WARNING! †¹
T27878 ONLY \$975⁰⁰



10" 2 HP BENCHTOP TABLE SAWS

- Motor: 2 HP, 120V, single-phase, 15A
- Table size: 22" x 26 3/8"
- Arbor speed: variable, 2000-4000 RPM
- Blade tilt: Left, 45°
- Max. depth of cut: 3 1/8" @ 90°, 2 1/8" @ 45°
- Rip capacity: 28" right
- Dado capacity: 1 3/16"
- Dust port: 2 1/2"
- Overall size: 28" W x 37 1/2" D x 20 1/2" H (G0869); 41 1/2" L x 37 1/2" W x 41" H (G0870)
- Approx. shipping weight: 72 lbs. (G0869); 106 lbs. (G0870)



G0869
shown



MADE IN AN
ISO 9001 FACTORY

WARNING! †¹
WITH RIVING KNIFE
G0869 ONLY \$439⁰⁰



WITH ROLLER STAND
G0870 ONLY \$569⁰⁰



3 HP SHAPER

- Motor: 3 HP, 240V, single-phase, 12A
- Max. cutter height: 2 1/2"
- Max. cutter diameter: 5 1/2"
- Spindle diameters: 1/2", 3/4", 1"
- Spindle lengths: 2 3/4", 3", 3 1/2"
- Spindle capacity under nut: 2", 2 1/4", 2 1/2"
- Spindle speeds: 7000 & 10,000 RPM
- Spindle travel: 3"
- Spindle openings: 1 1/2", 3", 4", 7"
- Table counterbore: 7" dia. x 5/8" deep
- Table size: 28 1/4" x 30 1/2"
- Floor-to-table height: 34"
- Footprint: 21" x 23 1/2"
- Overall dimensions: 30" W x 30 1/2" D x 39 1/2" H
- Approx. shipping weight: 392 lbs.



WARNING! †¹
G1026 ONLY \$1550⁰⁰



72" 8-DRAWER STAINLESS STEEL INDUSTRIAL CABINET WITH WOOD TOP

- Cabinet measures: 72"W x 37 1/2"H x 18 1/8"D
- Bottom Panel: 18 gauge
- Back and side panels: 21 gauge
- Door Panel: 21 gauge
- 1 1/2" thick rubberwood top
- 8 drawers with drawer liners included plus 1 cabinet
- 1000 lb. capacity
- Approx. shipping weight: 287 lb.



WARNING! †¹
T27879 ONLY \$1149⁰⁰



10" 5 HP SLIDING TABLE SAW

- Motor size: 5 HP, 230V, single-phase, 19A
- BBlade sizes: 10" main, 3 1/8" scoring
- Max. cutting height @ 90°: 3 1/8"
- Max. cutting height @ 45°: 2 1/4"
- Max. ripping capacity - right: 33"
- Dado capacity: 1 3/16"
- Max. crosscut capacity: 63"
- Overall dimensions: 76" W x 125" D x 46" H
- Approx. Shipping weight: 688 lbs.



EXTREME
SERIES

MADE IN AN
ISO 9001
FACTORY

WARNING! †¹
G0623X ONLY \$4295⁰⁰



ELECTRONIC ADJUSTABLE WORKBENCH FRAME

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- Mounting length: Adjustable, 43" – 74 5/8"
- Mounting width: 21 3/4"
- Weight capacity: 265 lbs.
- Dual motors for smooth height transitions
- Digital keypad with 3 programmable height settings and LED height display
- Telescoping legs allow for an easy transition between heights



Workbench top
sold separately.

WARNING! †¹
T31850 ONLY \$475⁰⁰

72" 15-DRAWER STAINLESS STEEL INDUSTRIAL CABINET WITH WOOD TOP

- Cabinet measures: 72"W x 37 1/2"H x 19 1/4"D
- Bottom Panel: 18 gauge
- Back and side panels: 21 gauge
- Drawer Panel: 21 gauge
- 1 1/2" solid rubberwood top
- 15 drawers with EVA drawer liners
- 1000 lb. capacity
- Approx. shipping weight: 326 lb.



WARNING! †¹
T27880 ONLY \$1219⁰⁰



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OF PRODUCT VIDEOS
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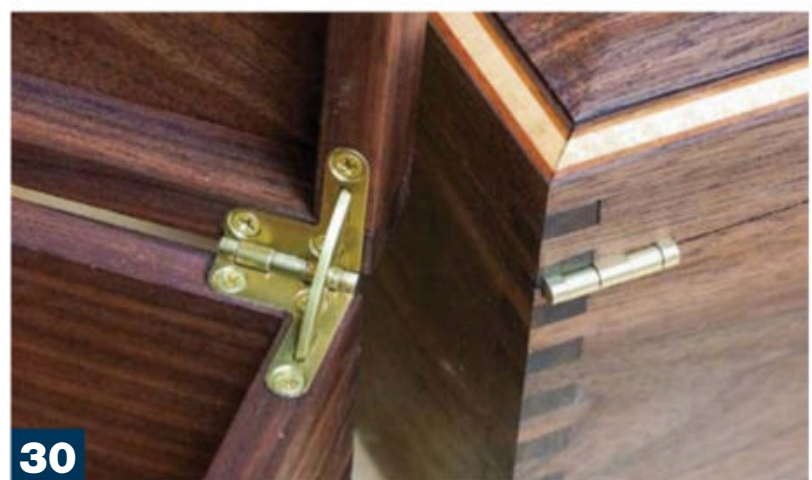
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NEW!

W1888

10" 2 HP HYBRID TABLE SAW W/ RIVING KNIFE

- Motor: 2 HP, 115V/230V (prewired 115V), single-phase, 16A/8A
- Max depth of cut at 90 degrees: 3 1/8"
- Max depth of cut at 45 degrees: 2 1/8"
- Table size: 40 1/8" X 27"

WARNING! †¹



W1812

7" 2 HP PLANER MOULDER W/ STAND

D3393

ELLIPTICAL JIG FOR CURVED MOULDING PRODUCTION

- Motor: 2 HP, single-phase, 240V, 10.8A
- Planing width: 7"
- Max. stock thickness: 7 1/2"

WARNING! †¹



PATENTED DESIGN
DOVETAIL-WAY
CUTTERHEAD HOUSING



W1873

15" 3 HP FIXED-TABLE PLANER

- Motor: 3 HP, 230V, single-phase
- Max. cutting width: 15"
- Max. cutting depth: 1/8"

WARNING! †¹



W1858

8" DOVETAIL JOINTER W/ HELICAL CUTTERHEAD & MOBILE BASE

- Motor: 3 HP, 230V, single-phase
- Table size: 8" x 72"
- Max. depth of cut: 1/8"

WARNING! †¹



W1811

5 HP 10" SLIDING TABLE SAW

- Motor: 5 HP, 230V, single-phase, TEFC, 3450 RPM, 19A single-phase, 15A/7.5A
- Max. ripping width with standard rip fence: 33"
- Main blade diameter: 10"

WARNING! †¹



W1852

22" X 42" VARIABLE-SPEED WOOD LATHE

- Motor: 3 HP, 240V, 3-phase (with inverter), 8A
- Distance between centers: 42"
- Spindle threads: 1 1/4" x 8 TPI RH

WARNING! †¹



Made in an ISO
9001 Factory

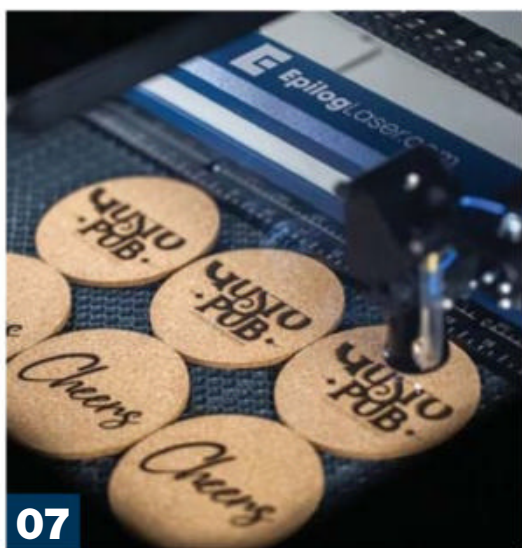
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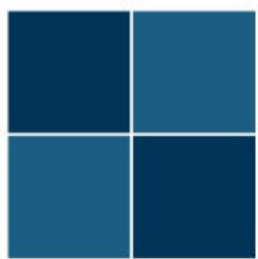
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BUILT TO PERFORM





Connect

■ FROM THE EDITOR

Rediscovering Our Roots

By Logan Wittmer

It's funny. If you look into the past issues of *Popular Woodworking*, you will find a long lineage of Editor in Chiefs. Now, stepping into that role and counting them as my peers feels surreal. Everyone that's contributed to this magazine has put a little bit of themselves into these pages. And while the magazine's content has shifted to reflect the people working on it, I always felt there was a "golden era" of *Popular Woodworking* that made it what it was: a top woodworking magazine full of character.

So here's my goal — bring back the soul and get this magazine its identity back. I want you to look forward to each issue. To want to sit down to read it. Every project, technique, or tool may not interest you. And that's okay, because the next one might. Above all else, I want you to be inspired. Inspired to build, to design, to try a new technique, or try a traditional technique. Inspired to try something and not be afraid of failing. If you fail, but learn something in the process, did you actually fail?

As we work through the next couple of issues and some of the articles and projects that had already been set in motion, it's my hope that you'll see a shift in content. I hesitate to label my vision for content as "traditional," but I guess the shoe probably fits. Does that mean that you will never see a CNC article appear in these pages? No. But, you'll probably see fewer of them. (Don't worry, there will still be plenty of that content on our website.)



Summer time in Iowa means long, muggy days full of sawdust. At least once a week, I'm running my sawmill. More often than not, it's for other people. But I also make sure I keep a healthy stash of walnut, cherry, ash, and quarter-sawn white oak for my shop.

So, who am I? I'm a woodworker, just like you. Somehow, I'm lucky enough doing this for a living. But this isn't just a job to me. I can honestly tell you that if I wasn't doing this for a living, I would be spending just as much time in my shop. Woodworking is my passion.

I have an affection for Shaker furniture, and my house is starting to reflect that. I continue to build and add more pieces to my collection. And even though my soft spot is for hand tools, I'm practical enough to supplement my hand tool use with power tools. Furniture aside, a recent vice of mine has been turning. I can't get enough of it, and I understand how people get caught up in it and leave all other woodworking behind.

Outside of my family, one of my deepest loves is running my sawmill. During the summer months, I'm often found outside, covered in sweat and sawdust with the largest, stupidest grin on my face. To me, there's something magical about turning a tree into lumber.

So, am I a realist and know that I won't please everyone? Absolutely. Only a fool would think they can do that. As I said, if a certain project doesn't speak to you, that's okay. Wait for the next one, because that one might. So, here's to looking towards the future — cheers.

PHOTO BY JACK COYER

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TWO-SPEED 13" Portable Planer

w/Helical Style Cutterhead

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NEW TOOLS

Introducing the New Fusion Edge 24

Epilog Laser has just released their new Fusion Edge 24 laser system. It features a 24" x 24" x 10" engraving area. It's available in 30, 40, 50, 60, and 80-watt configurations.

The Fusion Edge 24 also features Epilog's IRIS™ Camera System, which gives a live image of the engraving table so they can quickly and accurately position their artwork on whatever product they are engraving.

"The response to the IRIS™ Camera System on the Fusion Pro series was incredible, so we're very excited to make this technology available in the new Fusion Edge systems," said Mike Dean, vice president of sales and marketing for Epilog Laser. "It's an invaluable tool that makes it that much easier for our customers to get up and running faster than ever."

Additional features of the Fusion Edge include:

- **120" per second (IPS) engraving speed:** higher speed equals high throughput
- **Touch screen control:** 7" screen keyboard for job selection, setting controls, and more
- **Job trace:** quickly see where the engraving/cutting job will appear on materials
- **Safeguard™ features:** keep the mechanics of your laser machine cleaner than ever before with side bellow enclosures, a fully covered x-axis assembly, and covered lens assembly

While the Epilog Laser may not be for every shop, there are many workshops that specialize in CNC and laser work. Those shops will find value in the Epilog Fusion Edge 24. While it is priced at a "prosumer" level (price ranges from \$17,000 - \$26,000), Epilog has many other lasers at lower price points. The Epilog Fusion 24 is proudly designed, engineered, and manufactured in the USA.



PHOTOS PROVIDED BY EPILOG



■ Fusion Edge 24

Epilog Laser
epiloglaser.com

Price: \$17,000 - \$26,000
(price depends on wattage)

Popular Woodworking

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■ WORKSHOP TIPS

Easy Pour Spout



When finishing, I prefer to always pour just the amount of finish I need into a smaller container. To avoid a mess when pouring, I use a trick taught to me by a professional painter that was working on my house. Use a couple of strips of painter's tape to form a "v." It will act like a spout and avoid spilled finish. — *Logan Wittmer*

Power-Grip Handles



After 37 years of pushing pencils and typing on a keyboard at the office, my grip is not what it used to be. So I found an easy way to get a powerful yet comfortable grip on my clamp handles. First, I wrap the handle with athletic tape. Then I stretch on a piece of bicycle inner tube that is slightly smaller in diameter than the handle. That's it! The tape helps to hold the tube in place. If you don't have any used inner tubes, new ones are inexpensive, and a couple of tubes will cover a lot of handles. — *Serge Duclos*

PHOTOS PROVIDED BY THE AUTHORS



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HEPA CYCLONE DUST COLLECTOR

Stacking Sound Filter reduces sound by an additional 6 - 8 dB.



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- High-efficiency molded cyclone separator
- Ultra-quiet (72-74 dBA)
- Dust Sentry - infrared dust bin level sensor
- Durable, lightweight construction for quick and easy installation
- 35 gallon steel dust bin included (larger sizes available)

U.S. Patents
8377160
8496719
9370740
7247180
Pat. Pending
ETL Approved

MINI-GORILLA[®]

PORTABLE CYCLONE DUST COLLECTOR

Picked as a Top Tool by Fine Woodworking magazine.



- Industrial U.S. made 1.5 HP motor, 110V or 220V
- HEPA certified filter media
- Compact and highly mobile design (64"H x 28"W)
- 22 gallon dust bin with automatic liner bag holder
- Perfect for the small shop

U.S. Patents
7824457
7937803
8377160
8491686
8496719
D604464
ETL Approved

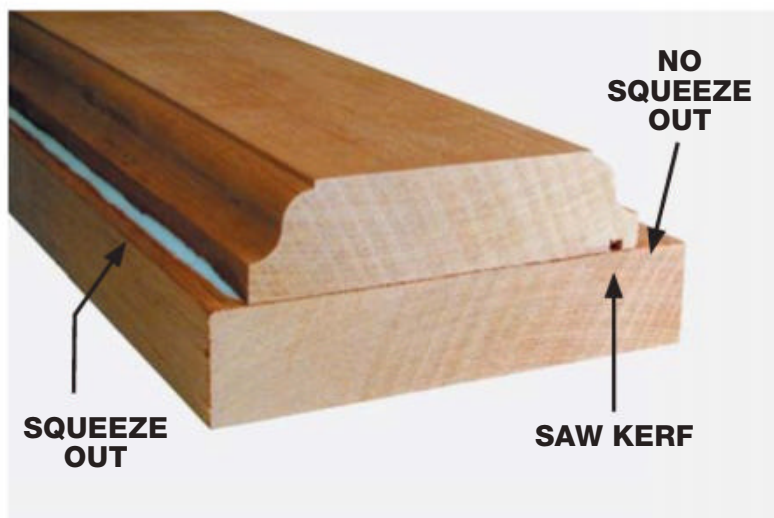
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WORKSHOP TIPS

Saw Kerf Stops Glue Squeeze-Out



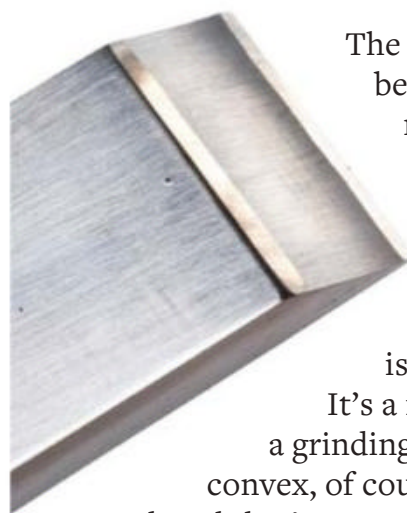
When gluing trim or other surface-applied pieces of wood, cut a shallow saw kerf near the edge of the piece being glued down. The glue will get trapped in the groove instead of squeezing out onto the other piece of wood.

Instant Rosewood



I like to use purple heart pen blanks because they are less expensive than other exotic hardwoods. Recently, I stumbled on a cool trick. I discovered that I could cause the wood to overheat and turn dark by using the backside of sandpaper while the wood is turning. Light overheating makes the purple heart look like rosewood; further overheating makes it look like ebony. Heating different sections creates an alternating effect, as if it's made of two species of wood. —Tom Bockman

The Hollow-Ground Bevel — What's the Big Deal?

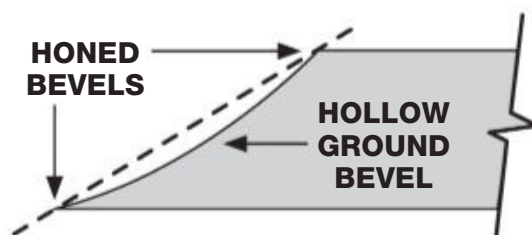


The phrase “hollow-ground bevel” has been widely misused, and I’d like to set the record straight as to what it is, what it’s good for, and when to avoid it. A hollow-ground bevel is simply a concave bevel.

It’s a natural result of using a grinding wheel. The wheel is convex, of course, so it always creates a bevel that’s concave.

A tool with a hollow-ground bevel is easier to sharpen by hand, without the use of a jig. The biggest problem with honing by hand is holding the tool at the correct angle with every stroke. A hollow-ground bevel helps you find and maintain that angle, so there’s no wasted effort.

With a hollow grind, you simply rock the tool up and down until it locks in place, resting on the bevel’s



heel and toe. Two points of support make the difference—it is much harder to feel the correct angle if the bevel were flat, rather than concave. That is why we have arches in our feet—they make balancing easier.

I often sharpen chisels by hand, without a jig, simply because it’s so easy. Ditto for plow plane and rabbeting plane irons that are awkward or impossible to hold in a jig. I do use a jig for honing standard-thickness bench plan irons, though. Even with a hollow-grind, their bevels are too narrow for me to maintain that correct angle with every pass on the stone.

OK, so when is a hollow-ground bevel not appropriate? Japanese tools and Western mortising chisels are exceptions. Ideally, Japanese tools should be ground with a flat bevel, to maximize support of the tip. The steel of Japanese tools can be brittle, and without adequate support, a tip could fracture. Mortising chisels should be flat ground too, or made slightly convex, for the same reason. To withstand heavy blows, their tips need to be as strong as possible.

■ WORKSHOP TIPS

Instant Vise for Long Boards



I think hand screws are one of the coolest inventions of all time. When I'm really in a clamping bind, they always come to my rescue. Like when a board is just too long for one vise to handle, I hold the board fast with a couple of wooden hand screws. Clamp one to your board and use the other to hold the first clamp to your workbench. Support the other end of the board in your vise or with another pair of clamps. Hand screws; they're quick, strong, and versatile. — *Tim Johnson*

Leather Tool Sheaths



When I'm not using my chisels I keep them in a drawer, so I made a set of leather sheaths to protect their sharp ends. I bought the leather and some rivets from a hobby shop and made sheaths for all my chisels in about an hour.

To make your own sheaths, cut leather strips twice the length of the finished sheath, and about $\frac{3}{4}$ " wider than the chisel's blade. Fold the leather strip in half lengthwise and punch the holes for the rivets with an awl. Split rivets are the simplest to install because all you need is a hammer and a piece of steel—I used the edge of my vise. — *Michael Dromey*

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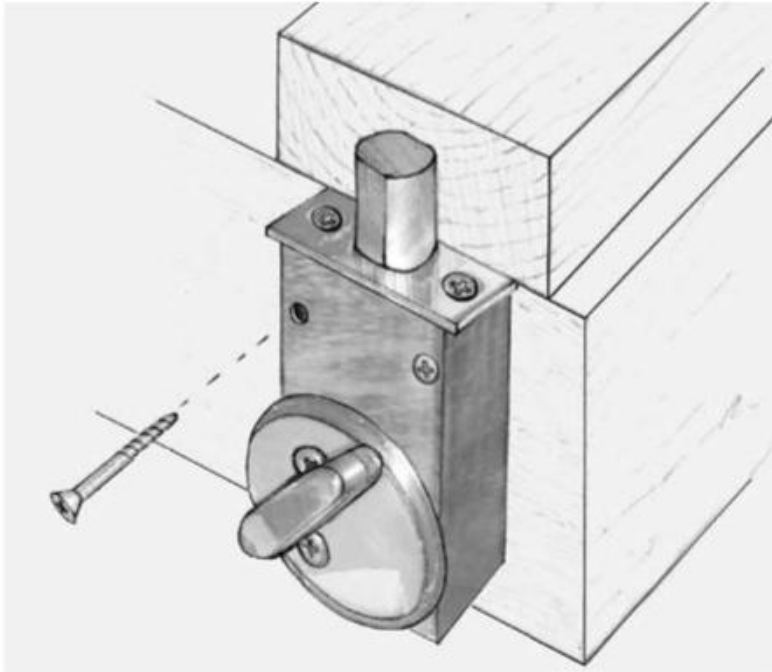
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WORKSHOP TIPS

Deadbolt Bench Stop



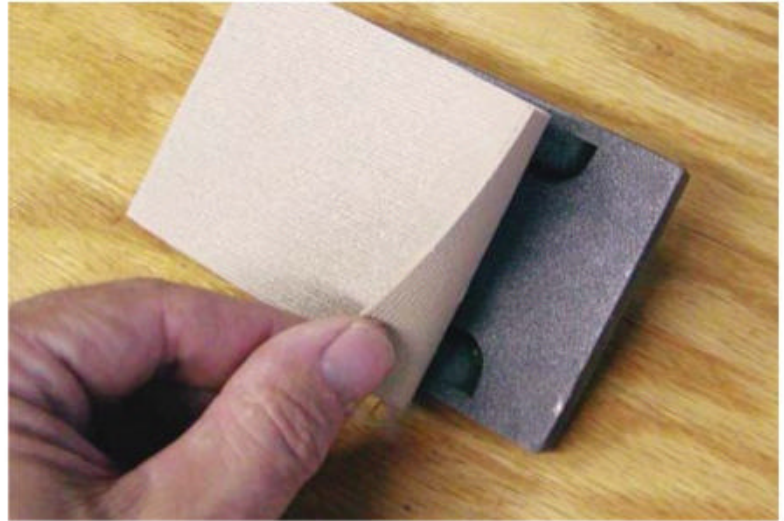
For a quick and simple bench stop, I mounted an old deadbolt taken from a door to the end of my workbench. In the “locked” position, the bolt stays put, and in the “unlocked” position it can be pushed down so you can use the unobstructed top. —*Darryl Thomas*

Spot-On Task Lighting



Even though my shop is well lit, sometimes I need more light right on my work area. Instead of rigging up additional lights, I attach a small clip-on LED light on my cap's brim. It's great for working inside cabinets or doing close work of any kind. The light shines right where you're looking. You can buy these lights at your local home center for cheap. —*Gary L. Curry*

Shelf Liner Sanding Pad



One roll of shelf liner will provide a lifetime supply of pads which improve the performance of your sanding block. I bought a 10 square foot roll of smooth surface shelf liner at a local home center for about \$10. At about $\frac{3}{32}$ " thick, I find it has just the right combination of firmness and give for finish sanding. I use spray-on contact adhesive to hold the pad in place. —*Mark Thiel*

Spring Clamp Blade Storage



I like to keep my band saw blades on the wall next to my saw. To save space, I fold them into coils. The trouble comes when the coiled blade is hung on a peg or nail. I've had the blades suddenly come uncoiled and spring off the wall! That's unpleasant and potentially dangerous. I tried using twist ties, but they wore out quickly and it was a pain having to tie up and untie the blade every time I used it.

I came up with this handy hanger made with a 2x4 and some very small spring clamps. I notched the edge of the 2x4 with a dado blade and screwed a spring clamp into each notch. Now when I go to change blades, all I have to do is squeeze the spring clamp to release the blade. —*Ryan Vogt*

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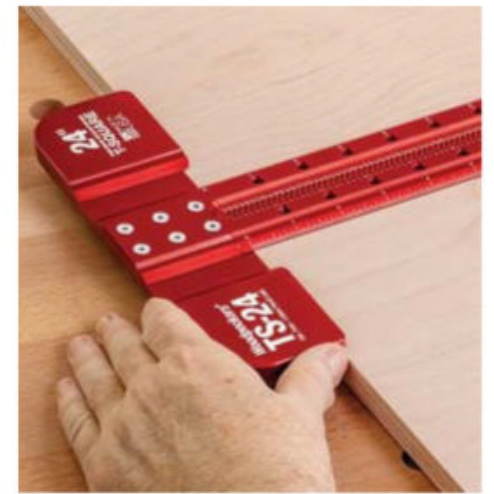
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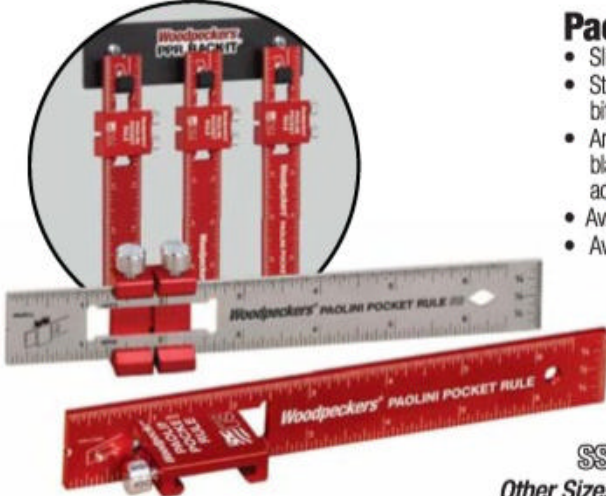
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Char Miller-King

Interview by Collin Knoff

How did you get started woodworking? Who were your mentors?

I am a self-taught maker. My first project was a platform bed that I made in 2003 with a borrowed drill and battery-powered screwdriver. My bed was inspired by a photo from a magazine, and I couldn't afford the bed. From there I took on other small projects and learned how to use each tool through trial and error. There were bookcases and more beds. I read a lot of books and watched the *Woodsmith Shop* and *This Old House* on the weekends to gain useful insight. Everywhere I went, I picked up a bit of knowledge about tools, techniques, and processes. Soon my circle of friends expanded and

our conversations centered around making and resources. Once I get an idea in my mind, I figure out how to do it with the knowledge I have. My uncle has been a carpenter for over 40 years. He taught me a lot of making and introduced me to the CNC. I send all my questions to him.

What do you think your best work is? What kind of work do you do the most?

My favorite project is the modern desk that I built last summer. I have gone through different iterations of desks. There was a hanging wall desk that I used for a few years that quickly became too small for my needs. So I set out to make something larger. A place for my monitor,



■ A BIG Shout-Out

There are so many amazing people on Instagram, it's hard to choose. My friend Tami, who is also a shop teacher, inspires me and teaches me great techniques.

@girlyshopteacher



PHOTOS COURTESY OF CHAR MILLER-KING

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drawers to conceal the papers, and enough room to spread out. It's my hub and all things start there. My ideas go from my mind to paper there; I communicate with my colleagues from there.

I am an educator at heart, and most of my work is in the shop showing others how to make. I teach woodshop classes at my local maker space, *Decatur Makers*, to children as young as seven, and adults of all ages. My mission is to bring woodshop back to schools. I started this by opening maker spaces at schools and teaching students how to use power tools.

I am a champion for women in woodworking. I do this through my monthly column *Women in Wood* for *Highland Woodworking*. Highland is an international purveyor of fine woodworking tools and products. I introduce a new maker to the community and share her journey into wood. My heart lies in servitude, whenever there is an opportunity to volunteer to teach children, I accept. I work with the *Girls' Maker Club* at our maker space and currently teach classes online to the community on topics ranging from SketchUp to paper circuits.

What advice would you give to someone starting out in woodworking or wanting to pursue it as a profession?

It is a very rewarding career once you find your niche. The best place to start is to complete a project someone has already done. Spend some time each day learning, whether that is reading a book or meeting a new maker online or in person. Every bit of knowledge you receive will benefit you in some way in the future. Most importantly, learn how to safely use your tools and protect yourself from dust and chemicals. Take what you know and pass it on, there will always be someone new who shares your passion.

What's your best hands-on tip or woodworking technique?

I recently started upgrading my shop and rethinking how I could double my work area and get the most use of my tools. One of my first builds, almost 20 years ago, was my workbench. At the time I didn't add any bench dog holes, because I had no idea that I would need them someday. Fast forward to today, and they sure would come in handy. However, I am not quite ready to modify my trusty bench. Instead, I used a large piece of scrap and pegboard to mark every six inches and then drilled bench dog holes. Here, I drop in bench dogs

with rubber topped bench cookies. Thanks to the pegboard, the holes are evenly spaced and I have created a secondary workspace. I also built a mobile workbench, which doubles in size when unfolded, and it has magnetic hardware to attach my measuring tools, a built-in Bluetooth speaker, and a collapsible shelf. I can instantly turn my 2 car garage into a full workshop by unfolding a few pieces of wood. **PW**

Char Miller-King is a woodshop educator from Georgia. See more of Char's work on her website (www.thewoodenmaven.com) or on Instagram @woodenmaven

“If you want to be great at woodworking, you have to put in the time to make mistakes. No one becomes proficient overnight.”



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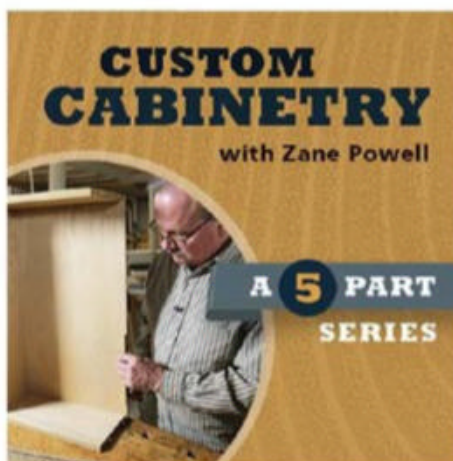
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■ Ebon Oak Rocker

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By Willie Sandry



PROJECT #2110

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PHOTOS BY THE AUTHOR

Rocking chairs are great things to have around the house. There's just something relaxing about a rocker, especially if it has the right proportions to be both comfortable and aesthetically pleasing. Add some soft chenille cushions, and this rocker makes a pretty nice spot to read a book or chat with a friend. This rocker is modeled after a Charles Limbert design circa 1914. In 1915 a new catalog debuted a line of "Ebon-Oak" furniture, which added dark wood inlays to existing Limbert Furniture Company's offerings, as well as introduced some new inlaid pieces. Interestingly, this rocker was not included in the company's printed catalog.

■ NEED A SIDE TABLE?

For the perfect complement to your new rocking chair, consider building the Dragonfly Side Table (pictured with the Ebon Oak Rocker). With tapered side panels, curved shapes, and angled joinery, it's loaded with woodworking challenges. It's all much simpler to build than it looks and the template based inlay technique is actually quite easy to execute.

■ View the plans in the November 2020 issue or at popularwoodworking.com/article/dragonfly-side-table

One standout feature of this chair is the single corbel found under each armrest. Limbert was known to incorporate single corbels in some of his furniture pieces, at a time when traditional designers only used corbels in pairs. The design and comfort of this chair places it near the top of my 'favorites list,' and not just the Limbert designs, but among all noted Arts and Crafts style designers. You'd know this chair if you saw it; the problem is you'll never see one. So rare is this particular chair, that I've never seen a color photograph of one, let alone one for sale at an auction house or antique dealer. So, my friends, you'll have to build it.

Start with Rockers

The rockers are glued laminations, so you'll need a bending form. I made a universal rocker bending form from layers of $\frac{3}{4}$ " MDF. It's one I've used in the past and seems to work well for rocking chairs big and small. The bending form has a radius of 42" and can be cut with a router trammel. The form is 40" long, and bulges $5\frac{1}{16}$ " over that span. Make one layer of the form starting with a piece of MDF 40" long x 8" wide. Then use that as a pattern to make a total of six layers.

Screw three layers together for the rocker form and set the other three layers aside.

Cut strips of white oak about $\frac{3}{16}$ " thick at the band saw for the laminations. The oak donor board should be about $2\frac{1}{4}$ " wide and 36" long. Plane the strips to a uniform thickness of $\frac{1}{8}$ ". The rockers will be trimmed to $32\frac{1}{4}$ " long and 2" wide once they come out of the form.

If you've never bent a pair of rockers before, it's not a difficult skill to learn. However, there are a couple of things to keep in mind for the best results. A piece of $\frac{1}{4}$ " plywood makes a nice clamping caul on top of the final thin strip of oak. Attach a scrap of wood to both ends of the caul to keep the clamps from slipping off. Along the same lines, a deep notch under each end of the bending form helps the clamps stay put. Cover the bending form and flexible caul with clear packing tape to keep the glue from sticking. Apply glue with a narrow, smooth paint roller to one face of each laminate, and start building a stack. Position the stack on the bending form, making sure it's registered against the vertical fence boards. Start clamping at the center and work your way toward each end. Use plenty of clamps for a nearly invisible glue line.



1 Use a narrow paint roller to apply glue to the thin strips and lay the stack on your bending form. Add a $\frac{1}{4}$ " plywood caul on top, before clamping the strips down on the form. I added two more clamps, for a total of 11.

2 When the rockers are released from the form, the amount of springback is negligible.



An interesting discussion is sometimes broached regarding what glue to use for bent laminations. Some woodworkers argue that epoxy or specialty glue is required. Concerns of springback, or 'creep' over time are often cited as the main concerns. To test these concerns, I used standard yellow PVA glue and paid particular attention to the amount of springback. With eight layers of $\frac{1}{8}$ " thick plies I noticed very minimal springback. I also have a rocker that I built months ago, using the same glue. I compared the loose rockers, new vs. old, and the curves were virtually identical. While specialty glues might be required in extreme situations, with this bending radius, they aren't necessary.

Make the Legs

Rummage through your hardwood pile and select kiln-dried stock for the chair frame components. Layout the shape of the rear legs on a piece of 8/4 that's $5\frac{1}{2}$ " wide and 39" long. The leg blanks will finish at $1\frac{3}{4}$ " thick. Cut the legs out following your layout lines and smooth the sawn surfaces.

Add veneers to two sides of the front legs for pleasing quartersawn figure on all sides. Plan the width of your stock so the legs finish at $1\frac{3}{4}$ " square. Alternately, you could select rift sawn stock for the front legs and skip the veneering step altogether.

Square Inlays

Now layout the location of the square inlay design on the front and rear legs. Start by routing the $\frac{1}{4}$ " wide x $\frac{1}{4}$ " deep groove with a router and edge guide. A $\frac{1}{4}$ " spiral down-cut bit is an ideal choice for the job. Once the groove is cut, size a strip of walnut or other dark hardwood to fit and glue it in place. Plane the inlay strip flush with the surface of the leg to prepare for the next step.

If you have a hollow chisel mortiser, the $\frac{3}{4}$ " square shapes are pretty easy to cut out. If not, you can always drill out most of



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3 Rip front legs that are $1\frac{9}{16}$ " wide and add $\frac{1}{4}$ " thick veneers on two faces. Small wedges help center the legs on the veneers.

4 Use a router equipped with an edge guide to cut $\frac{3}{16}$ " deep recesses for the decorative inlay.

5 Cut walnut scraps to fit the $\frac{3}{4}$ " square holes. Back-bevel the plug slightly, before gluing them in place.

6 When chopping the mortises for backrest rails, be sure to reference the front face of the leg against the fence. Consistency here will prevent alignment issues when assembling the chair.



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the waste, and chisel the recesses square. The final step of the inlay process is to cut pieces of walnut to fill the square recesses. Make sure to cut the square plugs so they'll show face grain (not end grain) for a consistent look. I clamped a block of wood to the rip fence on my table saw and cut the plugs with a crosscut sled. Adjust the rip fence until you're consistently cutting $\frac{3}{4}$ " plugs without further adjustment. The block clamped to the rip fence makes sure the small offcut won't be trapped between the blade and the fence. Back-bevel the walnut plugs with a sanding block for a gap-free fit, and glue them in place.

Move On to Mortises

The leg mortises are all straight, with no angles to deal with. Each rear leg receives four mortises, and each front leg receives only two. The mortises that will accept the seat rails are all $4\frac{1}{2}$ " long x $\frac{1}{2}$ " wide and $1\frac{1}{8}$ " deep. Whenever I cut intersecting mortises with a mortis-

ing machine, I set the depth of cut a little on the shallow side. Then I can come back and clean up the inside corner with a sharp chisel. This prevents cutting too far into the leg and weakening the joint.

The mortises that receive the curved backrest rails are a little smaller in size. They are all $2\frac{1}{2}$ " long x $\frac{3}{8}$ " wide, and $1\frac{1}{8}$ " deep.

Four Simple Seat Rail Parts are Next

How refreshing to build a chair without any angled seat rail joinery! The design of this rocking chair calls for straight, square joinery where the seat rails meet the legs. That makes your job of cutting the tenons a little bit easier. Prepare 5" wide x $\frac{7}{8}$ " thick boards for the seat rails and cut them to length. The front and rear seat rails are cut to $24\frac{1}{4}$ " long and the side seat rails measure $22\frac{1}{4}$ " long. Form $1\frac{1}{8}$ " long tenons on the ends of the seat rails, until they fit snugly into their respective mortises.

Only a few steps remain to complete the seat rail components. Mark curves that narrow the rails to $3\frac{3}{4}$ " wide at the apex. I suppose you could make a router template if you had more than one chair to make, but I simply cut the curve at the band saw. Spend a few moments smoothing the saw marks and fairing the curves before moving onto the next step.

Build the Backrest

The backrest rails require a couple more sticks of $8/4$ stock, but they only need to be $24\frac{1}{4}$ " long. Form offset tenons with a dado blade and miter gauge at the table saw. Once the tenons fit as they should, you can cut the curved backrest rails to shape at the band saw. Try to maximize the curve with the stock you have available and aim for a finished rail thickness of $\frac{3}{4}$ ".

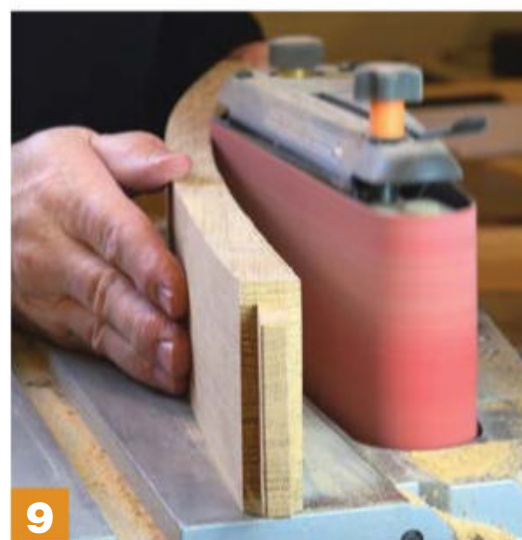
Cut a series of $2\frac{1}{2}$ " long x $\frac{5}{16}$ " wide mortises in the backrest rails. Dry assemble the chair to take a measurement for the slat length. Once you've confirmed the $17\frac{1}{2}$ "



7 Once the seat joinery is complete, band saw the curves and fair them with a spokeshave and sanding block.

8 Form offset tenons on the backrest with a dado blade and miter gauge at the table saw. Start by cutting the front cheeks $\frac{3}{16}$ " deep, then flip the rail over and increase blade height until the tenon fits the mortise.

9 When you're convinced the joinery fits well, band saw the curve and sand it smooth. A coarse 50-grit belt is best for rough shaping.





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10 Select lumber that has air-dried to 12-15% moisture content for the armrest parts.

11 Steam an armrest for an hour and immediately transfer it to the bending form.

12 Position the armrest on your mark and add a 1/4" strip of plywood on top, before clamping it down.

shoulder-to-shoulder dimensions, set out to make the backrest slat components. They're 18 1/2" long overall, and 3" wide x 1/2" thick. Cut 1/2" long tenons on the ends of all four slat with your method of choice. Fine-tune the tenons with a shoulder plane or sanding block until the parts come together without too much trouble.

Get Steamed

At this point you're ready to make the steam-bent armrests. Stock selection for parts that will be steam bent seems to be a critical point. I always use air-dried lumber

for steam bending, rather than my usual kiln-dried selection. Air-dried lumber bends more easily, holds its shape better, and is less likely to suffer internal cracking. So, I selected some highly figured, air-dried 5/4 lumber, and dress it to a finished thickness of 7/8". The armrest blanks need to be about 4 3/4" wide x 27" long for now.

Insert an armrest in a pre-heated steam box for an hour to soften the lignin. You'll use the same bending form as you did for the rockers, although you'll need to add three more layers of MDF to make it wide enough. Only the back 20" of the

armrest will be set over the form, while the front 7" of the armrest will hang unsupported. Have a piece of 1/4" plywood ready to cover the armrest and protect it from being dented by the clamps. Apply enough clamps to gently approximate the armrest to the curve of the bending form. Don't overdo it with the clamping pressure here... use just enough force to close the gap. Leave the armrest clamped in the form for 24 hours. Repeat the exact process with the other armrest, so the curves will match.

Fitting the Armrests

Once the curve is set, trim the parts to 4 1/2" wide, and cut a single mortise at the front of each armrest. It's always a good idea to transfer the mortise location to the underside of the armrest and score the perimeter with a chisel. That way you'll prevent chipout as you cut the through mortise. Once these mor-



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13 Position the armrest on the tenon shoulder and mark the notch location.

14-15 Drill a 5/8" hole in the armrest and use a dowel center to transfer a dimple to the rear leg.

16 With the armrest installed, transfer the curve to the side-slat. Now cut the side slat to length, being careful to stay 1/2" beyond your mark.

17 Cut the side-slat tenon with a bearing-guided rabbeting bit. Finally, complete the shoulder cut with a hand saw.

tises are established, you can cut a tenon at the top of each front leg to fit. When cutting through tenons, I like to test fit on the outside of the mortise. Take multiple passes to gradually sneak up on a snug-fitting joint. Once the tenon eases into the outside of the mortise, make no more adjustments to the tenon. Any additional finesse work will be done to the mortise wall as needed. Now dry assemble the chair again and set the armrest in position alongside the tenon. The tenon shoulder on the front arm provides a convenient perch, as you mark a line where the rear leg intersects the armrest. Calculate how big the notch needs to be to accommodate the rear legs and complete the cuts with a band saw or dovetail saw. When test fitting the armrest, pencil a reference line on the through tenon where it projects through the armrest. Then form the pyramid-shaped detail on the tenons with an oscillating belt sander or block plane.

This is the most enjoyable part about chair building, when you can stand back and see the results of your hard work. Once the armrests are fitted, the chair really starts to take shape. Now drill a hole in the back of the armrests and use a 5/8" dowel center to locate the receiving hole in the back legs. Finally, shape the armrests as indicated in the detail rendering to lighten the look.

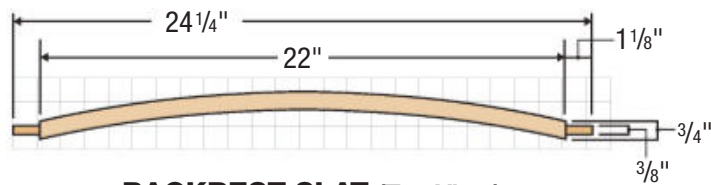


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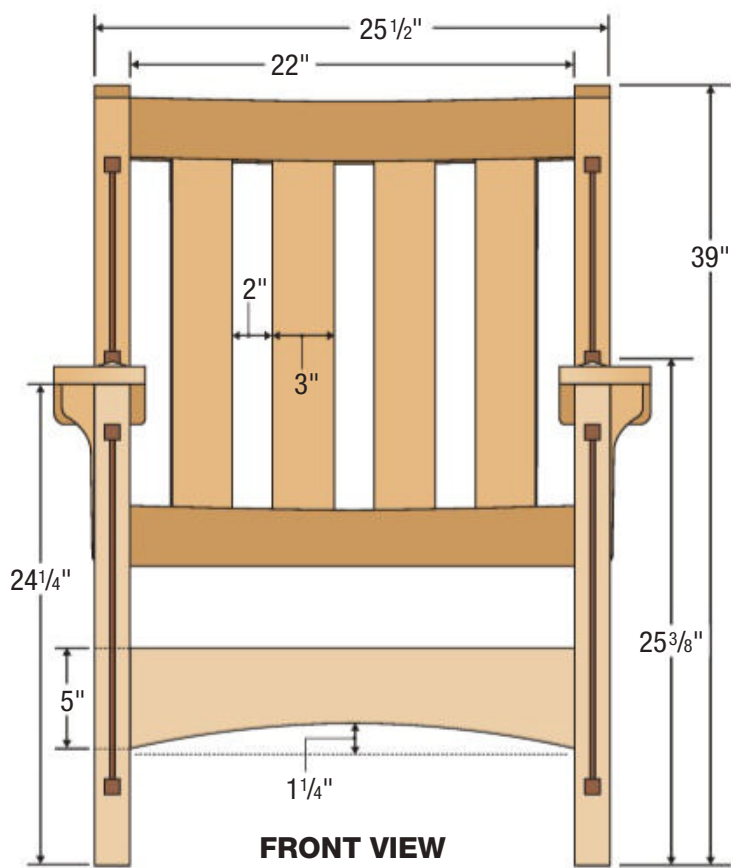


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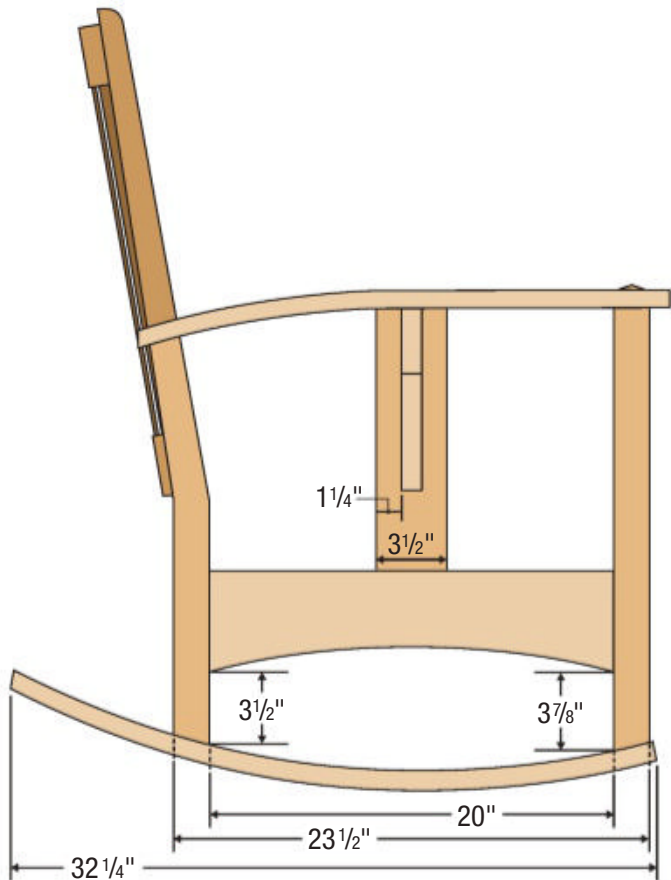
Ebon Oak Rocker



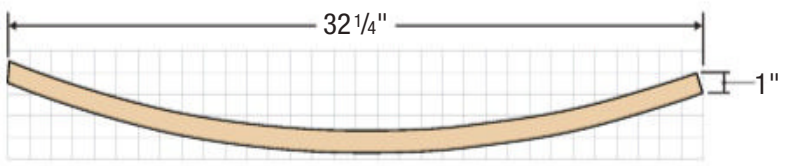
BACKREST SLAT (Top View)



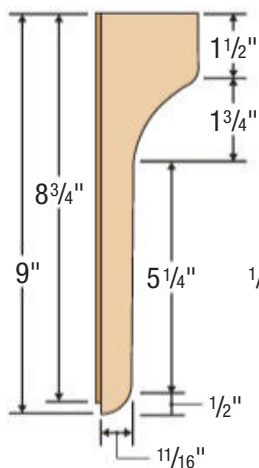
FRONT VIEW



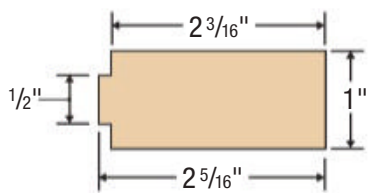
SIDE VIEW



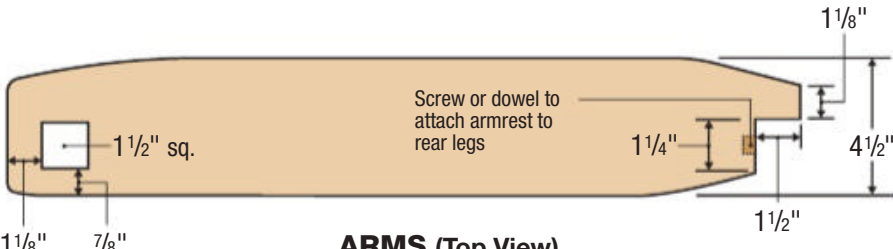
ROCKER (Side View)



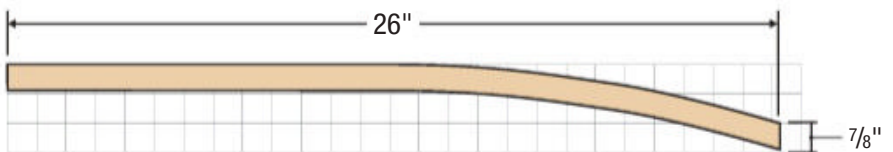
CORBELS (Side View)



CORBELS (Top View)



ARMS (Top View)

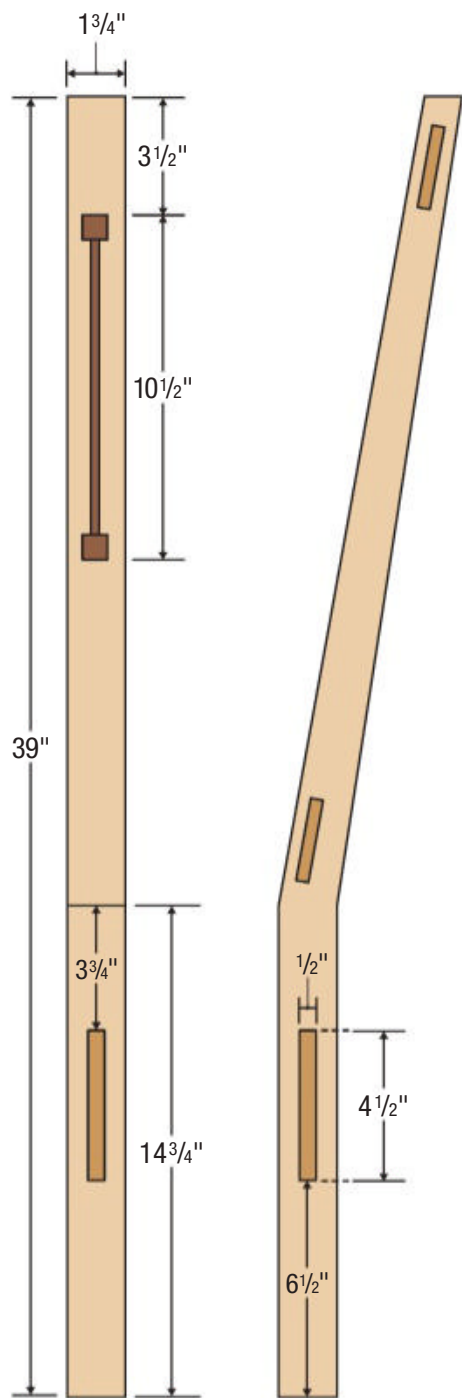


ARMS (Side View)

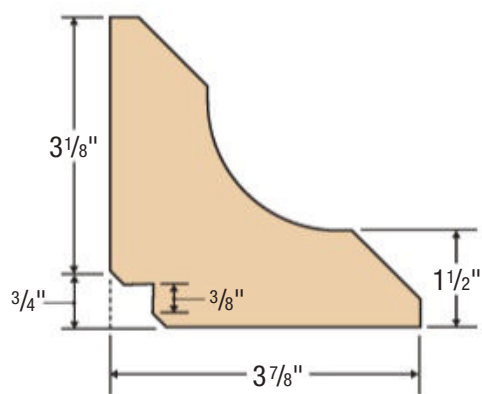
Materials List

- Ten #8 x 2" long square drive, **pocket hole** style screws for corner blocks and armrest-to-rear leg joint
- 3/4" **dowel stock** for attaching rockers to the legs
- 5/8" **dowel stock** for attaching armrests to the rear legs
- Various **walnut inlay material**

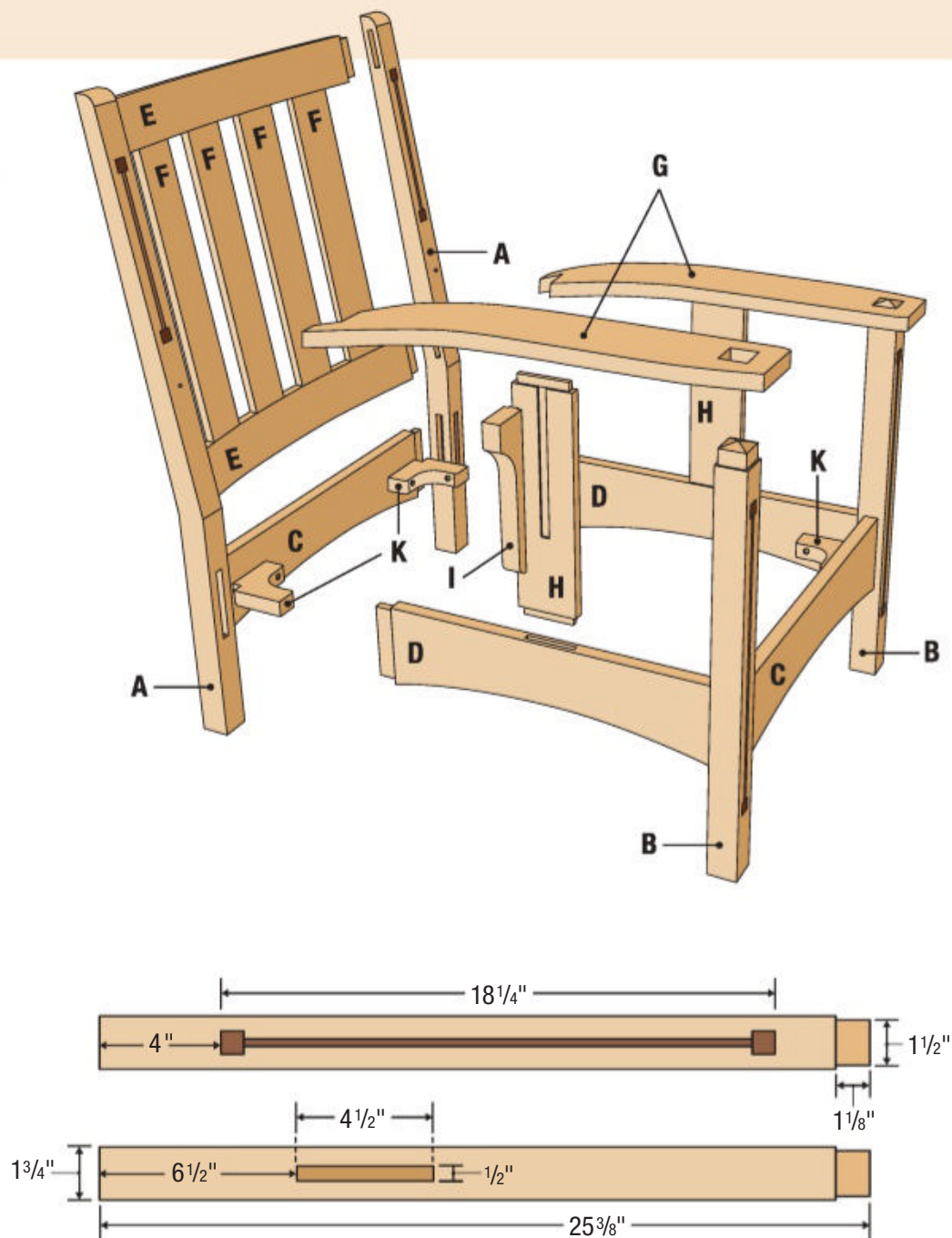
NOTE: Each square represents 1".



REAR LEGS
(Front View / Side View)



CORNER BLOCK
(Top View)



FRONT LEGS
(Front View / Side View)

Cut List

No.	Item	Dimensions (in.)			Comments
		T	W	L	
2	A Rear legs	1 3/4	5 1/2	39	Cut from blanks
2	B Front legs	1 3/4	1 3/4	25 3/8	
2	C Seat rails (front/rear)	7/8	5	24 1/4	Curved rail finishes at 3/4" T
2	D Seat rails (left/right)	7/8	5	22 1/4	
2	E Backrest rails	2	3	24 1/4	17 1/2" shoulder-to-shoulder
4	F Backrest slats	1/2	3	18 1/2	
2	G Armrests	7/8	4 3/4	27	Final size: approx. 4 1/2" W x 26" L
2	H Side slats	5/8	3 1/2	14	13" shoulder-to-shoulder
2	I Corbels	1	2 5/16	9	Finished dimensions listed
2	J Rockers*	1	2	32 1/4	
4	K Corner blocks	1	2 1/2	5 1/2	Holds seat cushion in place

*Each rocker is made up of 8 strips that are 1/8" T by 2 1/4" W and roughly 36" L.

Side Slats & Corbels

At this point there aren't many parts left to make for the chair frame. Only side-slats, corbels, and corner blocks remain. The side-slats are tenoned into the armrest and side seat rails. The only hang-up is the top of the side-slats will need to be curved slightly to meet the armrest. To handle this curved joinery element, I cut the bottom tenon like I normally would at the table saw. Then I registered the shoulder of the tenon against the seat rail, to mark a line where the side slat meets the armrest. Trim the slat $\frac{1}{2}$ " beyond your line and cut the top tenon at the router table. A bearing-guided rabbeting bit follows the curved shape and easily creates the tenon cheeks. Trim the shoulders of the tenon with a hand saw to finish the joint.

Chuck a $\frac{1}{2}$ " diameter bit into the router table and rout a groove in the side slat. This $\frac{1}{8}$ " deep groove extends $8\frac{3}{4}$ " to receive the corbel. Now that the grooves are complete, cut a shallow stub tenon on the corbel to match. Spend a few minutes test fitting the corbel in the groove. You may find it necessary to shape the top of the corbel slightly to meet the underside of the armrest.

Armchair vs. Rocker?

The rough leg length called for in the plans actually makes the perfect height armchair. This gives you the chance to look the chair over and decide if a stationary chair will suffice, or if you'd rather continue to make the rocking chair. You could even mock-up a cushion to help decide. If you decide to press on for the rocking chair, you'll need to trim the legs to length, and match the curve of the rockers. Mark the legs to indicate their final length and clamp the rockers alongside the legs. Mark a cut line on both the front and back legs. To trim the legs, I actually prefer to make the cut at the table saw. Just



18 Elevate the rockers on blocks to test the resting angle of the chair. Make a mark on each leg before removing the rockers and cut the legs to final length.

19 The corbels feature stub tenons that fit into a shallow groove in the side-slat.

20 Clamp rockers in place and drill a 3" deep hole with a $\frac{3}{4}$ " brad-point bit. Note wedges taped to bottom of rockers give clamps a flat bearing surface.

21 Add glue to the end grain of the legs and reinstall the clamps. Glue the dowel in place, and finally drive the wedges home.

22 Drill in $\frac{1}{4}$ " dowels to pin the armrest tenons in place. Trim the dowel flush and sand it smooth.



cut as close to your line as possible and curve the shape slightly with a sanding block and coarse sandpaper. I seem to get better results with this approach, compared to using the band saw. The radius across a 1 3/4" leg is almost negligible, so there isn't but a moments work with a sanding block.

Final Details & Assembly

Ease the edges of all the components and give the parts a good sanding. Permanently assemble the backrest slats into the curved rails. With this subassembly glued and clamped, add the rear legs and rear seat rail. Set this rear portion of the chair aside to dry and start building the front subassembly. This front intermediate glue up consists of the front legs and the front seat rail. Once those have a chance to cure, bring everything together with the side seat rails. Now add the side slats and armrest as you continue with final chair assembly. Add the

corbels, massaging the fit where they meet the armrests. I found a few swipes with a rasp or stationary sander does the trick. Finally, cross-peg the through mortises with long 1/4" dowels. Add a single screw in each armrest to reinforce the joint where it meets the rear leg. Cover the screw holes with tapered oak plugs.

Add corner blocks with glue and screws to reinforce the mortise and tenon joints. I always aim to install the corner blocks as low as possible on the seat rails. That way the actual seat height can be set to your liking with cleats at the front and rear (as needed). You can always raise the seat up higher, but once the corner blocks are glued in place you won't be able to lower the seat height.

The last assembly step is to affix the rockers to the chair with wedged dowels. Clamp the rockers in place, using angled clamping blocks as needed to hold them securely in position. Drill 3/4" holes

through the rockers and into the legs. Once the holes are drilled, remove the rockers to apply a heavy dose of glue, including the end-grain of the legs. Partially insert slotted dowels through the rockers, making sure to orient the slot across the grain of the rockers. Reinstall your clamp setup to hold the rockers in place as you finish the installation. Drive the dowels home and add small wedges to lock them in place. Don't count on the action of the wedge to tighten up gaps in the joint. Rather, the joint should be held tightly in place by the clamps, before the wedges are glued and tapped in place.

Apply the Finish and Add the Cushions

Now's the time to locate any dings in the wood or dabs of errant glue. A shop light at a low raking angle can help you spot any blemishes. Give the whole chair a good hand sanding with your final grit, making sure all the edges are eased. Apply your finish of choice, which in this case was an oil-based stain in a warm brown tone, and two coats of sprayed lacquer. Wet sand the final topcoat with soapy water and a 1200-1500 grit foam sanding pad.

The last bit of woodworking is to build a frame for the seat cushion. Size the seat frame 1/4" smaller than the opening in all directions and join the corners with half-lap joints. Now drop the rocker off at a trusted upholstery shop for a set of new cushions. If you're feeling adventurous, check out the article on page 54 to learn how to make your own cushions. **PW**



23

23 Install the extra soft seat cushion into the chair.



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24 It simply rests on four corner blocks which are glued and screwed to the frame. Mount corner blocks as low as possible in the frame.

Washington-based woodworker Willie Sandry is a master of Arts & Crafts furniture. Not one to take a project halfway, Willie often blends other disciplines, such as upholstery and leaded glass, to complete his projects. Take advantage of Willie's extensive knowledge by viewing his YouTube channel, The Thoughtful Woodworker.

Taming the Quadrant Hinge



A story stick and the router table simplifies hinge installation.

By Doug Stowe

The quadrant hinge is a lovely thing, bringing both class and strength to the operation of a fine box. But after having gone to great lengths to perfect a box, the installation of a complex hinge can be risky. Who wants to run the risk of destroying something when you've gotten so close to completion? For that reason, the quadrant hinge is often purchased but left hiding in the parts

drawer unused. The other aspect of quadrant hinges is that they're often sold with an expensive routing template that will apply only to the use of that particular hinge. A third point is that I find it awkward to balance a large router on the edge of my finely crafted, nearly completed box. It's an anxiety causing endeavor.

For many years I've taught woodworkers to use a story stick

technique to set up for routing the shallow mortises for butt hinges using the router table. Using the router table offers a steadier platform for accurate work than trying to balance a heavy router on the back edges of a box. My students have asked me if a similar technique can be used for the much more complex quadrant hinge. Here I'll show how. It is not a particularly easy technique, but it will

PHOTOS BY THE AUTHOR



work well with quadrant hinges, even the cheap ones for which no template is available.

The first step is to clearly mark the front of the lid and body of the box. You can do this in pencil if you like, as sanding of the front of the box can still take place after the hinges are installed. Masking tape also works and will not interfere with the routing.

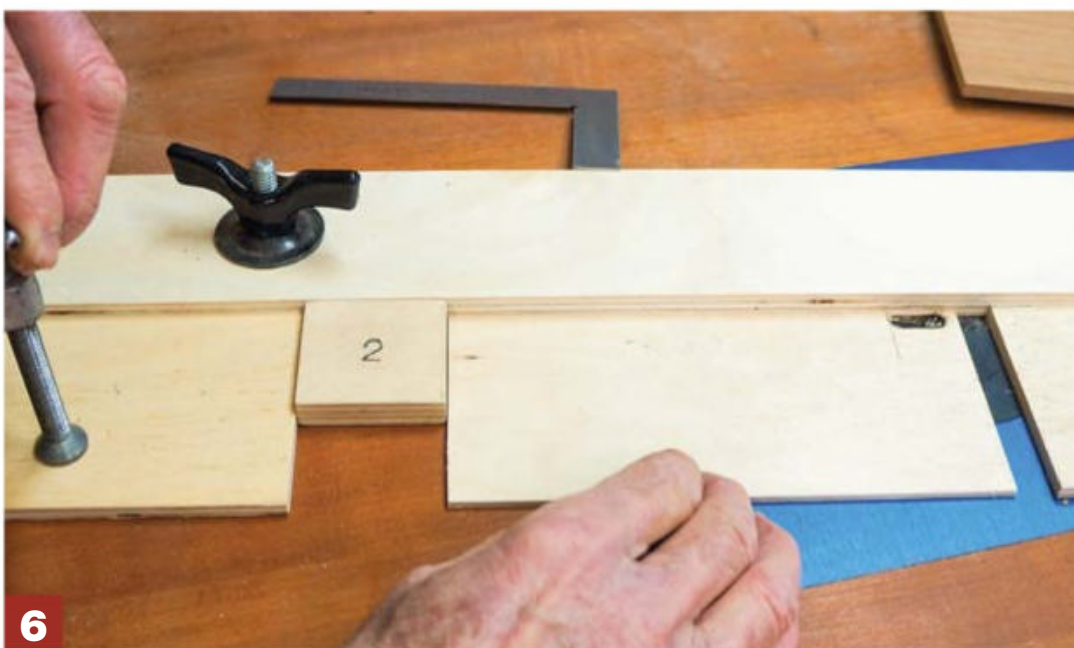
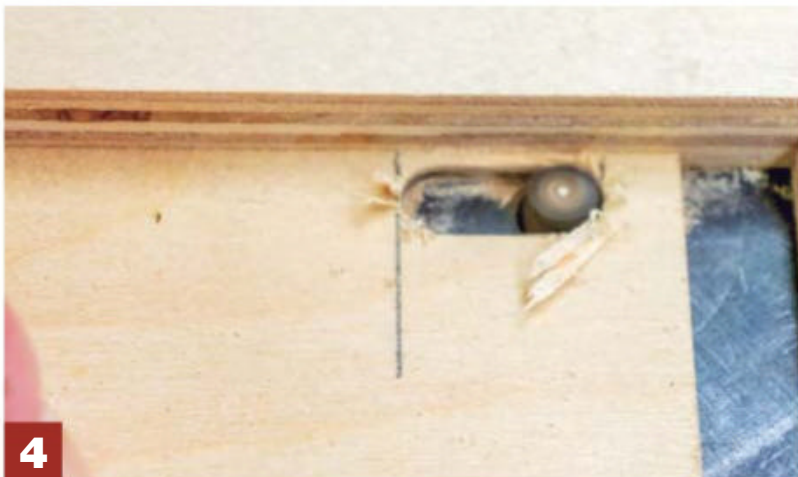
Cut a piece of thin material to use as a story stick. I use $\frac{1}{8}$ " Baltic birch plywood, but a thin piece of MDF or other compressed hardboard will work also. Choose a width for your story stick to feel safe for maintaining a good grip and cut it to the exact length as the distance from the front to the back of the box. I check very carefully with my thumbnails to feel that the length is exact.

1 First, make a story stick using thin stock and cut it same the length as the depth (front to back) of the box.

2 Use a scrap to test the router setup. Make certain that the fence is set so that an equal amount of wood is left on each side of the cut.

3 Carefully measure the necessary travel to conform to the width of hinge.

■ Quadrant Hinge



4 Carefully mark start and stop points on your story stick. Rout between marks with router bit high enough to cut through story stick.

5 The routed opening in the story stick will be used to set up the stop blocks on both sides of the router table. These will set the openings on each side of the box's lid and body.

6 The addition of a 2" spacer block brings the distance between the router table stops to the box's full length. The use of the low fence and thin, flat stop blocks keeps any inaccuracies from affecting the fit.

For this box I'm using the smaller Brusso quadrant hinge, which requires a $\frac{5}{16}$ " straight cut router bit. I chose this particular hinge because the sides of this box are only $\frac{7}{16}$ " thick. I wanted the hinge to center in that stock with $\frac{1}{16}$ " of wood on each side. Making the story stick requires that the height of the bit be adjusted to cut through the story stick stock.

Adjust the distance between the fence and the bit to leave a space equal to the distance between the edge of the box stock and the hinge. To make certain I get the set up right, I use a piece saved from making the box sides to test the cut. Measure, then test, before running the risk of destroying your masterpiece.

Next set up your first stop block. You'll notice in the photo above that the fence and stop block are made of relatively thin stock. I used $\frac{1}{2}$ " Baltic birch for the fence and $\frac{1}{4}$ " Baltic birch for the stop block. The reason

for this is that a taller fence or thicker stop blocks would cause some loss of accuracy in the event that my box was slightly out of square (that can happen, even to the best of us). Carefully measure where the hinge will fit. With the hinge being 1" wide and the inset from the edge of the box being $\frac{1}{16}$ ". I set the stop block at a distance of $1\frac{1}{16}$ " from the outermost cutting edge of the router bit.

Tell a Story

On the story stick, mark approximate start and stop points for routing the slot. Here, you'll want to closely watch that your routing of the story stick is where you want. The marks are also there to remind you where the router bit will plunge through the surface of the Baltic birch. Keep your fingers a safe distance from that point. Start the router with the stock held up above the surface of the router table, then lower the story

stick onto the spinning bit.

After the bit breaks through the stock move it from right to left along the fence to the pencil line on the right. Then, very carefully, rout back the other direction to bring the story stick up to the stop block. You will have to blow out any accumulation of sawdust between the story stick and stop block—this will interfere with getting a perfect fit. As you rout from left to right, it's a climb cut. Keep a tight grip on the stock and move slowly to keep control. This first router cut in the story stick will cover the first router operation in fitting the hinge to the box: hollowing out the hinge mortises.

With the story stick almost complete (minus some adjustment), I rout a test piece that's cut to the same length as the box (Photo 2). This is to double-check the mortises along the sides of the box and make any necessary adjustments.



7

7 After the story stick is made, lower the router bit to conform to the thickness of a hinge leaf.



8

8 Use the story stick and 2" spacer block to set up stop blocks on the router table to control travel of the box against the fence. The first cuts will be done with the story stick and spacer block on one side then swapped for subsequent cuts.



9

9 Practice on a scrap piece cut to the same length of the box. The more accurately the test piece conforms to the box length, the more accurately your hinges will fit.



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10 The set up allows you to rout along one end of the back of the box.



11

11 With the test piece turned 90°, rout into the opposite end.



12

12 To rout the other end of the test piece, flip the story stick and place the 2" spacer back in position allowing the correct travel space between the two place. Then remove story stick and block and rout the hinge mortises on the opposite end of the test piece.



13

13 The necessity of doing the operation first on a test piece becomes clear when you check the fit on the hinge. The test fit shows that the hinge mortise must be longer in the sides in order to fit the full distance into the back. It's an easy fix.

Many of the boxes I make are in what I call an "X plus" or "minus two" system of proportion. The length of the front will be 2" less than the length of the side. To use that proportion when cutting box parts to size, I use a 2" spacer block. I use the same spacer block to extend the length of the story stick in

setting up to rout the hinge mortises at the back of the box.

Remember that I cut the story stick to represent the front-to-back length of the box. The 2" spacer makes the story stick match the length of the box, and the routed space in the story stick provides the appropriate amount of travel. To set



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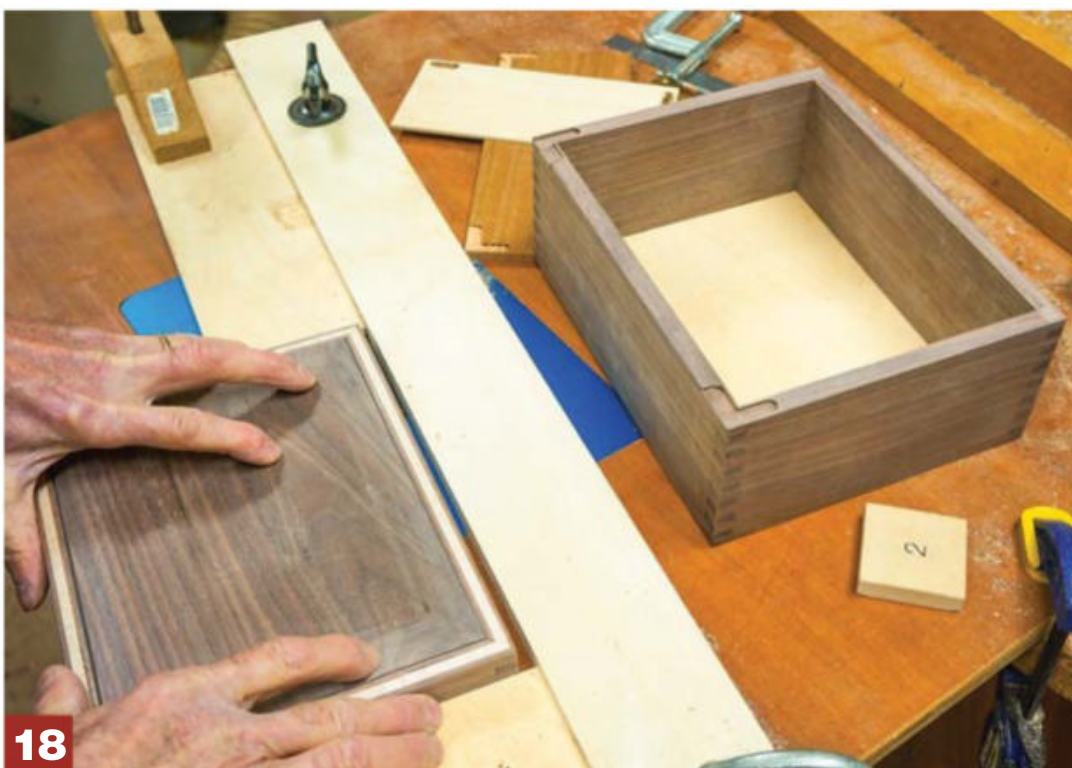
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14 Raise the height of the router bit to cut through the story stick. Put the story stick in place then open a space between the router table stop and the story stick equal to the distance you want to lengthen the mortise along the side. Form a guide mortise on another corner of the story stick and raise router after cut.

15 When you have achieved a perfect fit in the test piece as shown, you will have confidence for hinging the box.

16 Use the newly developed story stick mortise to set up the stop blocks for routing the hinge mortises in the ends of the box, first from one side, and then with the story stick placed on the opposite side.

17 Rout one end of the lid and the opposite end of the box's body and then reposition the stop block for the matching mortises.

18 Use the 2" spacer block and story stick to set up and rout the hinge mortises across the back. Start by routing with the back of the box slightly away from the fence. Complete one side of the top and bottom then reverse position of the stop block as shown in photos 8 and 12 and repeat.

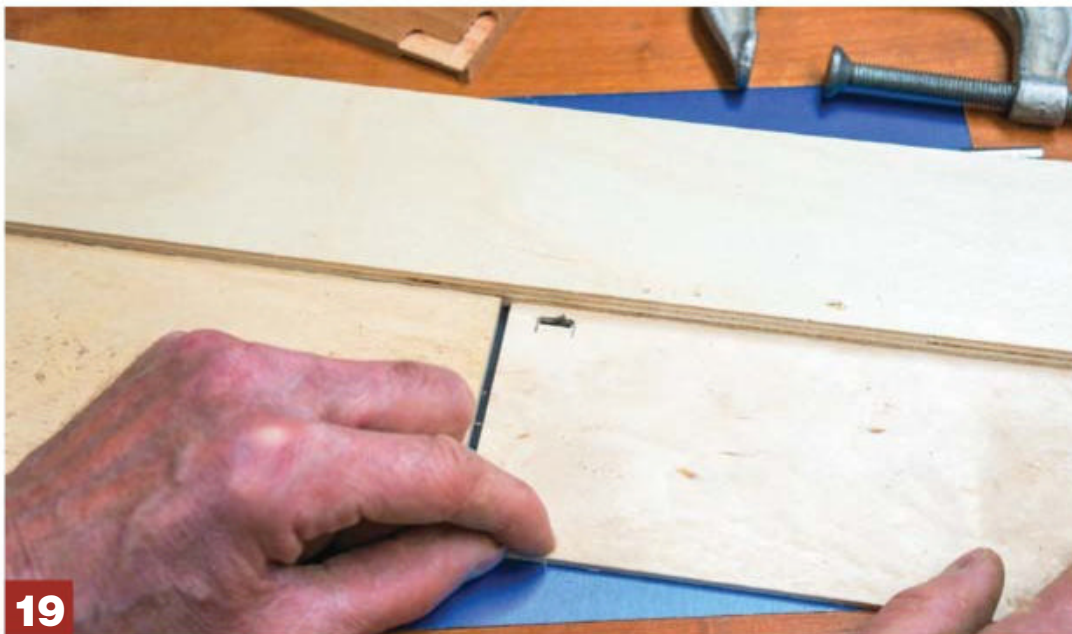
this up, rotate the router bit so that its cutting edges are at their widest point parallel to the router table fence. With the spacer block in place slide the story stick first to the left and then to the right as you clamp the stop blocks in place. Next, set the

height of the router bit to conform to the thickness of one leaf of the hinge.

Use your test piece to begin evaluating your set up. Rout between the stops, moving the workpiece back and forth as you work it tight against the fence. The result is shown in

photo 10. Rotate the workpiece 90° and rout with one end tight to the fence. This makes the mortise that follows the side of the box.

Next, flip the location of the stop blocks by reversing the story stick and spacer block. Now, you'll use



19 The third operation recorded in the story stick is routing the deeper groove that provides clearance for the lid support arm. This operation can be done on another corner of the template so it can be saved for the next time you use a quadrant hinge. Use a $\frac{1}{8}$ " router bit and raise it in several steps, rather than attempting to rout the full depth in a single pass.

20 The finished hinge mortise is a lovely thing routed step-by-step. Again, save the template to serve as a starting point, simplifying the next time you use a quadrant hinge.

the travel left and right in the story stick to provide the correct amount of travel between stops. Rout the test piece again between stops.

At this point you can actually test to see how the hinge fits and you can make whatever adjustments are needed. In this case, you can see that the rout in the side of the box is insufficient in length (Photo 13). This is caused by the side arm of the hinge being longer than the back arm. This is easy to fix by making another routed groove in the opposite end of the story stick.

To make the groove longer I raised the bit and after moved the stop block enough to change the length of the groove. Then, I formed a new guide cut. With that cut made to the right length, it's now a perfect fit that will translate directly to my finished box. I will use this new guide to set up and rout the hinge mortises into the sides of the box. After a test I can see how the hinge fits.

When I'm satisfied that the story stick provides for an accurate set up, I begin routing the actual box.

Taking up right where we left off in the test routing, rout the grooves in the sides of the box lid and body. Then flip the story stick along the fence in the other direction to rout the hinge mortise along the opposite side. Photos show the side mortises routed on both sides.

To finish the hinge mortises along the back edges of the lid and body of the box, the story stick and spacer block are required. Use the story stick and spacer block to position the stop blocks and clamp them in place. With the stop blocks secured to the router table, begin routing the back edges of the lid and body of the box. Photo 15 shows the fit of the hinge and proof that this technique actually works! Flip the story stick along the fence to set up the opposite side.

Next and finally in the routing operation, we need to provide space for the catch to fit equally into the lid and body of the box. This requires a routed mortise $\frac{1}{8}$ " wide, nearly $\frac{3}{4}$ " deep and $\frac{1}{2}$ " long. Again, the story stick comes in handy. Leave the fence in the same position through the hinging operation but change router bits to one that's $\frac{1}{8}$ " in diameter. In order to rout a mortise this deep in hardwood with such a skinny bit requires the mortise to be routed in stages, $\frac{1}{4}$ " at a time.

First make the required cut in the story stick as shown. Use this set up to rout the mortises for the lid stay to fit into the lid and body of the box when it is closed. Rout one side of the lid and base in $\frac{1}{4}$ " increments, then use the story stick to reposition the stop blocks and follow the same procedure for the opposite sides of the lid and body of the box. All that's left to do is install your hinges and marvel at your completed box. **PW**

Doug Stowe is a longtime woodworker and author. He teaches woodworking at the Clear Springs School in Eureka Springs, Arkansas. You can see more of his work at www.dougstowe.com.

■ Turning a Celtic Shield —

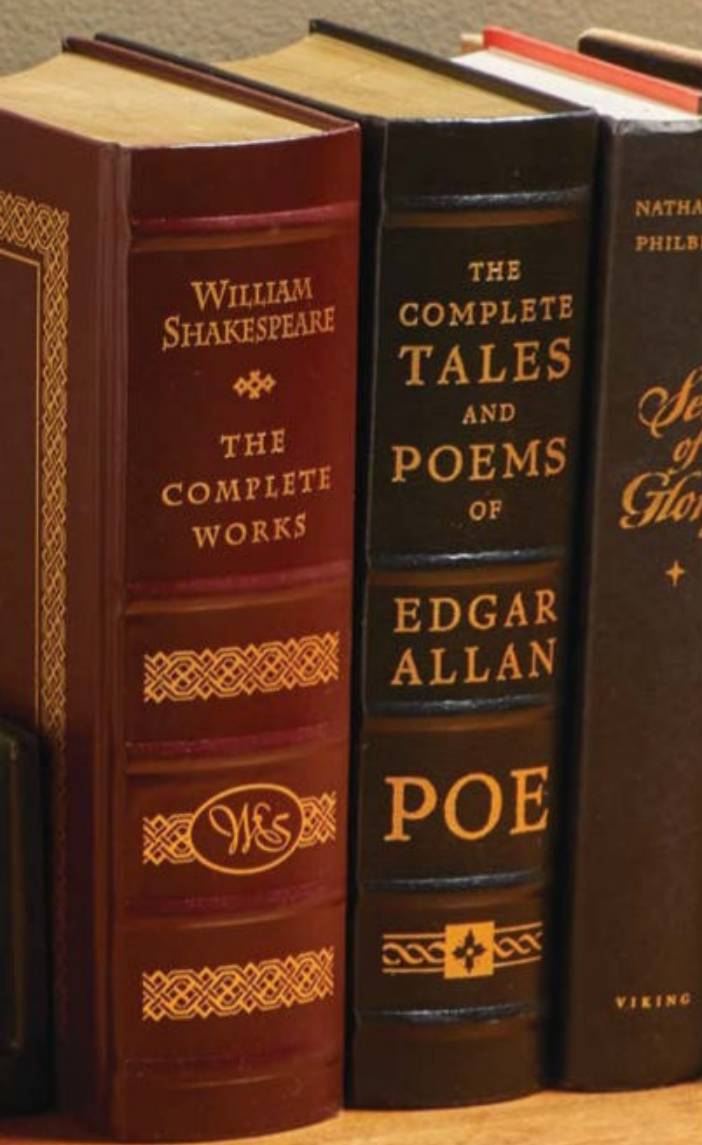


PHOTOS BY JACK COYIER & LOGAN WITTMER

Spend a couple of hours creating this beautiful, decorative Celtic shield.

*Not for use in actual combat.

By Jimmy Clewes



PROJECT #2111

Skill Level:
Intermediate
Time: 1 Day
Cost: \$75



1



2

Tools & Equipment

- 1/2" bowl gouge
- 1/8" parting tool
- 1/8" spindle gouge
- Torch with MAP gas
- Black Sharpie
- Metal leaf and size (latex adhesive)
- 2 soft-bristled brushes
- Shellac and Danish oil
- Upholstery studs

1 After cutting the blank round, mount a faceplate ring on the back. The dovetailed ring quickly and easily mounts the blank to a scroll chuck.

2 Use a bowl gouge and a series of draw cuts to smooth out the face of the blank. This face will end up being the back of the finished shield.

Looking for a fun project with so much potential for embellishment and design? Or maybe a unique, historically based piece to turn and hang on your wall? Look no further. Turn a Celtic shield.

You'll need to start by selecting a blank that fits your lathe. Here, I'm using ash. Scribe a circle and cut it at the band saw. Even if you just cut the corners off to make the blank an octagon, it will make a difference to how quickly the piece can be trued up and balanced.

Preparing to Turn

The size of the blank dictates which method I use to initially mount the piece. With a larger diameter blank (say over 12"), I like to use a 4" faceplate ring for the extra support towards the edge of the shield. Faceplate rings have a dovetail and allow the piece to be taken off the lathe and replaced without losing

accuracy. The faceplate ring is placed and mounted with several screws. I use at least 3 holes to affix it to the wood. On larger pieces I may use them all. Don't worry about the screw holes in the face of the shield as these will be removed whilst designing the shield.

When mounted on the lathe and ready to turn, I first true up the edge and then the face of the blank using a 1/2" bowl gouge. This face of the blank will become the back of the shield. As a side note, when working on a blank with the grain running perpendicular to the bed, never use a spindle roughing out gouge. The grain is running in the wrong direction and could invite a huge catch. The spindle roughing out gouge is for roughing out a spindle square from square to round, where the grain runs the length of the bed. Lastly, I make sure that this surface is slightly undercut to ensure that the shield will sit flat against a wall.

Starting With the Back

Using a pair of dividers, I measure the outside diameter of the chuck jaws and transfer the measurement to the wood by marking it with dividers. I close the jaws until there is approximately $\frac{1}{8}$ " between the jaws before measuring as this will ensure that the jaws grip evenly with the maximum amount of jaw surface in contact with the wood.

I use the Vicmarc 120 chuck and the diameter of the recess measures $2\frac{3}{4}$ ". After marking the recess, I use a $\frac{1}{8}$ " parting tool and plunge cut into the face of the blank to a depth of about $\frac{3}{16}$ ". This is ample to hold the 16" diameter blank. Make sure you cut to the inside of the scribed mark otherwise the recess will be oversize. I then make two similar cuts with the parting tool to remove enough of the

recess to fit a $\frac{1}{2}$ " bowl gouge. I use this to remove the rest of the recess waste. The back of the shield is now ready for sanding and finishing.

I power sand using a 2" sanding pad starting with 180 grit and working through to 400 grit. I then seal the wood with a thinned down Zinsser's Shellac clear coat. The mix I use is 30% denatured alcohol and 70% Zinsser's clear coat. I find that this thinned-down version penetrates further into the wood and seals it better. I prefer to apply a couple of thin coats rather than one thicker coat. When the shellac is properly dry, sand back lightly with a fine abrasive. I use a Scotch-Bright abrasive pad as the fibers do not tend to break and enter the pores of the wood as steel wool tends to do, especially with open grain wood

like ash. After sanding, I apply a light coat of Natural Danish oil, wipe off the excess, and leave it to dry. The oil really "pops" the grain and gives the piece a beautiful luster. The back of the shield is now finished.

3 Measure the outside diameter of the jaws with dividers.

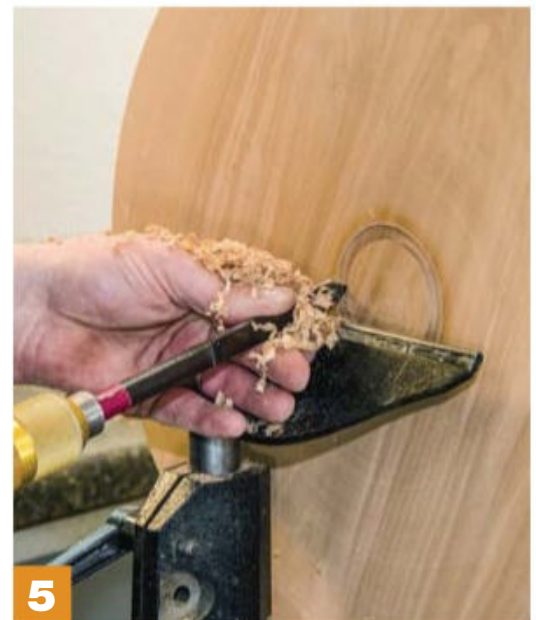
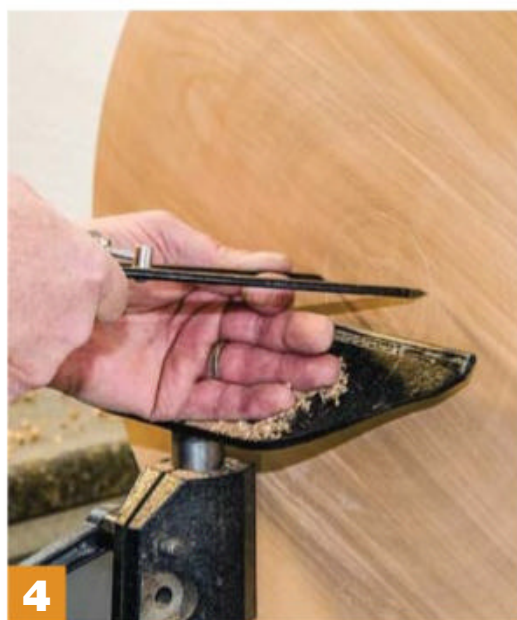
4 Transfer the measurement to the center of the blank.

5 Make three plunge cuts to the inside of the scribed mark.

6 Switch to a bowl gouge to remove the rest of the waste.

7 True up the outside edge of the blank with a light push cut.

8 Sand, seal, and oil the backside of the blank.



Turn It Around

After removing the blank from the faceplate ring, place the recess in the jaws of the chuck and expand them firmly so we can attend to the front of the shield. I cleaned off the front face of the shield using the 1/2" bowl gouge and a draw cut. You will see that you have the screw holes in the surface from the faceplate, don't worry as these will disappear in the design.

Now using the 1/2" bowl gouge, I start a cut from the middle and begin to form the dome in the center of the

shield. The depth and curvature of the dome will change depending on where the screw holes are located on the surface. Your aim is to remove the holes with the dome or if necessary, cut a cove in beside the dome to get rid of the holes. The design of the shield is entirely up to you as long as the holes are removed within your design. Thinking about it a little more, you could fill the holes with a copper or silver rod or any other product you think of to include the even spaced holes in the design.

9 Flip the blank around and expand the jaws into the recess on the back.

10 Clean up the face of the shield with a draw cut from center to rim.

11 Start in the center and roll a dome into the shield.

12 As the dome starts to form, remove some of the outside waste with a push cut inwards.

13 Continue to roll the dome until you're happy with the size.

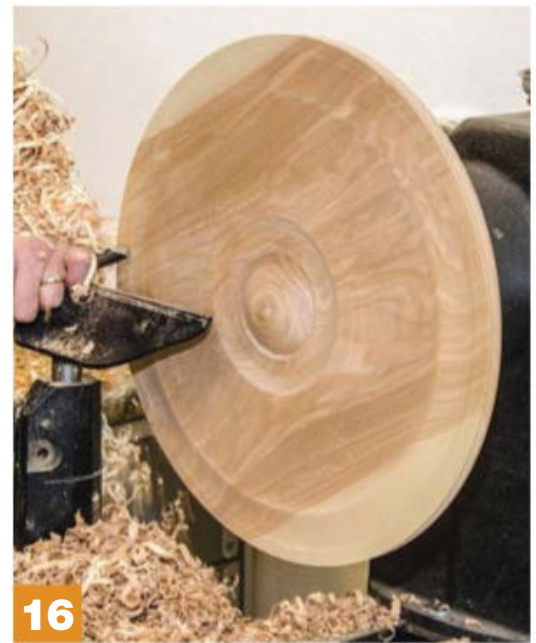




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14 Use a spindle gouge for a clean cut around the edge of the dome.

15 Cut a cove leading into the dome.

16 Bring the thickness of the shield rim to approximately 1/2".

17 Leave raised areas to create frames around decorative elements.

18 Roughly draw in scorched area.

Give It Some Personality

After I have the dome turned, I used a draw cut and take away some of the excess wood away towards the outside of the shield. Next, I scribe a pencil line to mark the finished thickness at the rim of the shield. This gives me something to aim for when turning away the excess. After completing the dome in the center, you can pretty much design the shield however you like.

You can see in the main image (as well as the illustration to the bottom right) that mine has a dome, a cove, a bead, and an area which is scorched

with a blowtorch. The charred area is then cleaned off with a wire brush to give the shield a very tactile feel as you feel the grain in the wood.

Scorching the Surface

When scorching the surface, I use MAP gas (mixture of Acetylene and Propane) which is hotter than propane gas alone. Start by scorching the surface until you see the grain (annular rings) in the wood turn red. I start in one area working around the piece. Make sure that the scorching is consistent and has an even black tone.

Then, use a wire brush to scratch away the scorched wood. Be sure to work with the grain and not across the grain, otherwise you will leave large obvious scratches. When you have removed all of the loose carbon, cover the surface with a soft paste wax so it soaks into the grain and mixes with the carbonized surface. It will dry quickly as the surface will still be hot. Next, buff the excess off with a paper towel and you will be left with a jet-black area that has a silky smooth, textured finish. This can be done on or off the lathe. Choose a spot where you can take the proper safety precautions.

I then use a parting tool to cut away the unwanted scorching back to the natural wood. It defines the scorched area and gives it a clean line. Next, I remove the rest of the waste wood on the shield and form a raised area where I will eventually place the upholstery studs after indexing and marking the points.



19

19 Use a torch to scorch the designated areas. Burn until the surface crackles red.

20 After brushing away any loose carbon, apply soft wax.

21 Clean up the scorched area with a parting tool.



20

22 After the scorching is complete, you can bring the details down to the final thickness, including the raised area around the outside of the shield.

23 Use a bead tool (a modified spindle gouge) to cut a small bead, framing the center of the shield.



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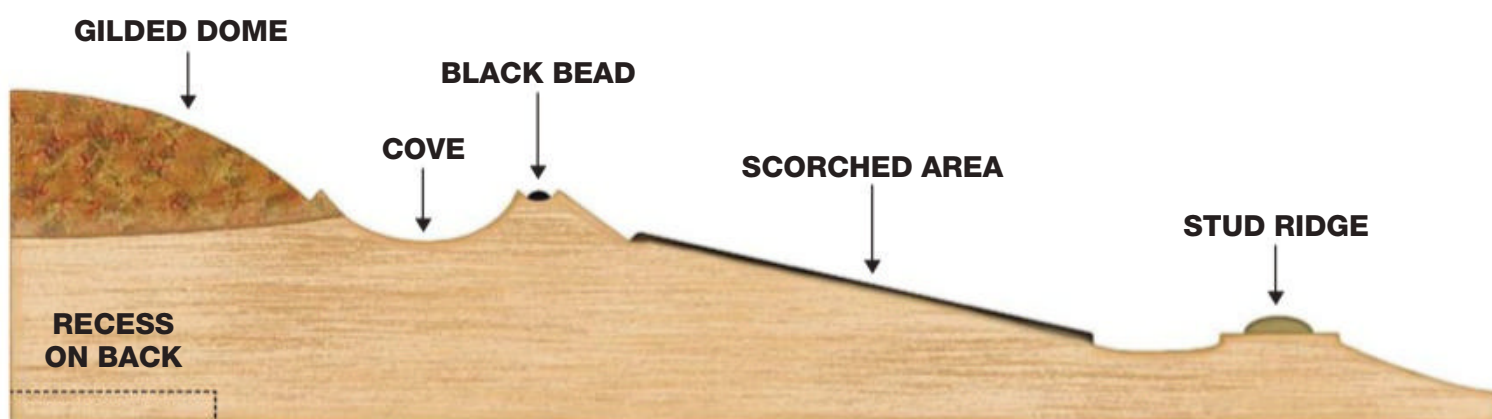


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Celtic Shield (Side View)



Turned Celtic Shield



24 Seal the non-scorched areas with shellac.

25 Apply a leaf adhesive called "size." It paints on white but dries clear.

26 After the size is dry, sprinkle on metal leaf. It will stick wherever there is dried size.

27 After using a balled-up tissue to press the leaf down, use a soft bristle brush to flake off any loose leaf.

28 Use a black Sharpie to color the small bead.

29 Use the lathe index (or dividers) to mark, then punch, the stud locations.





30 Because the upholstery tacks are fairly soft, pre-drill all of the stud locations. Use a small flag of painter's tape to set the depth of the bit, and avoid going through the back of the shield.

31 Lay the shield flat on a solid surface (like your lathe bed), and hammer the studs into place. If you find the studs are slightly loose in the pre-drilled holes, you can use super glue to hold them in place.

The Final Touches

Once you are happy with the look and feel of your Celtic Shield, it's time to sand, finish, and add some final details. All of the natural wood surface, except the scorched area (the wax has finished it), are sanded to 400 grit and sealed. Do not finish with the Danish oil just yet. We have to metal leaf the dome first.

Now that the dome is sanded and sealed, the next step is to apply the latex-based adhesive with a soft-bristled brush. The liquid adhesive is a white color when applied but dries clear when ready to apply the leaf. I used a variegated leaf which had some bright colored flakes as well as gold, silver, and copper. Whatever color flakes hit the surface of the glue first is what will be left when the excess is brushed away with a clean, soft bristle brush. The leaf flakes only adhere to the glued surface. I tend not to put any finish over the metal leaf as that the natural luster can shine on its own.

Back on the lathe, I color the small bead around the center with a black Sharpie. This black bead frames the metal leaf work on the dome adding a very attractive touch to the middle.

For the final detail, I used the indexing feature on the lathe to divide and mark the placement of the 12 upholstery studs. Next, I drilled a fine hole at each marked spot before tapping in the upholstery studs. I find that the studs aesthetically draw the eye away from the quite dominant leafed center and frame and balance the whole piece.

The rest of the natural surface is then finished with a light coat of Danish oil and then hand buffed to a satin sheen. Your shield is sure to become a conversation starter in any room of your house. **PW**

Jimmy Clewes has spent the last 30 years traveling the world teaching woodturning. His quick-wit and rebellious personality have made him a favorite instructor of students worldwide.

Bentwood Coat Rack



Following an innovative construction method from a classic, this piece will inspire curiosity with its simple, yet dynamic design.

By Dillon Baker

PROJECT #2112

Skill Level:

Intermediate

Time: 3 days

Cost: \$75

Chair No. 14, also known as the café chair, the bistro chair, or “the chair of chairs” by Michael Thonet, is probably one of the most recognizable pieces of furniture in the world. Created in 1859, this bentwood chair has served as the blueprint for modern furniture design.

Known for his innovative steam-bending techniques, Thonet began experimenting with the process of bending wood to form various chair parts as early as the 1830s. Using a method of soaking thin veneers in hot glue, he would then mold the pliable veneers around a bent form. The results were, lightweight, sturdy, and inexpensive to produce.

Additional revolutionary aspects of Thonet’s designs were the minimal number of parts required for assembly as well as their ability to be disassembled. This allowed for the pieces to be economically shipped “knocked down” and assembled upon delivery to a store or distributor.

It was not long after my introduction to Thonet’s work that I stumbled across an illustrated catalogue from 1904 called *Thonet Bentwood & Other Furniture*. This visual index explores his extensive breadth of work and provided me with the visual, as well as process-driven inspiration for the piece discussed in this article.

Selecting Right Material

Before you begin, it is important to establish which species of woods (hard vs. soft) are best for steam bending. In my experience, white oak, red oak and ash have all been more than cooperative in their bending yields. Another thing to consider is whether the material you select has been kiln or air-dried. Kiln-dried lumber tends to dry out and harden the lignin, compromising its naturally hygroscopic nature and ultimately affecting its malleability. That said, kiln drying does not render the wood completely useless, but will require an alternative form of preparation before the wood can be adequately bent.



1



1 Michael Thonet (shown here) stands beside his Chair No. 14. Originally designed in 1859, this iconic form is considered to be the first piece of mass-produced furniture. It consisted of six pieces, 10 screws, and two nuts.

Constructing the Forms

First things first, begin by building a “form” for which your pieces will be bent around while the glue cures. I ended up using some leftover Baltic birch plywood, although any plywood will do. You will notice that both bending forms are attached to the same backer-board; this was done to consolidate the procedure and is not requisite. With any remaining material, create a series of drying forms that replicate the two constructed for the glue-up. Since the form will be used more than once, a glue-resistant coating is required to prevent the piece from adhering to the form, or worse, damaging it. For this, I chose to cover my plywood with packing tape. Although unattractive in appearance, this application sustains itself over multiple uses.

Prepping Laminations

To create the strips for the bent laminations, resaw the board(s) into several sheets of veneers (about $\frac{1}{8}$ " in thickness). Once this is complete, move to the planer (or drum sander) and use a backer-board to reduce the thickness of your veneer down to about $\frac{3}{32}$ ". Using the table saw (or band saw), rip your material down into several $\frac{3}{4}$ "-wide strips. I would implore

you to cut a handful of extra just for insurance. With the surplus of strips milled to the desired thickness, it’s time to prep them for bending. Using a bucket, or shop-made trough, soak the strips in warm water for 3-4 hours.



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2 The only requirement for a “proper” bucket, is its ability to retain water, that, and be large enough to submerge the veneers for soaking.

Hot Pipe Bending

In order to achieve the desired radius, I took a hybrid approach to Thonet's technique of bending wood. Instead of soaking veneers in vats of hot glue, I went with the hot-pipe method of bending to create the sharp radii needed for the laminations. This allowed me to hand-form the individual strips to match the pattern, thus allowing for a less labor-intensive glue up. For this procedure you will need: a steel pipe (about 10" in length and 1-2" in diameter), a propane torch, a vise, and a nod to the pyromaniac within. Side note: when working with an open flame, make sure your area is well ventilated.

Water, Fire, Pipe

With strips adequately saturated, begin by heating the pipe using the propane torch. The key is to get the pipe hot enough to where the water beads off the pipe (around 215° F).

Once you have reached the correct temperature, start moving the strip back and forth over the pipe. This process helps raise the temperature of the wood enough to soften the lignin, thus allowing the wood to "relax" and flex. As the piece moves across the hot pipe, the water will begin to evaporate and dry out the wood. To remedy this, keep a sponge handy and reapply water as needed to prevent scorching. Once you have completed seven pieces, clamp them in succession around a drying form while you proceed with the next group. Complete this process for all upper as well as lower laminations (42 in total) and allow the strips to dry for 24 to 48 hours.

Glue Up and Hook Construction

With the strips dry, it is time to start our bent-lamination glue-ups. With the jig created, it was possible

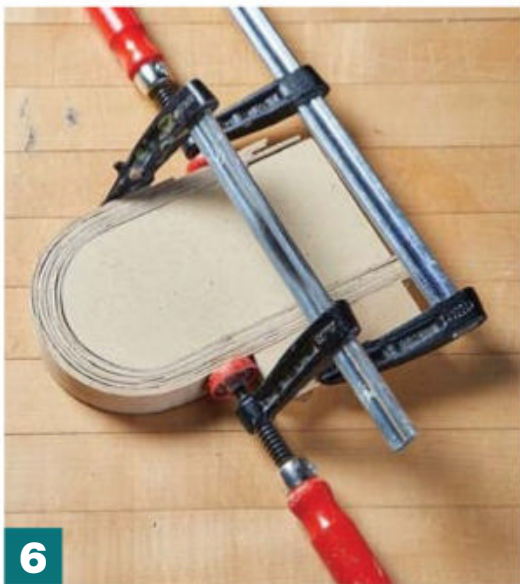
for me to tackle one hook at a time. If you are looking to expedite the process, you can create a gluing form for each of the hook assemblies. Apply glue to both the front, and the back of each strip and clamp them around their respected forms. Once the glue is dry, head over to the band saw and rip the hooks down to just shy of the final 1/2" thickness. Clean up any blade marks by attaching a piece of

3 Without a thermometer? No problem. Just splash some water onto the hot pipe. If the water beads off rather than evaporating, you are ready to bend.

4 Free-form your veneers using the drying form as a guide.

5 Clamp all seven of the veneers around the drying form together. This will aid in the ease of the glue-up that follows.





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6-7 Use cauls to evenly distribute clamping pressure while drying.

8-9 Apply a thin layer of glue to both sides of each veneer (with the exception of the first and last). This will ensure a solid bond and reduce springback.

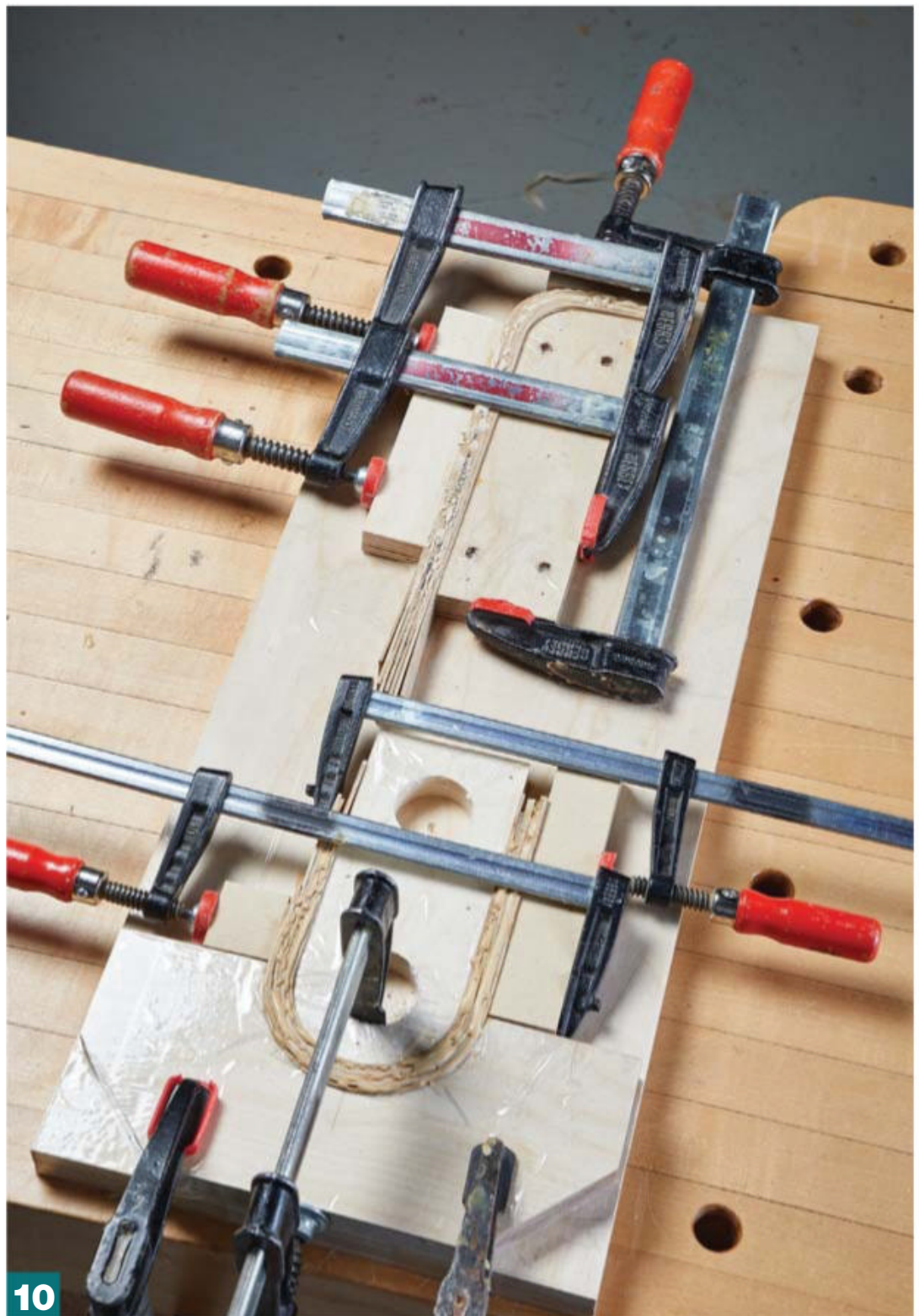
10 Packaging tape was used to prevent the glue squeeze-out from adhering to the form. It may not look pretty, but it's effective.



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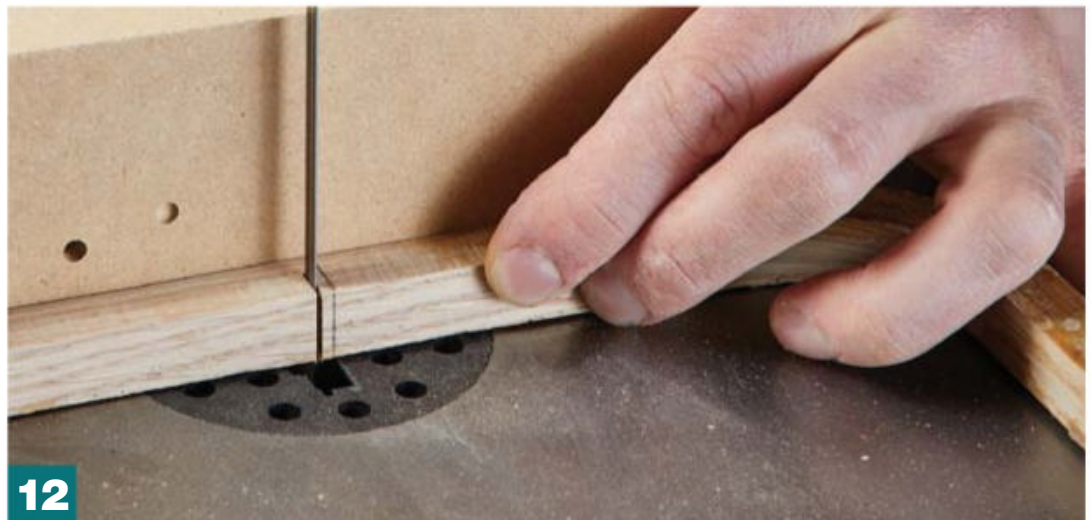


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adhesive-backed sandpaper onto a flat surface. Proceed to work the lamination across the sandpaper until the piece is smooth.

Using either the band saw, or the table saw, cut all the laminations down to their final lengths. Once this is accomplished, cut the shoulders and cheeks of the bridle joint using the band saw, or a combination of handsaw as well as band saw — dealer's choice. Head to the drill press and drill the $\frac{1}{4}$ " dowel holes that accept the ball knobs. Considering the delicate size of the hooks, a minor amount of flex may occur while drilling these holes. Make sure your piece is not only clamped securely to the fence but reinforced on the exterior of the curve of the lamination — even the smallest amount of give will create an off-center hole. Once the holes have been drilled, proceed to glue up the corresponding laminations that complete a hook. For an added line of security, I went ahead and pinned my bridle joint with $\frac{1}{8}$ " dowel.

With your hook assemblies in hand, move to the drill press and drill two $\frac{1}{4}$ " holes on the backside of the lower lamination. These holes will receive two corresponding dowels that attach the hooks to the rack mounting plate. Once complete, head over to the router table and create a chamfer on all sides of the hook. Note: chamfer the ends before it reaches the mounting-plate on the backside of the lower hook. This is done to allow for maximum surface area contact, thus ensuring rigidity of the hook. With the hooks complete, it is time to direct our attention towards the rack.



11 Square up the sides of the lamination by removing about an $\frac{1}{8}$ " off each side, using the band saw.

12-13 Here, the band saw was used to cut the two lamination assemblies to their final lengths.



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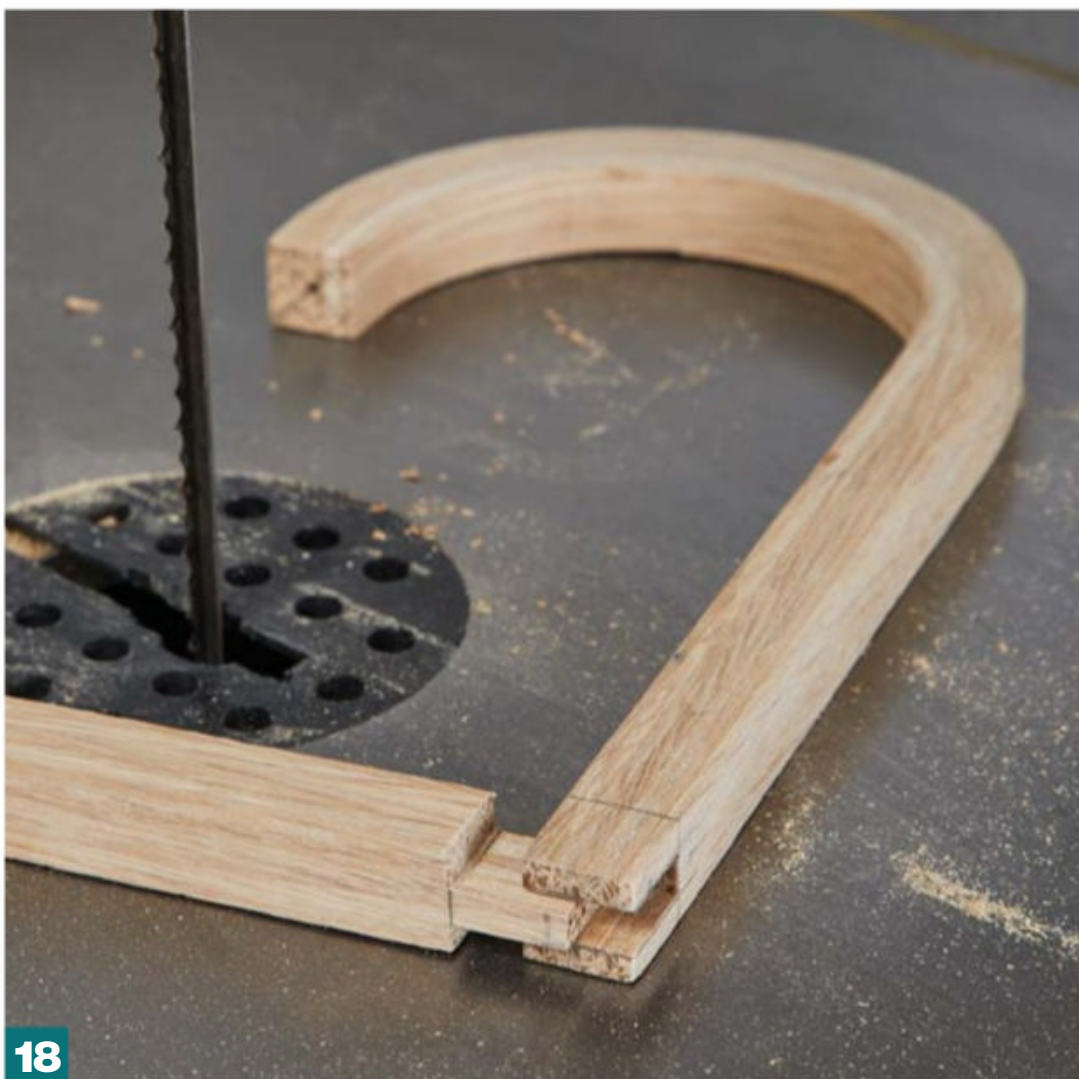
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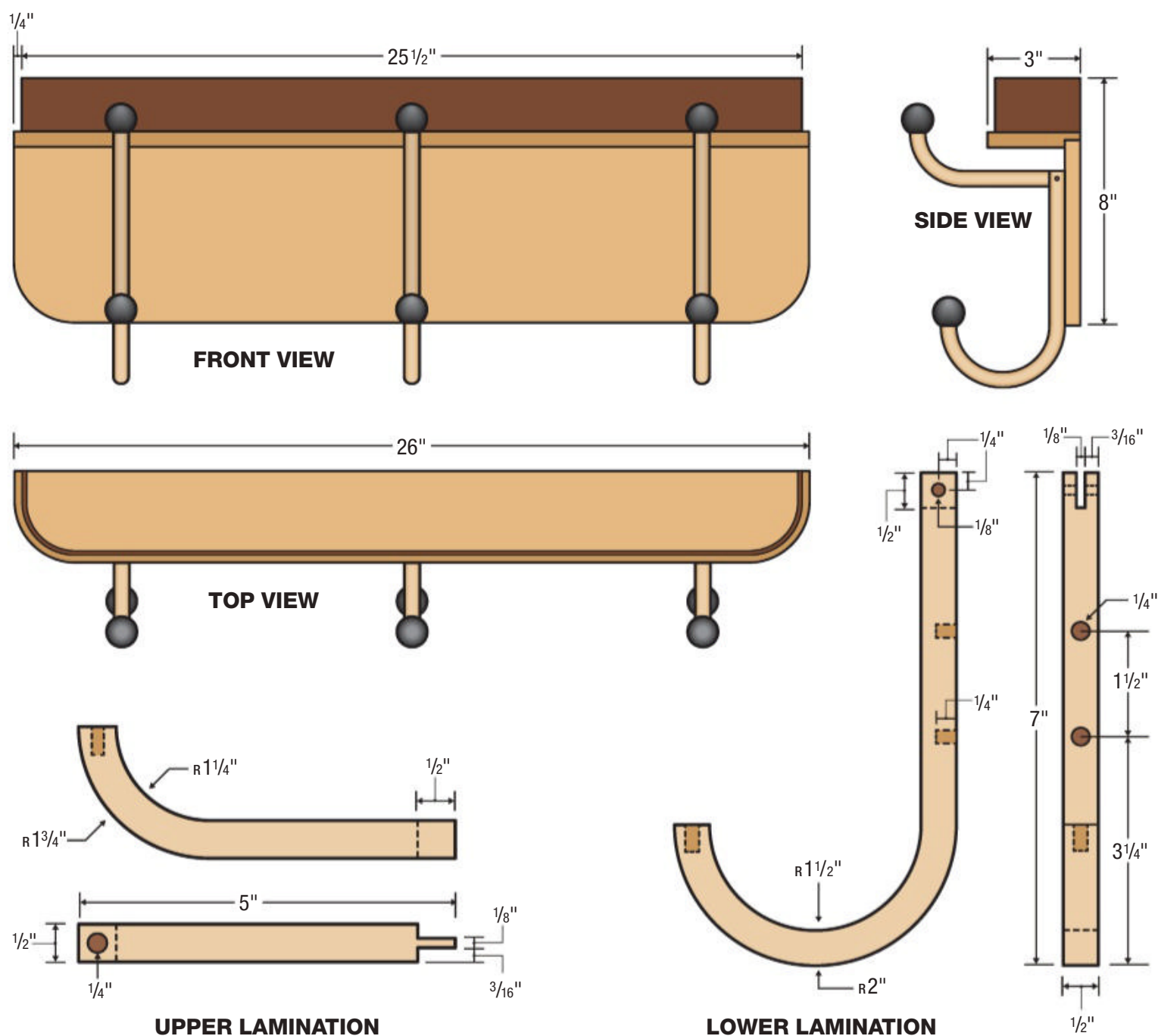
14-15 Create the cheeks of the bridge joint starting with a couple of stop cuts. Clean out the bottom of the joint with an $\frac{1}{8}$ " bench chisel.

16-17 Here, the band saw was used to create the shoulder cuts for two corresponding laminations; however, a table saw is equally effective.

18 Check the fit of your joint and make any necessary adjustments.

19-20 Use stop blocks to accurately position your laminations for drilling. Moreover, if you experience any "flex" from the downward pressure of the drill bit, place a block under the curve to stabilize the piece.

Bentwood Coat Rack



Creating the Rack

No new, exciting methodology here. Cut two pieces of stock to the same size. Starting with the mounting plate, cut a 2" radii on the bottom corners of the piece. Then, layout the 1/4" dowel holes and proceed to drill them over at the drill press. Tuck this piece aside and grab the second of the two 1/2" pieces. In order to rout the groove to accept the shelf lip,

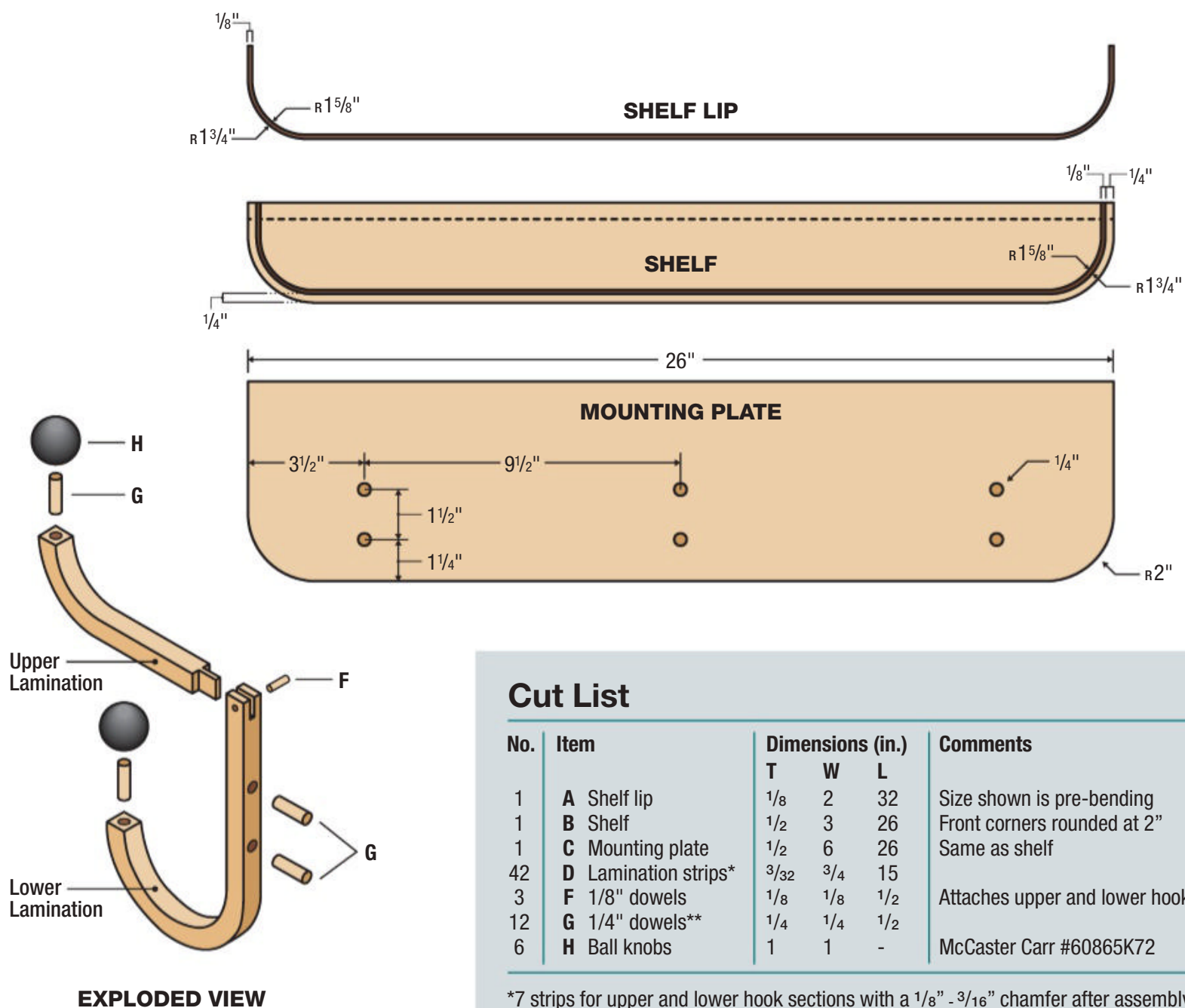
I created a couple of 1/4" templates from some leftover plywood. Using a guide bushing and 1/8" router bit, double-stick tape the template to your piece. Proceed to rout the groove in a couple of passes. Once this is done, cut the shelf down to its final width. Trace the radii onto

the piece, cut close to your line, and sneak up on it with some sandpaper. Finish by creating a rabbet joint on the backside of the shelf.

Once your pieces have been properly modified, proceed to glue the shelf to the backplate. Since the connection point between

21 Oversize the shelf blank to allow for a stable surface for which the router template can be applied.

22 Since we are only using a 1/8" straight bit, the groove for the shelf lip was created in two passes to prevent deflecting, or worse, a broken bit.



Cut List

No.	Item	Dimensions (in.)			Comments
		T	W	L	
1	A Shelf lip	1/8	2	32	Size shown is pre-bending
1	B Shelf	1/2	3	26	Front corners rounded at 2"
1	C Mounting plate	1/2	6	26	Same as shelf
42	D Lamination strips*	3/32	3/4	15	
3	F 1/8" dowels	1/8	1/8	1/2	Attaches upper and lower hooks
12	G 1/4" dowels**	1/4	1/4	1/2	
6	H Ball knobs	1	1	-	McCaster Carr #60865K72

*7 strips for upper and lower hook sections with a 1/8" - 3/16" chamfer after assembly

**4 for each hook - 2 attaches ball knobs, 2 attaches hook to mounting plate

NOTE: Dowels can be made of wood or steel.



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23 Once the groove for the shelf lip is complete, go ahead and rip the shelf to its final width.

24 Cut the profiles for your shelf using the band saw. Follow this step by cleaning up any saw marks or irregularities left behind with a sanding block.

25 With the shelf pieces disassembled, take this time to verify corresponding lengths and complete any necessary sanding.

26 Sometimes over-clamping is used to compensate for a bad joint, and the cantilevered construction of our backplate may inspire this poor practice. Solution, use a couple of assembly squares to reduce this risk.



25



26

the two corresponding pieces is minimal, use a couple of assembly squares while clamping to ensure a square 90°.

With most of the construction done, there is one last detail to address, that being the lip for the

shelf. Referencing the inside radius of the groove cut for the shelf lip, create a drying form the same shape as the interior space of the shelf. Then, create a piece about 32" in length by 2" wide, and 1/8" thick. Soak the piece for the same length

of time as the strips for the hooks. Re-heat the pipe and continue to shape the piece until the arc closely emulates the form. Now, clamp the piece to the form and allow it to dry for 24 to 48 hours. If unwanted spring back becomes an issue,

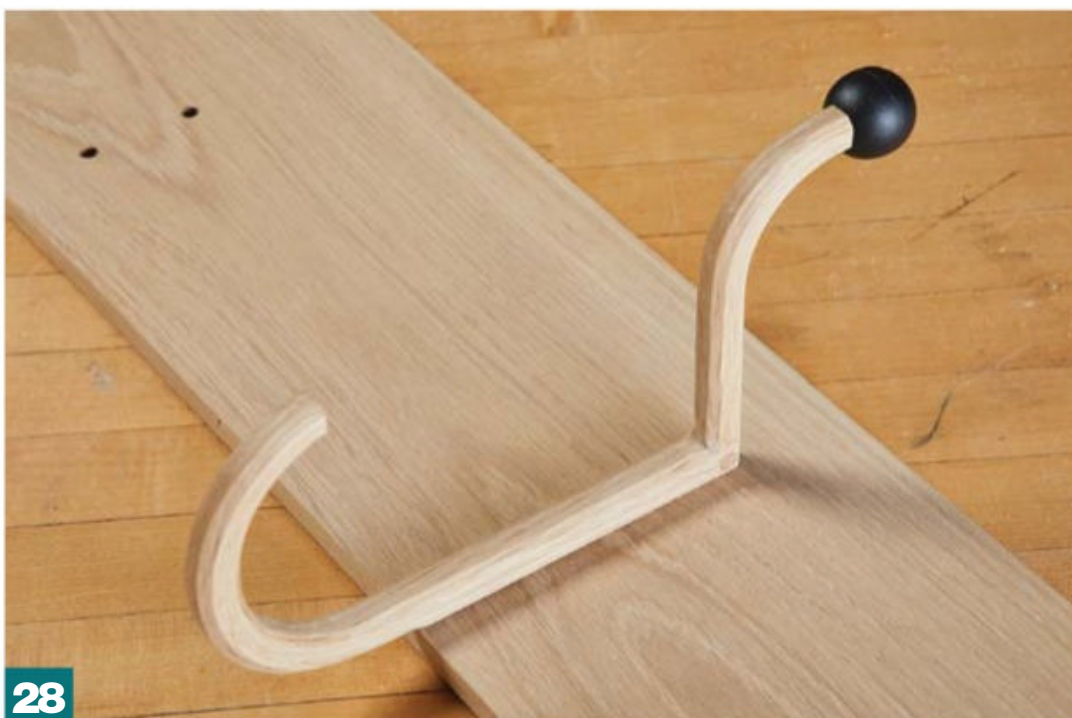


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27 I had a scrap piece of 1/4" steel rod lying around without a purpose, so I went ahead and used this in place of wooden dowels—both are equally acceptable.

28 Before applying the hooks to the backplate, check to make sure the chamfer size is large enough to accommodate the surface area of the ball knob.

29 I ended up modeling my drying form for the shelf lip after the template created for the router. This minimized the margin of error when going to fit the shelf lip into the corresponding groove.



28

continue to leave the strip clamped up in the drying form for several days—better safe than sorry. Once dry, apply glue into the groove of the shelf and clamp the shelf lip in place.

Finishing Touches

With the rack and hook construction complete, it is time to attach the hooks. Cut several 1/4" dowels and glue them into the backside of each hook. Then, place a couple of spots of glue on the back of the hook(s) and clamp in place. Before the ball knobs are added, apply any stain or finish you prefer. Once the finish is dry, apply the ball knobs to the hooks using the same dowel joinery used for the hooks.

The last step in the process is to affix the coat rack wherever its services are most needed. To perform this task, I went ahead and routed a couple of recesses on the backside of the rack using a keyhole or T-slot router bit. This simple and inconspicuous application allows for a zero-clearance attachment point all the while providing for a much “cleaner” and more modern look. **PW**



29

Dillon Baker is a regular contributor to Popular Woodworking and is the design editor for Woodsmith Magazine.

Ebon Oak Rocker Upholstery

Custom upholstery really makes the project.

By Willie Sandry

Upholstery can be intimidating

for woodworkers, and there are more options as you proceed with the cushions for your rocking chair. Armed with some specific knowledge, you can decide if it's a skill you would like to learn. If nothing else, you will know just exactly what to order from a professional upholsterer. Just like woodworking, you will need to invest in a few tools to tackle upholstery projects. Many people find they recoup their costs after the second or third upholstery project, compared to hiring a pro.

This reproduction Limbert rocker features a plush sprung seat cushion with chenille fabric. The backrest cushion hangs from straps over the crest rail and is attached with guitar

Need a comfortable yet aesthetically pleasing rocking chair for your home? See page 20.



strap buttons. The green chenille piping and straps complement the period floral fabric.

Zig Zag the Seat Base

A wooden frame is built with half-lap joints at the corners, and sized $\frac{1}{4}$ " smaller in all directions than the opening in your chair. Now add zig-zag springs for a plush seat cushion with an authentic feel. Cut the four springs to length with a bolt cutter and layout their location on the seat frame. The 8-gauge springs install with special clips

that can be nailed or screwed to the frame. Get the three-hole clips for more holding power.

With the springs installed and anchored, it's time to add a protective layer and start padding the cushion. Indoor/outdoor carpet makes a great spring-topper and is available by the roll. If you don't have many projects to do, you can buy pre-made office carpet runners to save some money. They feature a low-pile carpet on top, and a rubberized woven fiber on the bottom. Simply cut the carpet to fit and staple it in place.

1 Buy or make a device to bend the ends of the zig-zag springs. I made this version with a piece of angle iron and a few bits of hardware lying around my shop. The bar has a hole drilled in the end and levers the spring against a pivot point (bolt with washer).

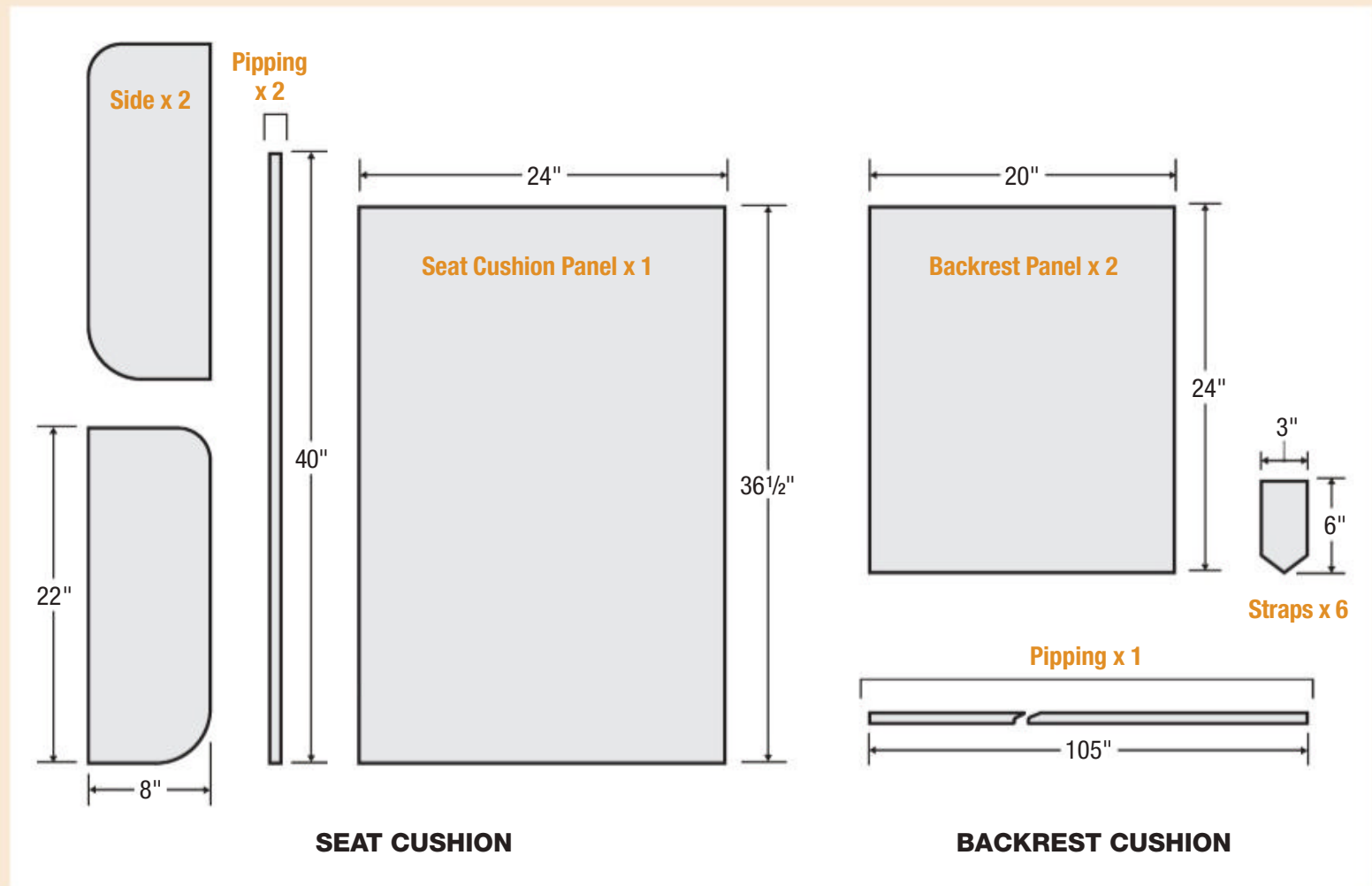
2 Install the clips and stretch the springs until they're nearly flat. Once they hook into place, add 2 more nails at each clip to permanently secure the springs.

3 Attach stay wire (aka springing wire) with special clips. Ideally, you'd use three-jaw pliers, but hog ring pliers will work in a pinch. Crimp the wire to each spring and attach a total of three wires.

4 Add a couple of staples to each end of the wire to hold it in place. Now the spring deck will act as one unit, rather than individual springs.



Ebon Oak Rocker Upholstery



5 Add indoor/outdoor carpet as a buffer between springs and padding. Attach the thin carpet to the seat frame with T50 style staples and a pneumatic stapler.



6 Cut foam to same size as your seat frame with the band saw.



7 Mock up the cushions to check seat height and comfort level.

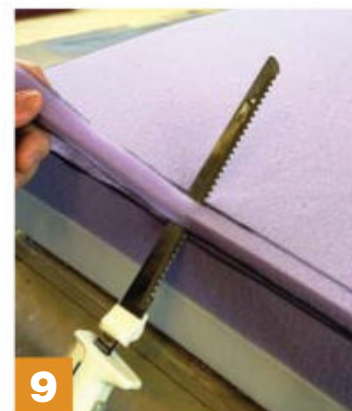
Materials List

- 1.5 yards of backrest chenille fabric
- 2 yards of seat chenille fabric
- 5 yards of 5/32" upholstery piping
- Approx. 24" x 20" Nu-Foam, 2" thick
- 1 yard of Dacron™/polyester batting
- Spray glue like 3M 90 or 3M 77
- 2" 1834 and 3" 1818 upholstery seat foam (cut to same size as wooden seat frame)
- Zag zig springs, springing wire, and clips
- Indoor/outdoor carpet (sized to cover frame)
- Dust cover (landscaping weed barrier fabric)
- #4 invisible zipper, 26" long

Ebon Rocker Upholstery

8 Apply spray contact adhesive such as 3M 90 High Strength™ to both foam surfaces. Similarly, attach the foam stack to the seat deck.

9 Mark lines about 1/2" from front edge of seat cushion. Trim to your lines with an electric carving knife to help establish a waterfall curve of the finished cushion.



10 Start with two staples at the back and smooth the batting towards the front. Set 2-3 more staples at the front before moving on to the sides.

11 Continue installing the batting, working towards the corners. Sight down the edge of cushion for a uniform shape. Gently pull the final tuft to remove any wrinkles.

12 Cut away the extra batting with a sharp pair of scissors. Measure for the finished cushion. Take your front-to-back measurements 1/2" away from the inside edge of the frame.

13 For a naturally shaped cushion, trim the side panels with a larger radius at the front (such as a gallon and pint can). You'll have to make a left and right panel.

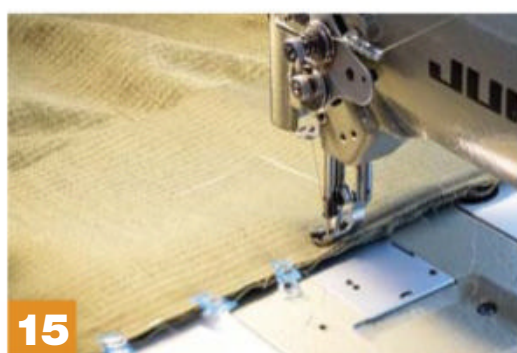
14 You'll have only three panels and some piping to make this simple cushion.

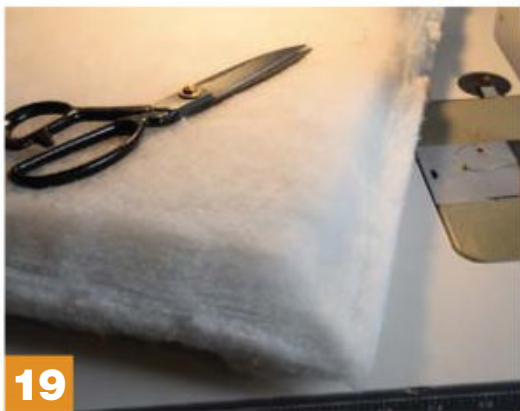
15 With a 1/4" piping foot installed on the machine, clip the parts together and sew one side panel to the top panel. Repeat the procedure on the other side.

16 With the sewing complete, stretch the cover over the cushion. Center the cover on the seat frame and staple it in place from underneath.

17 The last step is to add a non-woven cambric fabric as a dust cover. While not really essential, it gives a professional and finished look to the project.

18 If your cutting and sewing came out right, you'll have a form-fitting cover without many wrinkles. The cushion simply rests on four corner blocks.





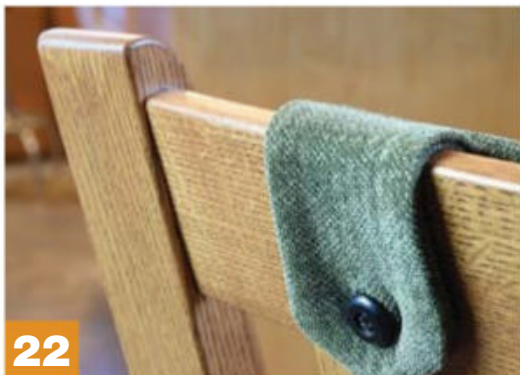
19



20



21



22

19 Trim the Nu-Foam to a knife-edge with a sharp pair of shears which helps prevent bulk at the edge.

20 After the piping is installed, add the zipper to the front panel, separate it, and attach it to the back panel.

21 Position the straps and sew the perimeter of the cushion. Add extra stitches to reinforce straps.

22 Screw strap hardware to the crest rail. Focus on aligning the cushion over the slats when placing the hardware.

The foam is layered for comfort, with medium foam on the bottom, and soft foam on the top. Layer the foam and glue it together with spray adhesive. Once glued, they behave just like a single piece of foam. Glue the foam assembly onto the decking and chamfer the front edge of the foam with an electric carving knife.

Once the foam is glued to the spring deck, you will add a single layer of polyester batting (Dacron™). Staple the batting in the cardinal directions, removing any wrinkles and pulling it snug as you go. Install the batting working from the center towards a corner, pulling excess material away from the corner as you go. When you reach the corner, you will have a tuft of batting that remains. Carefully manipulate the excess batting without wrinkles or bulges. Overall, I find batting is quite forgiving to work with, once you have had a little practice.

Finished Seat Cover

Now for the cover. Leather makes a nice-looking cushion, but I opted for coordinating chenille fabrics. Measure directly from the cushions to determine the size of the fabric panels you'll need. Remember to

account for a little fabric stretch, as well as any seam allowances when cutting panels to size.

Make strips of piping using 1 3/4" wide strips of fabric. Pay attention to fabric nap, if any, and orient it so it smooths to the front. Sew the two long seams to form the cover.

Backrest Cushion

The project's most unique aspect is the backrest cushion. It hangs from three wide straps over the crest rail and is attached with hardware on the back. California Historical Design shows pictures of an Ebon-Oak bench with similar cushion hanging hardware. I believe this was the original method of attachment.

The padding for the backrest is a special material called Nu-Foam. Its properties are somewhere between foam and batting and makes an excellent slim backrest cushion. There is a firm side and soft side to the 2" thick Nu-Foam, so make sure the soft side faces out toward the sitter.

Measure for the two fabric panels and add in a 1/2" seam allowance. Make more piping from 1 3/4" wide fabric strips and assemble the cover. First sew the piping to the front panel and terminate it at the bottom.

Now for the zipper. I suggest

ordering a heavy-duty #4 invisible zipper by YKK. Install the zipper along the bottom edge of one fabric panel. Once attached, install the zipper pull and clip the front and back panels together.

Make three fabric straps to be sewn into the backrest cushion. Use medium or heavy-duty fusible interfacing to stiffen both pieces of the strap. Sew the strap together with a simple blind stitch and turn it right side out. Sew a buttonhole near the end of each strap to reinforce the opening. Open the slot with a sharp chisel or seam ripper. Clip the straps into the backrest cushion and sew them together. With the main perimeter sewn, add a second line of stitches with plenty of back-tacking to reinforce the connection to each strap. Turn the cushion right side out and stuff it with Nu-Foam. Use the cushion to position the strap hardware on to the chair. They're sold as guitar strap buttons and come in a variety of finishes. Pre-drill and attach with a screw to the back of the crest rail. Place the cushions and enjoy. **PW**

Willie Sandry is an accomplished woodworker that often incorporates custom upholstery into his projects.

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Pop That Grain

And show off your figured wood.

By Logan Wittmer

I don't know about you, but I have an affinity for nice pieces of wood. Some might call it a problem — if I see a beautiful piece of figured wood, such as curly or quilted maple, you can bet that it's coming home with me. But, all that figure does nothing if you can't show it off on a finished project. So here, I'll show you how I make the figure pop.

Good Prep

I know that you've heard it before. The key to a good finish is good surface preparation. And that's even more important with figured wood. When possible, it's best to prepare the surface for finish with a hand plane. To understand why, you first have to know how wood fibers work.

At a microscopic level, wood consists of a series of tubes. Think of them like drinking straws. In a normal piece of wood, the end grain is the ends of the straws. In a figured piece of wood, such as the curly maple shown in Photo 1, the wood fibers are undulating. The ends of the straws, instead of being at the end of the board, poke through the surface in waves. This face grain to end grain shift causes the curly appearance. When you sand the surface, even to an extremely high grit, you're mashing the fibers and making them fuzzy. At a certain point (a high grit), you'll make them fuzzy and burnished enough that they don't actually want to soak up any finish.

By slicing through the fibers, with a plane or card scraper, you're leaving the ends of the tubes open and ready to accept finish. If you've never experienced this, try it on a test board. A clean, nice cut from a hand plane will give the board a much flashier appearance than sanding. This is called chatoyancy.



1



2

1 Figured wood is best finished straight off a hand plane. A tight mouth, sharp blade, and a properly tuned plane will take care of any figured wood without much fuss.

2 De-waxed shellac, often sold as sanding sealer, is alcohol-based and you can tint the finish with any alcohol-soluble dye.

Put the Stain Down

Now, I almost always prefer a clear, oil finish on my projects. If you fall into the group who like to stain their projects however, I beg you to not stain your figured wood. Instead, reach for a dye.

Dyes, such as the alcohol-based trans-tint dye shown in Photo 2, have pigmentation that is dissolved in a solvent. In contrast, a stain is a pigment that is carried in a binder. The binder “glues” the pigment to the surface. By this nature, stain sits on top of the surface and obscures a portion of the grain and can make it appear muddy. That's no bueno when you're trying to highlight the figure.

Even though I prefer clear oil finishes, I almost always highlight figured grain with a dye. I do this by mixing dye into a base of shellac. For maple, I found that the dark antique maple dye is a nice subtle contrast. A key here is “less is more” to some extent. I'll usually add about 5 to 6 drops of dye to a small Dixie-cup size serving of shellac. You can always go darker if you'd like, but it's much harder (nigh, impossible) to back peddle and remove color. As a side note, if you're doing an additional color on top of the first application, black dye yields good results. For example, coloring a piece with emerald green dye would get a base of black.

3 Apply an even coat of the tinted shellac. A light coat is all that's needed, as the end grain fibers in the figure will wick up the finish.

4 Sand away the top layer of shellac. A few minutes with 220-grit sandpaper leaves slight color in the figured areas.

5 After sanding, apply a top coat of your choice. Nine times out of ten, I use a clear (natural) Danish oil.

6 After the top coat is dry, you'll be left with a piece that has a pronounced figure (right) versus the subtle shimmer of the undyed wood (left).



Sand it Back

After applying a coat of the dye-tinted shellac, you'll want to let it dry thoroughly. It shouldn't feel tacky, cool, or wet. Once you're convinced it's fully dry, you will want to sand back the finish. What you're looking for here is to remove the shellac and dye off the surface of the workpiece. You can see this in Photo 4. But why would you do this?

As I mentioned before, the figure you see on this is end grain. Those open ends of the wood fibers will soak the shellac and dye deeper than the surface of the stock. So, after sanding the top coat, you're still left with areas (the end grain/figure) that is holding onto some of that color. Now's the point where you'll want to decide if you want another coat of dye to darken the figure more. Refer back to my "less is more" comment earlier. It's rare that I've decided to go back and hit a workpiece with a

darker mix. If anything, I'll add an additional coat of the tinted shellac after sanding to help saturate the end grain fibers.

Beautiful Top Coat

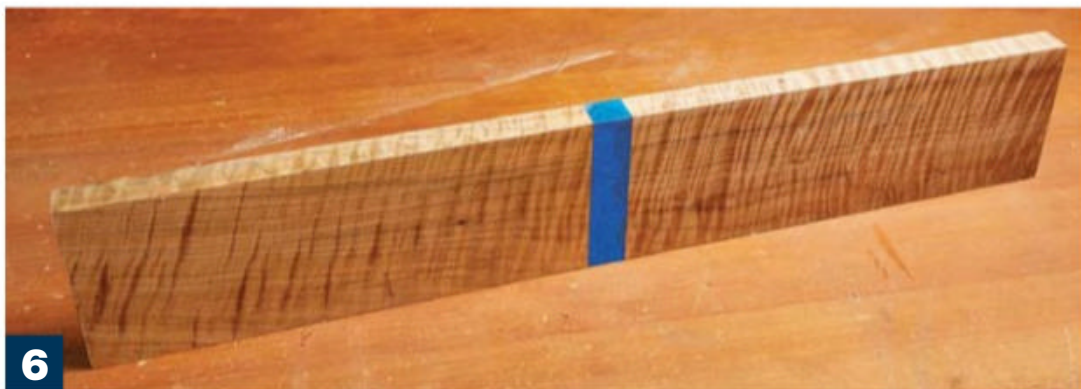
Now is where you can put your normal finishing hat back on. Once the figure has soaked up some of the tinted shellac, you can top coat it. Personally, in my shop, I lean towards Danish oil (in natural flavor). If it's something I want a little more protection on, I'll apply a wipe-on polyurethane.

As you can see in Photo 6 below, the effect that this technique gives is pretty subtle. But, I think it's a finish

that looks natural, and doesn't look like it's going to compete with the design of whatever piece I'm finishing.

It's also important to note that this technique doesn't only apply to a clear finish, such as I've shown here. You can use this dye layering technique to create some spectacularly colored pieces. Layering colors on a bowl or platter rims is a common technique of turners. When working with colors, always work from the darkest color to the lightest, sanding in between.

One of the most exciting things about woodworking, at least to me, is seeing the various species of woods that grow around us. And because each tree is unique and different, you'll never know what you'll find when cutting into one, or digging through a lumber stack. So, the next time you have a special piece of wood stashed away, reach for some shellac and dye, and make that grain pop. **PW**



Logan Wittmer is Popular Woodworkings Editor in Chief.

Angela Hollis

Interview by Collin Knoff

How did you get started woodworking? Who were your mentors?

My greatest influence in becoming a maker and builder was my grandfather who taught me from the time I was 5 years old that it didn't matter if I was a girl, I should be able to handle my own business. For him, "business" meant taking care of things for yourself. If something broke, we fixed it. If there was something that needed building, we built it! He was a home builder and I was by his side, fetching tools and learning to measure and cut for as long as I can remember. I started rehabbing furniture and building for myself and friends as an amateur interior designer and that led to a full-on passion for woodworking and desire to build a business and life for myself in carpentry. I get tons of inspiration and help

from the online woodworking community and local craftspeople I'm lucky enough to know.

What do you think is your best work? What kind of work do you do the most?

My favorite thing to build is a window seat. For me, window seats mean connection. As I am building window seats into a client's home, I think of the conversations and "life" that is going to happen there. Whether it's in a little girl's bedroom window, or the family kitchen, there will be laughter, tears, homework, cups of tea, and LIFE shared on that simple structure I leave for them. I build many, many window seats as well as custom wall units with shelving for family treasures, books and storage. Another popular build for me is the "mudroom locker"



NOTE: This article is republished from the June 2021 issue, due to an editorial error

or cubby systems that transform a regular hallway or storage room into a functioning drop zone and command center for the family. It's amazing what we can squeeze into 18" of floor space!

Folks to Follow

Two people I try and check in with every week are:

@woodenmaven
@overkillwoodcraft

I also follow this hashtag:
#womenwhobuild

For every woman hustling to start up:

@msrachelhollis:
(No relation) She has written two inspiring books:

Girl, Wash Your Face:
Stop Believing the Lies About Who You Are So You Can Become Who You Were Meant to Be

Girl, Stop Apologizing:
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“I read a note somewhere when I first started that said,

‘Make the next job you accept be one you don’t have the tool for, or know-how to do.’

I love this and live by it. This is what keeps me learning and growing. If I only did what I’m comfortable doing, I’d never be able to grow my business.”

What’s your best hands-on tip or wood-working technique?

My residential carpentry instructor, in the tech school course I took when I first started charging money for my work, told our class, “You will be a good carpenter, but it’s learning to fix your mistakes that will make you a great carpenter.” Taking time to go over your

work and really get to know the wood before you even begin will save time and the heartache when things don’t go well with a project. Plan, plan, plan! It doesn’t matter if no one else can decipher your drawings, take the time to do them anyway. Visualize what it will take to actually put the project together and work through one step at a time. Check your lumber for square,

sand out rough spots, line up and plane your boards/sheets before you glue up. Take your time and maybe you won’t have to pull apart quite as many pieces of furniture as I did when I started! **PW**

Angela Hollis is a carpenter and historic preservationist from Alabama. See more of her work at grlbuilder.com or on Instagram @grlbuilder.



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