

WOOD®

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2017's Most Innovative New Tools

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16-xFM-0788

The pen is mighty

At a silent auction at church last spring, my buddy Bruce kept anxiously leaving our table to bid on something. Finally, I asked him which item he was working so hard to get. Was it the weekend at the lake condo? Tickets to the big Iowa-Iowa State football game? A set of golf clubs? "No," he said, "I want that wooden pen."

I shouldn't have been surprised. It was a beautiful zebrawood cigar-style pen turned by one of the parishioners.

As I thought more about Bruce's fascination with this simple woodworking project, it occurred to me that a handmade pen may be the perfect gift. Why?

► **It's practical.** Even in the digital age, you need a device for inking greeting cards, checks, and mortgage papers.

► **It's personal.** Carried in a shirt pocket, it's physically as close as you can get to someone's heart. And the body of a wooden pen acquires patina from its user, so the person literally becomes part of the pen.

► **It's personalizable.** You'll find hundreds of pen kits online, from gearshift- and bolt-action-style mechanisms, to themed kits, such as breast-cancer awareness and music.

► **It's affordable.** Free, in fact, if you make use of those too-small scraps of exotic woods you've been hoarding. Specialty blanks, such as antler, circuit board, or corncob, can be had for just \$20 or so. And, even if you own no other woodworking tools, you can get set up with a mini lathe, turning tools, and a few accessories for well under \$1,000.

► **It's easy.** You can turn your first pen in about an hour. (The article on [page 36](#) walks you through the entire process.) Soon, you'll be cranking them out in half the time.

► **It's scalable.** Once you have the tools and skills, you can use them to turn a variety of gifts, including bottle stoppers, flashlights, USB flash drives, and more.

As it turns out, Bruce got outbid at the last second and went home disappointed. But I have a pretty good idea of what's he's getting for Christmas...

See you in the shop!

Dave Campbell
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Facebook and Twitter: @WOODeditor



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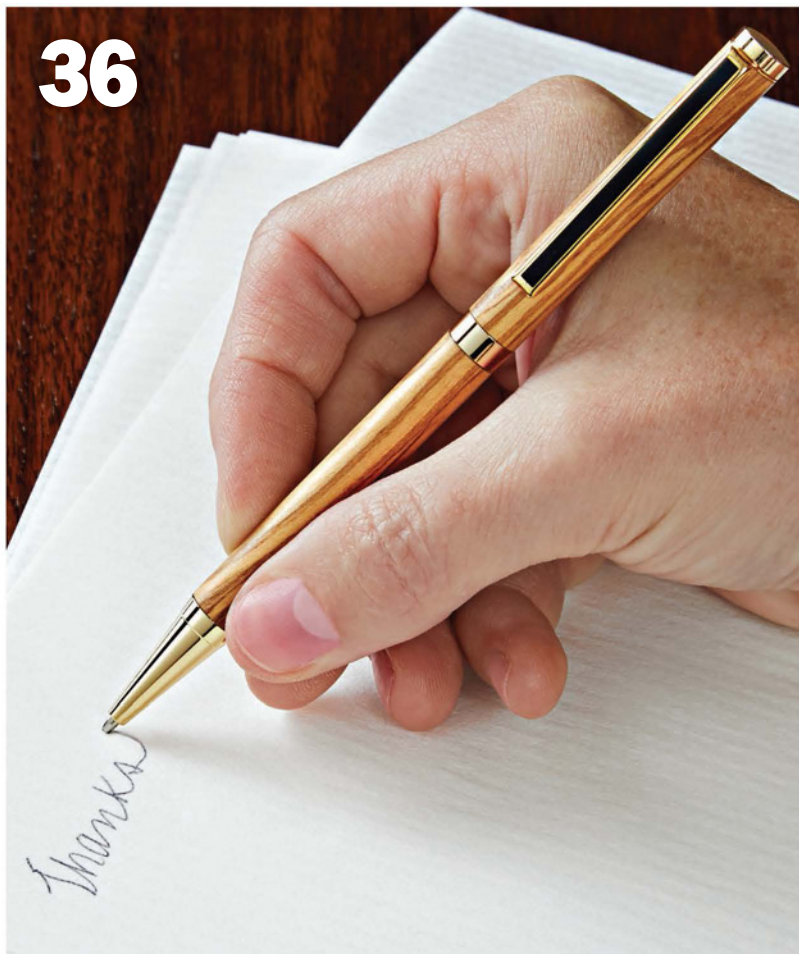
A sneak peek at your next WOOD.



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TIME TO MAKE THE TOYS

TONS OF FUN

This tough tractor and trailer will put a smile on any kid's face (and many a dad's, too) come Christmas morning. woodmagazine.com/tonsoffun

Top your trailer. Find more Construction-grade toy plans, such as the bulldozer shown, for your hefty hauler. woodmagazine.com/cgtoys

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SOUNDING BOARD

YOUR VOICE

Girl Scout goes for the Gold

I am working toward my Gold Award—the highest achievement in Girl Scouting—and for my project, I built six “buddy benches” for the elementary schools in my district. Buddy benches are designed to eliminate loneliness and foster friendship on the playground: If a child is sitting on the bench alone, it’s a signal to other kids to ask him or her to play. Your Durable, Doable Bench (issue 197, May 2010) fit the bill perfectly. Thanks for the great plans!

—Kendra Bries
Bettendorf, Iowa

Congrats on the accomplishment, Kendra! You’ve inspired us to offer that downloadable plan to readers at no charge for a limited time. Find it at woodmagazine.com/buddybench and enter promo code KENDRA at checkout.

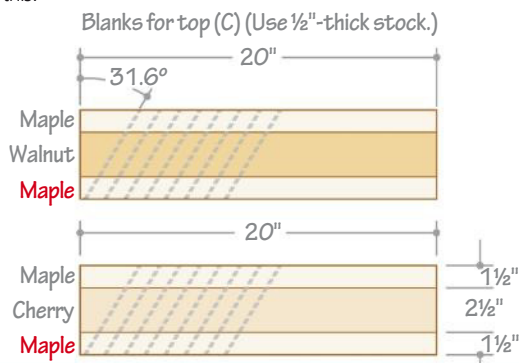


Zigzag box drawing takes wrong turn

While reading the plans for the Zigzag Box in issue 243 (November 2016), I think I discovered an error: In Drawing 1, the blanks for the top (part C) should be edge-glued maple-walnut-maple for one blank and maple-cherry-maple for the other, right?

—Bill McCracken
Highland Heights, Ohio

You’re absolutely right, Bill, and we apologize for the error. The drawing should look like this.



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The right way to ring

As a retiree from Norton Company, I enjoyed your article about choosing grinding wheels in issue 242 (October 2016). However, “ringing” the wheel as shown on page 68 won’t reveal a problem with the wheel.

Ringling must be done with the wheel loosely suspended on a finger, as shown at left. Tap the wheel with the butt of the screwdriver handle (not the side) at the 12-, 3-, 6-, and 9-o’clock positions. As you mentioned, a bell-like ring confirms a sound wheel; a dull “thunk” indicates internal cracks that could result in the wheel exploding under operating speed. This ringing procedure is valid only on vitrified wheels and not on resin-bond wheels.

—Blair Crum
Shelby, N.C.



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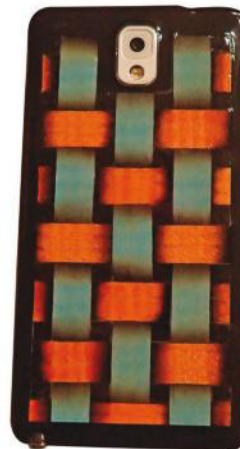
18-year-old **Logan Hedrick**, of Monroeville, Ohio, spent six months completing this 9'-long workbench made from locally harvested maple and hedge.



Jerry Barkman of Canby, Ore., crafted this tansu for a friend, and enjoyed the build so much, he built another for her friend.



After designing and building this bicycle from laminated walnut last spring, **Larry Keller** of Altoona, Iowa, rode it all the way across his state in one week.



Using the basket-weave veneering technique from issue 237 (December/January 2015/2016), **Jason Cowin** of Beaverton, Ore., customized a case for his mobile phone.

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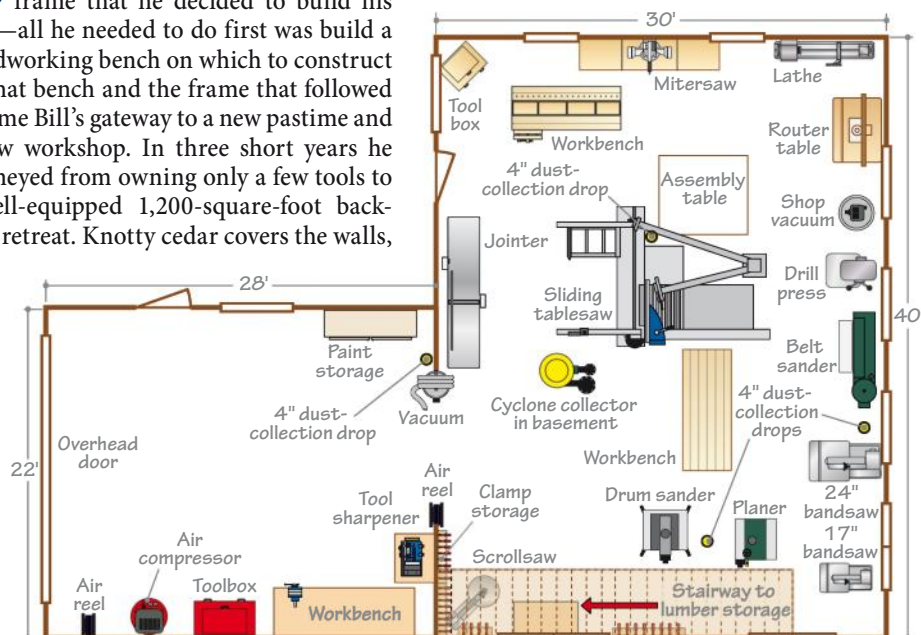


Sliding
tablesaw



The shop centerpiece is a Felder sliding tablesaw (also called a panel saw). Bill programs the height and tilt of the blade, plus the width of the cut from a computer screen. A small blade ahead of the main blade scores the bottom of the panel, eliminating tear-out.

Bill Bélanger was so put off by a contractor's estimate for a custom mirror frame that he decided to build his own—all he needed to do first was build a woodworking bench on which to construct it. That bench and the frame that followed became Bill's gateway to a new pastime and a new workshop. In three short years he journeyed from owning only a few tools to a well-equipped 1,200-square-foot backyard retreat. Knotty cedar covers the walls,





Bill's ideal retreat includes basement storage that also serves as a two-car garage. The second story houses a lumber loft with two 30'-long racks mounted on opposite walls.

and 5½"-wide white-pine plank flooring laid at a diagonal gives Bill a comfortable floor to work on. He says, "Most days I wear slippers in my shop." Bill's shop includes the main floor shown in the floor plan, plus a basement, home to the air compressor, 5-hp cyclone dust collector, and additional storage. The 6" Nordfab Quick-Fit main ducts travel across the basement ceiling, then extend through the main floor and connect to 4" flex hose attached to the power tools.

Sure, the shop is palatial, but to Bill, it's been a perfect investment: "It's a hobby! It doesn't have to make sense." 🌱

Show us your shop

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A 30×90" workbench built three years ago was Bill's first project. The ash top disassembles, allowing him to resurface the 12"-wide sections in his planer.

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Q **Build a wall of semi-silence**
I'd like to enclose my shop's dust collector to reduce the noise it makes during use. What do I need to know before tackling this?

—Ray Crosby, Cedar City, Utah

A A dust collector doesn't emit the high-pitched whine of, say, a shop vacuum, Ray, but you're not alone in being bothered by the constant noise. And it's a good idea to keep the unit running even when you're not using a dust-making machine, because the collector continues to pull dust from the air through open blast gates, (hopefully) trapping it in the filter.

But enclosing a dust collector is not as simple as just stuffing it in a closet—you need to keep a few things in mind. First, you're not building a recording studio, where all noise must be eliminated. Instead, you just need to dampen the noise to a level that's not disturbing. Second, in order to have effective airflow through your ductwork, you must allow filtered air to return to the shop, through vents in either the walls or doors. And third, you need easy access to the collection bin or bags for dumping and cleaning.

Dust collectors often fit conveniently into corners, so adding a two-sided enclosure is a simple way to start. You can make your enclosure permanent, or hinge two wall panels together for a freestanding, removable solution. Lining the inside of the enclosure with rigid foamboard or "egg-crate" acoustic foam will further deaden noise. But remember, walling off a noisy dust collector also puts the chip bin out of sight, so don't forget to check the fill level frequently. 🌲

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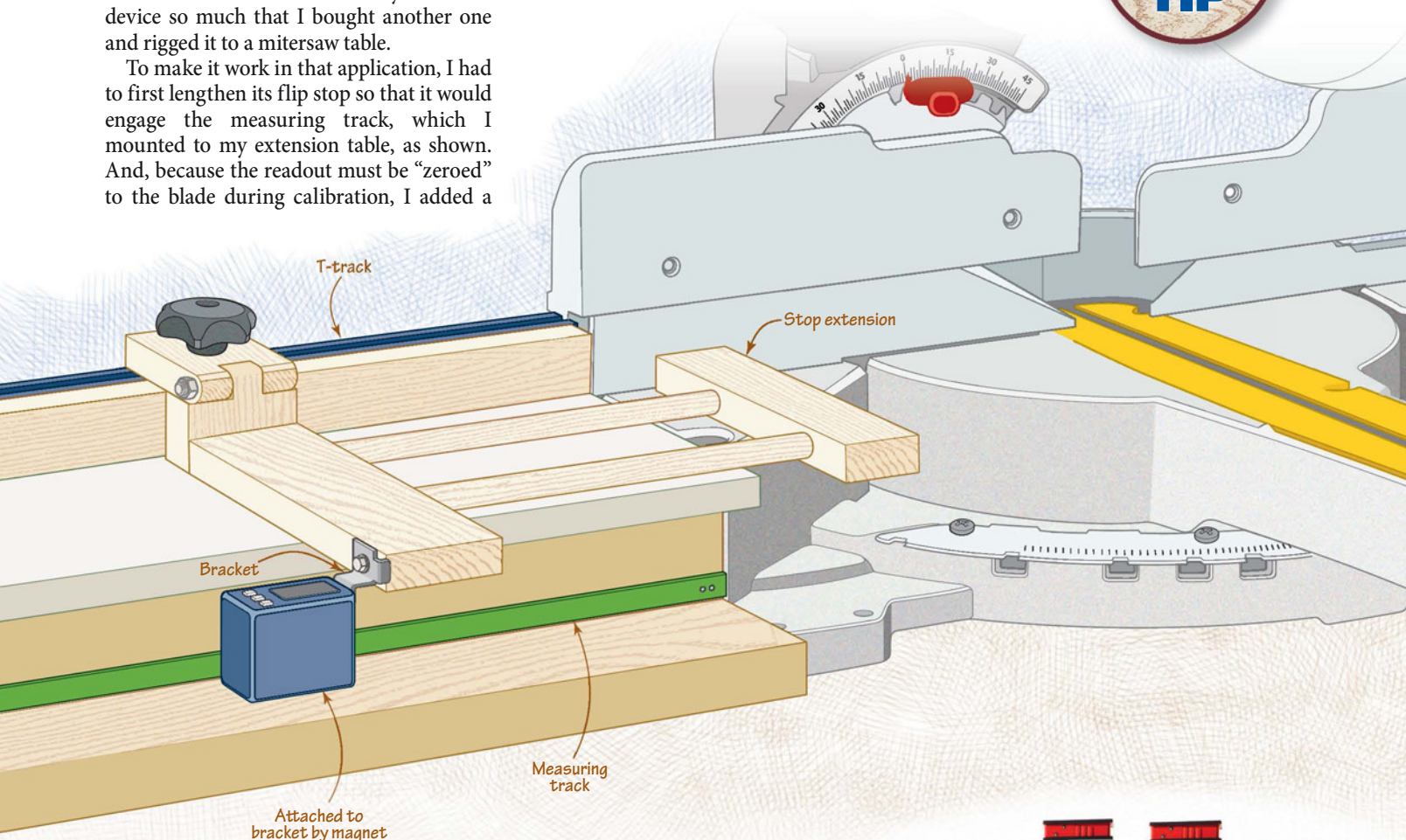
Digital readout adds uber-accuracy to miter saw cuts

I really like the digital fence readout from Wixey (wixey.com) I added to my tablesaw. The digital readout box attaches to my fence via a magnet and slides along a measuring track (provided with the readout). Once calibrated, the box displays the exact distance between the blade and the fence to within .001". Talk about accuracy! I like the device so much that I bought another one and rigged it to a miter saw table.

To make it work in that application, I had to first lengthen its flip stop so that it would engage the measuring track, which I mounted to my extension table, as shown. And, because the readout must be "zeroed" to the blade during calibration, I added a

stop extension to reach the blade with the readout near the right end of its measuring track. The readout box never leaves the measuring track, but when I drop the stop to set up a cut, the stop and box connect magnetically, and the display reads accurately.

—Michael Arruda, Grantville, Ga.



Tips earn up to \$150.

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Send your tip, photos or drawings, and contact info to shoptips@woodmagazine.com

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For sending this issue's **Top Shop Tip**, Michael receives two Bessey K-Body parallel-jaw clamp framing kits worth \$350.





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Gearshift Pen Kit Inspired by our best selling bolt action pen mechanism, this Gearshift pen is an ideal gift for any car enthusiast.

3 Gearshift Pen Kit Starter Package

You get one of each pen in Chrome (shown above), Antique Pewter, and Antique Brass. Plus you get the bushings and drill bit.

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Music Twist Pen Kit Your recipient will twist and shout with joy. The cap features a realistic snare drum, the clip replicates the head, neck, and strings of a guitar. Musical notes and piano keys round out the design.

4 Music Pen Kit Starter Package

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Steampunk Bolt Action Pen Kit Here's a pen kit straight out of Victorian science fiction. The kit combining rivets, flat head screws, replica Gatling gun barrels, our patented Bolt Action mechanism along with a mixture of industrialized Antique copper, pewter and brass finishes.

Steampunk Pen Kit Starter Package

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Dragon Twist Pen Kit This dramatic pen makes the perfect gift for any Dragon lover. The clip is a full body, mighty crouching dragon. The tip and end feature scales and the band is a intricate dragon claw.

3 Dragon Kit Starter Package

You get one of each pen in Antique Brass (shown above), Antique Pewter, and Antique Copper. Plus you get the bushings and drill bit.

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SHOP TIPS

Bucket of clamps gets around

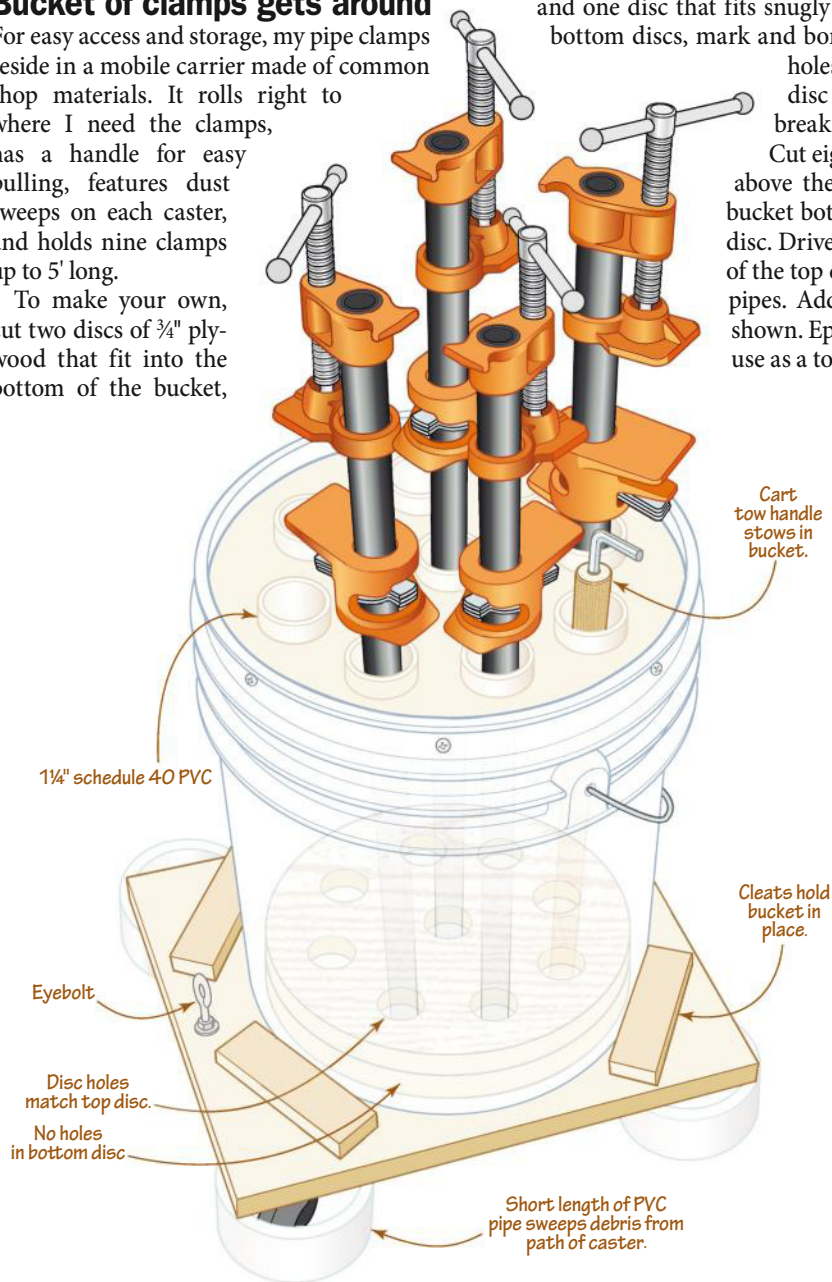
For easy access and storage, my pipe clamps reside in a mobile carrier made of common shop materials. It rolls right to where I need the clamps, has a handle for easy pulling, features dust sweeps on each caster, and holds nine clamps up to 5' long.

To make your own, cut two discs of $\frac{3}{4}$ " plywood that fit into the bottom of the bucket,

and one disc that fits snugly inside the bucket top. In the top disc and one of the bottom discs, mark and bore a $1\frac{1}{8}$ " hole at the center, as well as eight more such holes in the same radius from the center. Place the undrilled disc into the bottom of the bucket to keep the pipes from breaking through the bottom.

Cut eight pieces of PVC pipe to length so they stick about $\frac{1}{2}$ " above the bucket rim. Place the smaller drilled disc into the bucket bottom, then use three PVC pipes to align it and the top disc. Drive panhead screws through the bucket and into the edge of the top disc to hold it in place. Then insert the rest of the PVC pipes. Add a base, cleats, casters, floor sweeps, and eyebolt, as shown. Epoxy an unneeded hex key into the end of a dowel rod to use as a tow handle in conjunction with the eyebolt.

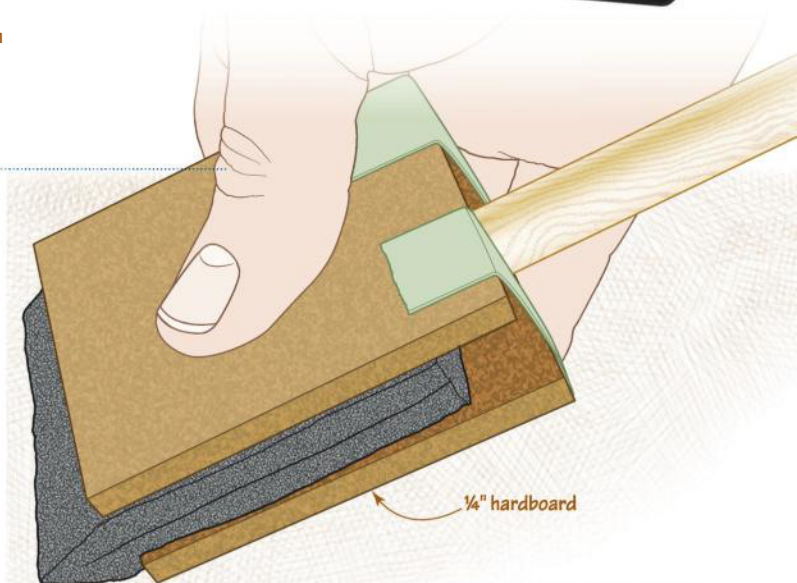
—Ralph Day, Lakeville, Minn.



Stiffen foam brushes for better results

I like the convenience of disposable foam brushes but find that the foam becomes too flexible after soaking in finish for a few minutes. To remedy that situation, sandwich the foam between two pieces of hardboard held together with tape hinges. As you lay down the finish, apply finger pressure to stiffen the foam as necessary. You'll get better flow control, fewer bubbles and streaks, and more life out of every brush.

—Joe Carretto, Corsicana, Texas



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The redesigned MLCS PowerLift Pro[®] runs by foot pedal and/or Android app

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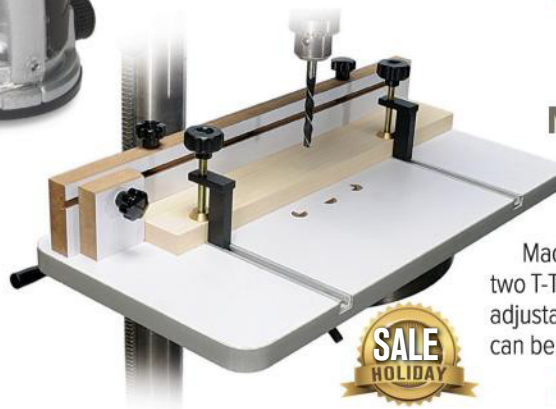
SAVE \$37! Get the heavy duty, 1 HP variable speed Rocky with both Fixed and new Plunge Base, PLUS two FREE router bits. Features a quick release three turret position depth stop for making repetitive or incremental cuts.

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SHOP TIPS

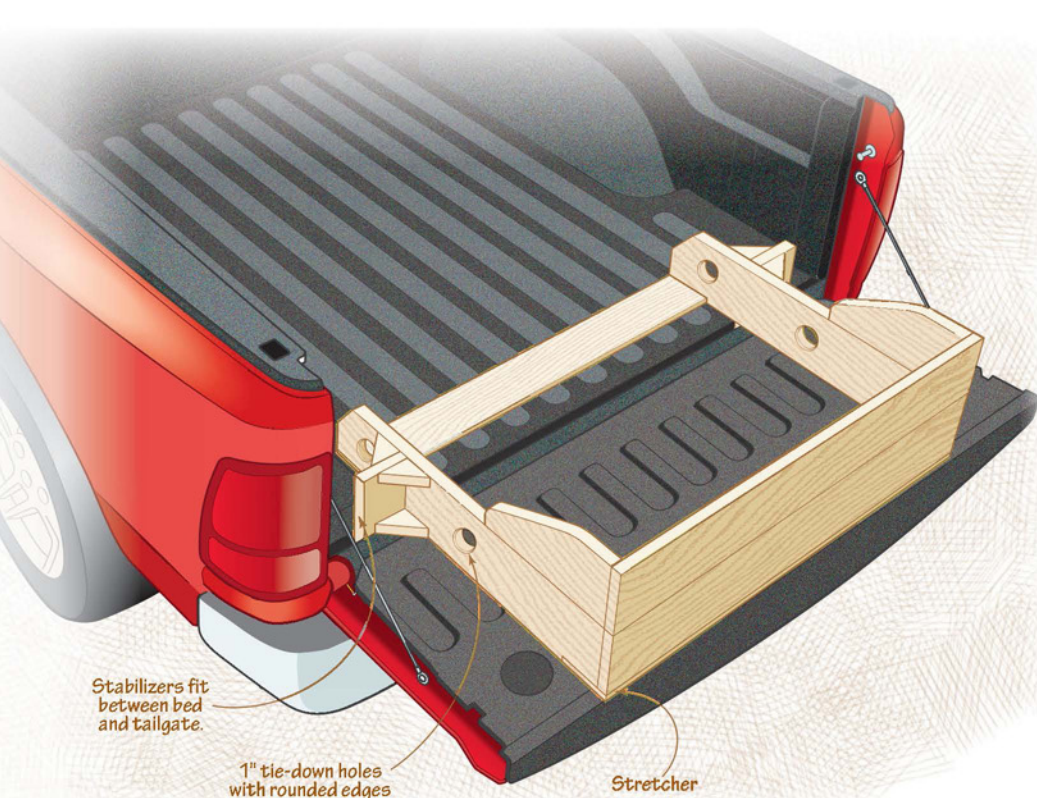
Safely haul sheet goods using a short-bed pickup truck

Even when tied down, slippery sheet goods can slide out of an open truck bed like playing cards from a fresh deck. To solve that problem, I came up with this hauler accessory. My son and I have used it with success more than 100 times over the past 15 years.

Build yours to fit your vehicle. This one measures 50" between the sides and is made entirely of $\frac{3}{4}$ " spruce joined with screws and exterior glue, except for the $\frac{1}{4}$ " maple stretchers joined to the sides with glued-and-stapled half-laps. The sides are 24" long and range from $3\frac{1}{2}$ " to 7" in width. The stabilizers measure 6" long and $3\frac{1}{2}$ " wide.

When picking up just one or two heavier sheets, simply place them in the holder—the accessory's back rail keeps them from sliding out. For lighter sheets, or a stack, hold them down with ratchet straps hooked to the opposing tie-down holes.

—George Ziembra, Success, Mo.



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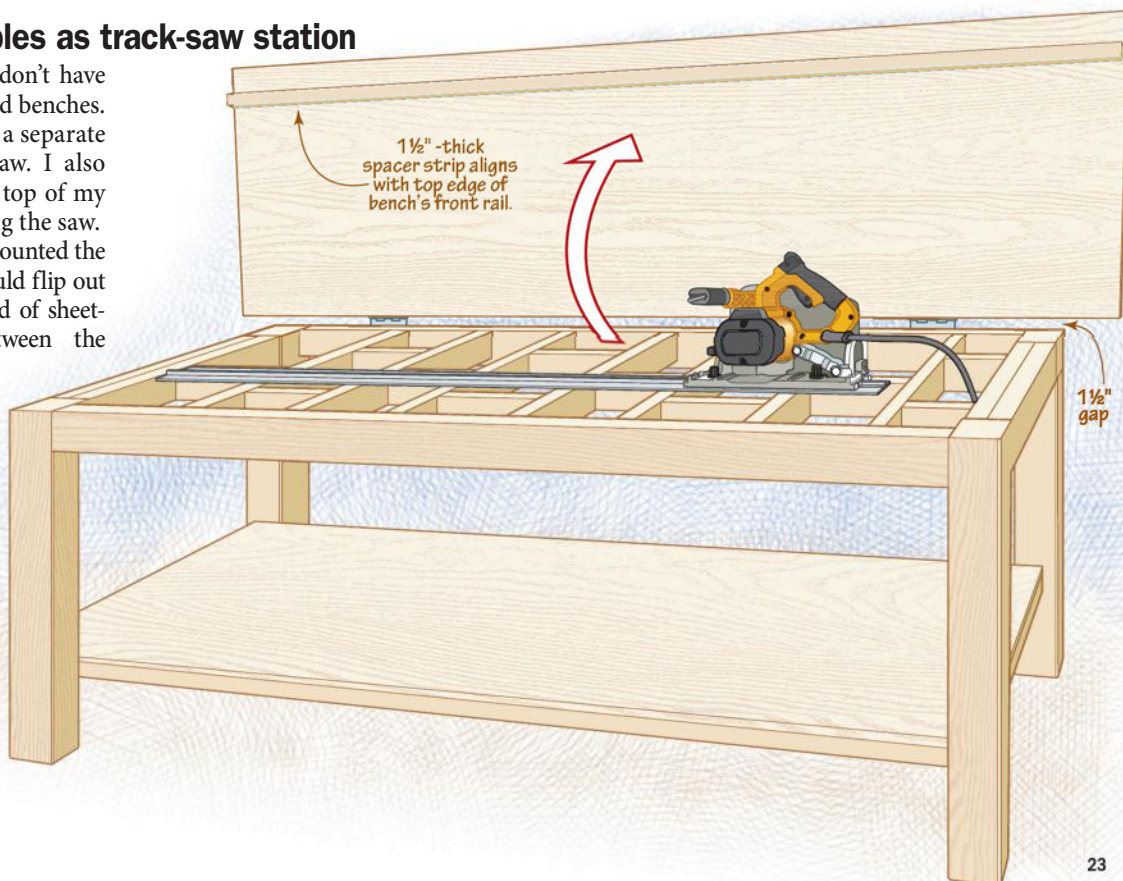
SHOP TIPS

Flip-top bench doubles as track-saw station

Like most woodworkers, I don't have unlimited space for tools and benches. So I didn't want to dedicate a separate bench just for my track saw. I also didn't want to cut into the top of my main workbench when using the saw.

To solve this dilemma, I mounted the benchtop on hinges so it would flip out of the way, and added a grid of sheet-good-supporting 2x4s between the bench's top rails. Give yourself additional working flexibility by attaching the hinges so you can slide the rail (while it's on top of a $\frac{3}{4}$ " sheet) through a $1\frac{1}{2}$ " gap at the hinged side of the benchtop. 🌲

—James P. Carr, Pittsburgh, Pa.



woodmagazine.com

23

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Beans of Wisdom

Learn to let go.

by Matt Seiler

I worked professionally in a detached 2 1/2-car garage for 15 years. During that time I pined for a larger shop that provided better workflow and more lumber storage. Especially storage. I was a wood hoarder in the extreme. My stash crippled my available workspace.

Eventually I did move to a 2,500-square-foot shop. And boy, did it get stuffed! But now, with a major shift in the work I do, it's time to move back to the garage. I've had to let go of a lot, which taught me a few things I'll share after a short anecdote.

Do you know how to catch a monkey in the wild? Simply place a handful of beans in a narrow-neck jar and put it out for a monkey to find. He'll reach in and grab all the beans he can. But his overstuffed fist won't fit back through the narrow neck. He's so greedy, he'd rather get caught than let go of some beans so he can remove his hand from the jar.

In my case my fist was full, so I'm letting go. And the beans I am keeping are only high-quality. So here are some hard-won beans of wisdom:

1 It's better to buy a new sheet of what you need rather than store a lot of what you don't need against "someday." "Someday" never happens. Honest. Learn to throw off-

No, really. Stop hoarding.

continued on page 26



One Workcentre Many Tasks

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The TWX7 brings the precision and convenience of the legendary Triton Workcentre to a new generation. Constructed using lightweight yet robust extruded aluminium sections, which support innovative low-friction work surfaces, the TWX7 is the ideal solution for the woodworking enthusiast. In addition the all new TWX7 is now a highly capable and mobile multi-purpose workshop for professional site use.



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Dust Collection Since 1993.



Collectively, these boxes contain a fair amount of lumber. But individually, these cutoffs are useless, and that amount of space will easily accommodate a stationary tool or allow room for assembling projects. So off they go.

cuts away, or burn them in the fire pit. No, really. Stop hoarding. Reduce the number of beans you're holding on to.

2 Assign a specific area for wood storage and live within it. It doesn't matter if you think that as soon as you pitch that piece of wood you'll need it the next day. Buy another one and save the space! Learn to let go of the beans.

3 Don't haphazardly build up a collection of stationary or benchtop tools because you think someday you might need them or eventually you'd like to do that kind of work. Think about what you want to build and assemble your tooling only around that. The "someday" tools take up space you need for other things.

I'm selling off large "someday" tools I used only a handful of times. I'd rather not do the work at all than sacrifice the space the other 11½ months of the year. As soon as I get them sold off, I'll have fewer beans!

As I write this, I've just completed my move and the garage is still stuffed with beans I have yet to part with. It'll take time, and I'm earmarking more to pitch than I ever thought possible. But when I'm done, I'll have a lean, mean shop that's specifically kitted out for my upcoming adventures.

This monkey is learning to let go and regain his freedom! 🐒



► Matt Seiler is a custom furniture- and guitar-maker in the Chicago area. He's been wrestling with wood since the mid '70s, with no sign of winning any time soon.

Think about what you want to build and assemble your tooling only around that.

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Materials code 206

Well-composed Cutting Board

Blocks of walnut and maple, separated by ebony veneer and enhanced with end-grain “shadows,” create the illusion of black keys standing proud of white keys.

Note: Veneer thickness varies from supplier to supplier. But that's okay because the thickness will be consistent throughout the project and will not affect any of the glue-ups.

Laminate the key blanks

- 1 Cut six $1\frac{1}{8}$ "-wide strips of ebony veneer 26" long [Source, Photo A].
- 2 To make key blanks, cut six pieces of walnut and six of maple, each $\frac{3}{4}\times1\frac{5}{8}\times26$ ". Glue and clamp a strip of ebony veneer between

pairs of walnut and pairs of maple blanks [Photo B] to make three black-key blanks and three white-key blanks.

- 3 With the glue dry, scrape off squeeze-out and square up the edges of each lamination on the tablesaw [Photo C].

D I M E N S I O N S
 $16\frac{1}{8}$ " W $\times$ $8\frac{1}{8}$ " D $\times$ $1\frac{1}{2}$ " H

Approximate materials cost:

\$60

87

Sliced and diced pieces.

► Purchase a saw like the one shown in Photo A. woodmagazine.com/buyveneersaw



A Place the veneer on a softwood scrap and cut the strips, using a 1 5/8"-wide piece of maple as a width gauge and to guide the veneer saw.



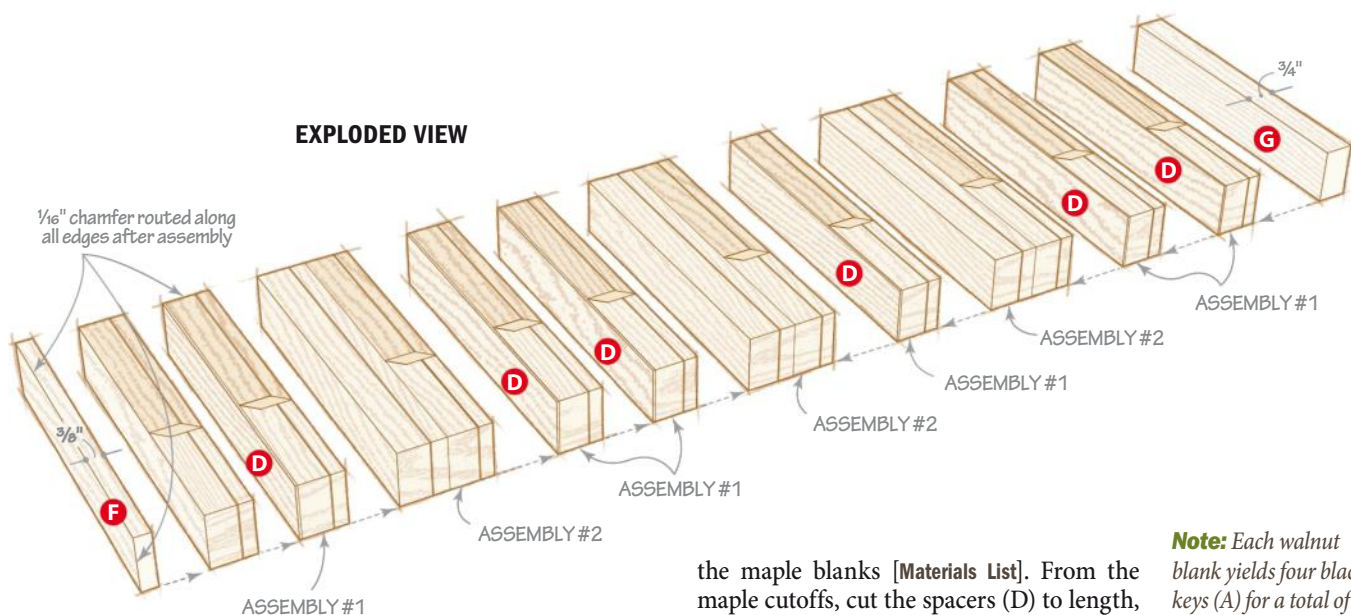
B To ensure a good glue joint, evenly distribute pressure by clamping each key-blank lamination between cauls.



C Rip 1/16" from each face of the key blanks, smoothing the surfaces and bringing them to a finished thickness of 1 1/2".



D Flip the key blanks upright and rip one edge to bring them to the finished width.



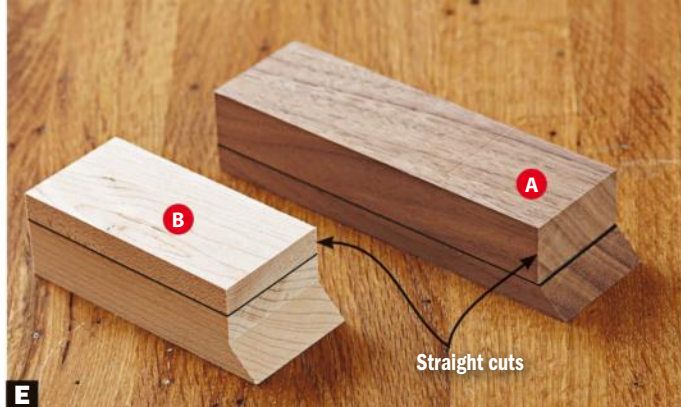
Form the keys

- 1 Rip each key blank to 1 1/8" wide [Photo D].
- 2 Save the maple cutoffs for the spacers (D). Cut the black keys (A) to length from the walnut blanks and the short white keys (B) and long white keys (C) to length from

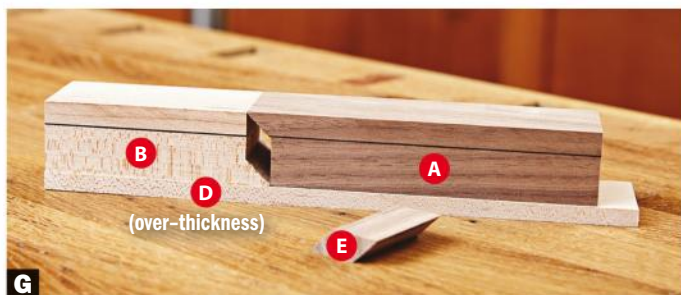
the maple blanks [Materials List]. From the maple cutoffs, cut the spacers (D) to length, leaving them thick for now. Cut the thin end cap (F) and thick end cap (G) to size. Mark the thin end cap to avoid confusing it with the spacers. Set parts F and G aside.

3 To begin forming the ends of the black keys (A) and short white keys (B), make an initial cut on the tablesaw 3/4"-deep and 3/8" from the end of each key [Drawing 1], making

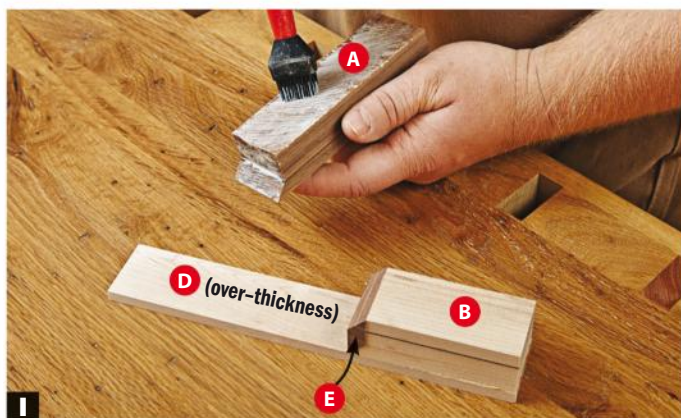
Note: Each walnut blank yields four black keys (A) for a total of 12. Two maple blanks yield 12 short white keys (B) and the remaining maple blank yields three long white keys (C). You have extra parts A and B in case of an error.



E Make the straight cut in the black key (A) with the thick walnut section face-down on the tablesaw. Make the same cut in the white key (B) with the thin maple section face-down.



G Check the fit of the end-grain key (E) in the opening between the black key (A) and the short white key/spacer (B/D) before proceeding with the glue-up.



I Apply glue and position the end-grain key (E) against the short white key (B). Apply glue and add the black key (A).

sure you orient the pieces correctly [Photo E]. Tilt the blade to 45° and make the second cut in each key [Photo F].

4 Dry-assemble one Assembly #1 and measure the dimensions for the end-grain key (E) [Drawing 2]. Cut an 18"-long key blank to the measured thickness and width. Bevel the blank edges on the router table with a 45° chamfer bit. Check the fit [Photo G].

Glue the subassemblies

1 Using six each of the short white keys (B), over-thickness spacers (D), end-grain keys (E), and black keys (A), form six of Assembly #1 [Drawing 2, Photos H, I, J, and K].

2 Glue and clamp three short white keys (B) to three long white keys (C), keeping

the ends and edges flush [Drawing 3]. Remove excess glue from the bevel area. Using these three assemblies and three each of the end-grain keys (E) and black keys (A), form three of Assembly #2 [Drawing 3, Photos L and M].

3 To make the key assembly at the left end of the cutting board, retrieve the thin end cap (F). Glue and clamp one each of the short white key (B), end-grain key (E), and black key (A) to the thin end cap [Exploded View].

All together now

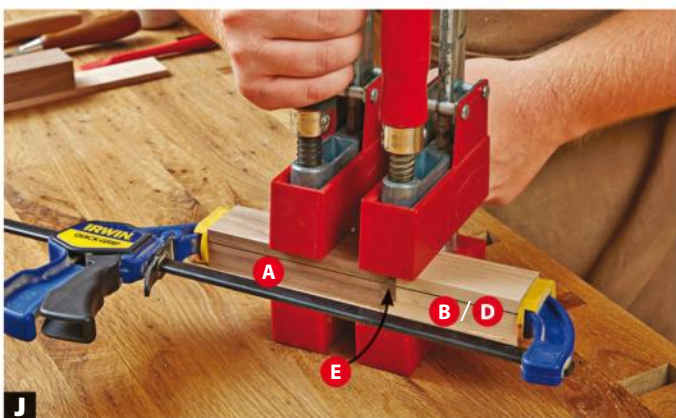
1 Edge-glue the subassemblies [Exploded View, Photo N]. Make sure the key with the thin end cap (F) attached is at the left end of the keyboard. Add the thick end cap (G) to the right end.



F The corner of the second (angled) cut in each key meets precisely at the corner of the first (straight) cut.

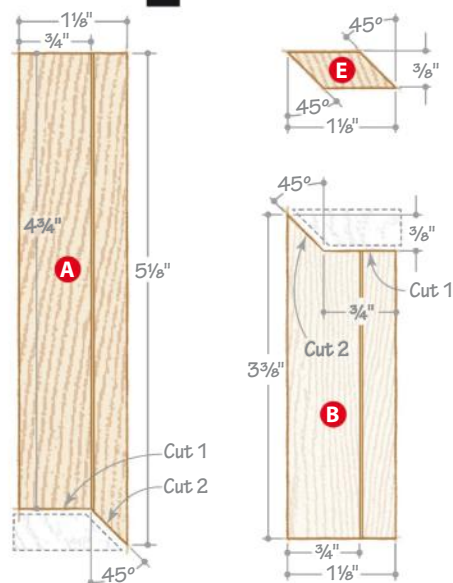


H Glue and clamp the short white key (B) to the over-thickness spacer (D), keeping the ends and edges flush. Remove excess glue from the bevel area.



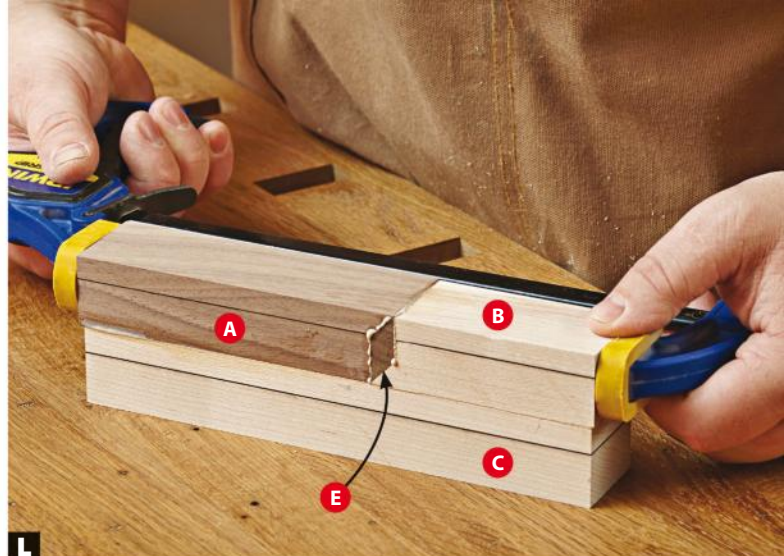
J Clamp the assembly (A, B/D, E) along the length and across the width, checking for flush edges as you work.

1 END ASSEMBLY

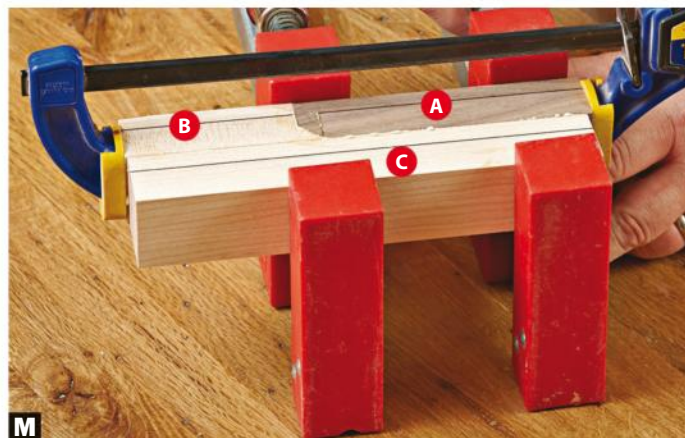




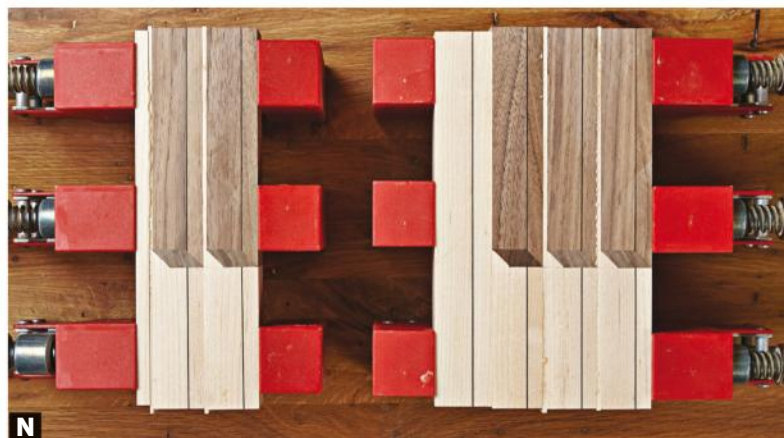
K Rip the six Assembly #1s to $1\frac{3}{16}$ " wide after scraping away excess glue. Rip only the spacers (D).



L Make three Assembly #2s by gluing and clamping an end-grain key (E) and black key (A) to the end of the short white key (B).



M Carefully flip the assembly and clamp the black key (A) to the long white key (C).



N To keep things manageable and make it easier to keep all surfaces flush, glue and clamp the subassemblies two at a time.

2 With the glue dry, scrape away any excess. Sand the cutting board to 320 grit. Rout $\frac{1}{16}$ " chamfers along all edges. Apply coats of mineral oil, saturating all parts of the cutting board. 🌲

Produced by **Craig Ruegsegger** with **John Olson** and **Jan Svec**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine**, **Lorna Johnson**

Materials List

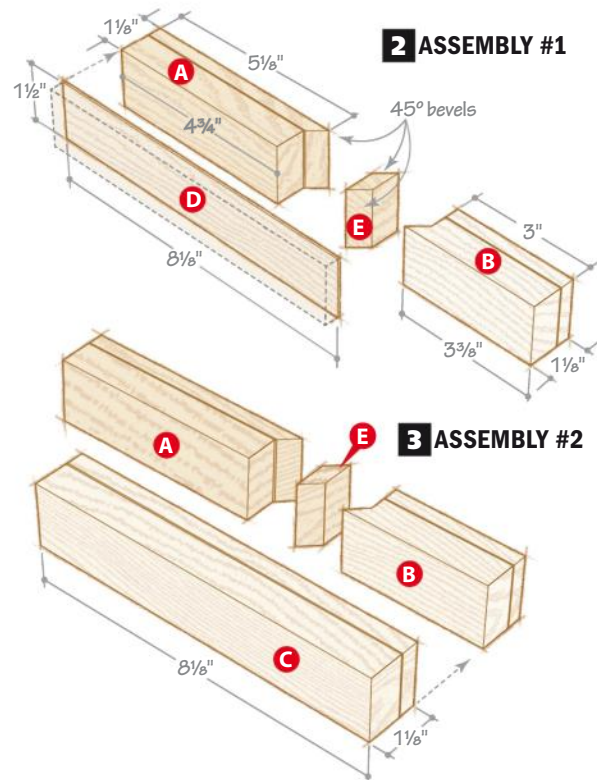
Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* black keys	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$5\frac{1}{8}$ "	LWE	10
B* short white keys	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$3\frac{3}{8}$ "	LME	10
C* long white keys	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$8\frac{1}{8}$ "	LME	3
D* spacers	$\frac{1}{16}$ "	$1\frac{1}{2}$ "	$8\frac{1}{8}$ "	M	6
E* end-grain keys	$\frac{3}{8}$ "	$1\frac{1}{8}$ "	$1\frac{1}{2}$ "	W	10
F thin end cap	$\frac{3}{8}$ "	$1\frac{1}{2}$ "	$8\frac{1}{8}$ "	M	1
G thick end cap	$\frac{3}{4}$ "	$1\frac{1}{2}$ "	$8\frac{1}{8}$ "	M	1

*Parts initially cut oversize. See the instructions.

Materials key: LWE-laminated walnut and ebony, LME-laminated maple and ebony, M-maple, W-walnut.

Blade and bits: 45° chamfer router bit.

Source: Ebony veneer, 3 sq. ft. pack, no. 48303, \$31.99
Rockler, 800-279-4441, rockler.com.



Keep cutting path within this range.

Cutting path

► See the Origin
in action.
[woodmagazine.com/
origin](http://woodmagazine.com/origin)



We honor these eight tools and accessories as the most innovative in the field of woodworking for the coming year.



Give this CNC a hand

One of the most common objections to CNC machining is that the machine does all the work for you. The Shaper Origin bridges that gap by keeping you in control of the cut. Looking more like a plunge router than a typical CNC machine, the Origin routs profiles and shapes you load into its onboard computer or design on the tool itself. Apply the provided tape to your workpiece, and the Origin “reads” that tape as you move it around to understand its position relative to the workpiece. Small stepper motors provide automatic course corrections to keep the bit on the designated cutting path. If you stray from your intended cutting area, the bit automatically retracts. The included router accepts only 1/4"-shank cutters.

Origin handheld CNC router

\$2,199 (\$1,499 limited-supply preorder price)
Shaper Tools
415-857-4888, shapertools.com



Small footprint with big possibilities

The workpiece-riding Crawlbot CNC router provides a large cutting capacity while minimizing the amount of space it takes up in your shop. Because it's not permanently affixed to a table—limiting its work capacity—you can position the Crawlbot however and wherever you like on your workpieces. Out of the box, the Crawlbot cuts 4×8' if you have a worksurface on which to rest the workpiece. Crawlbot comes with a control app that works with design files from popular CAD software, such as Autodesk Fusion 360.

Crawlbot CNC machine

\$4,000
Printrbot
916-258-2540, printrbot.com



Machine rides on wheels resting on workpiece



► See (and hear)
one of these pulse
drivers in action.
[woodmagazine.com/
pulsedriver](http://woodmagazine.com/pulsedriver)



All the torque without the noise

Cordless impact drivers have great screwdriving torque, but their rapid-fire hammering noise can be bothersome and induce hearing loss over time. Instead of the noisy hammer-and-anvil system typically found in impact drivers, these tools use an oil-pulse-driven mechanism that delivers needed torque, but at significantly quieter noise levels. The Ridgid driver comes with two batteries and charger; the Ryobi sells only as a bare tool, but it works with all Ryobi 18-volt battery packs.

18-volt pulse drivers

Stealth Force, no. R86036K, \$199
Ridgid
866-539-1710, ridgid.com

Quiet Strike, no. P290, \$99 (bare tool)
Ryobi
800-525-2579, ryobitools.com



No more blind-nailing blowout

One of the difficult aspects of joining wood with a pneumatic nailer is accurately placing the fasteners to avoid blowout. With Grex's edge guide, you can precisely position the nose of the nailer to center the fastener on the workpiece below. The guide adjusts up to about 2½" from the nose, and mounts to Grex 18-gauge brad nailers and narrow-crown staplers and 23-gauge micropinners.

Pneumatic nailer edge guide

\$30
Grex Power Tools
888-447-3926, grexusa.com



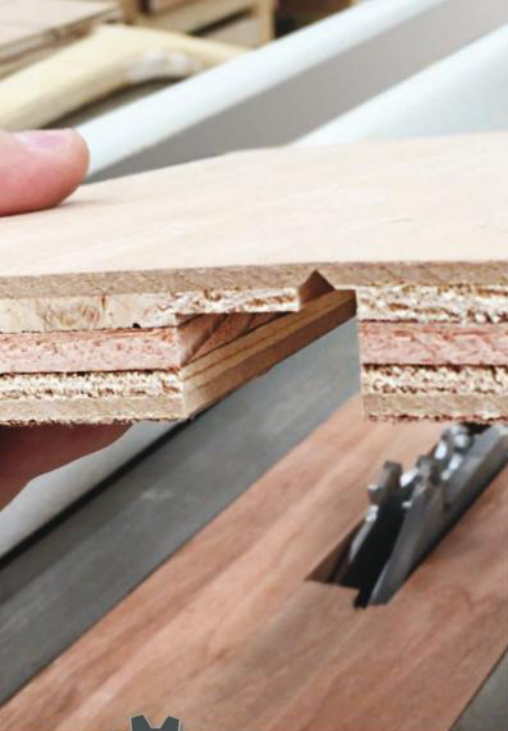
Big voltage adapts to the tool

Not only do these 60-volt battery packs provide greater power than any other cordless system in the tool market, they also step up and down in voltage. Use one pack in any of DeWalt's new FlexVolt tools, and it functions with 60 volts of power. (Or pair up packs in either of the two 12" mitersaws for 120 volts of power.) And you can even use these packs in DeWalt's 20-volt tools, where they step down to 20 volts with extended run time. Best of all, one of these packs weighs about the same as a DeWalt 18-volt nickel-cadmium pack.

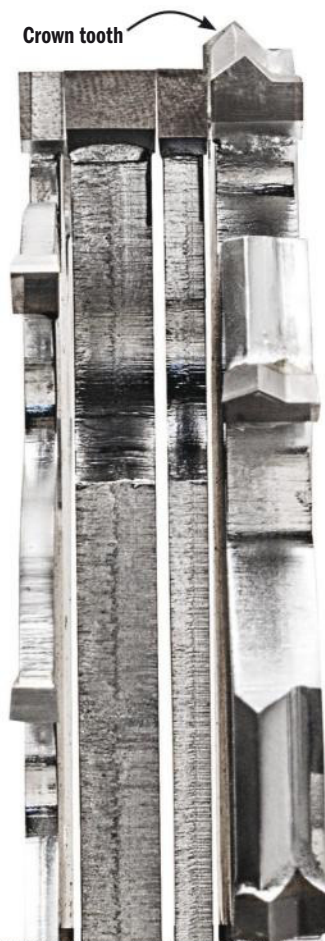
FlexVolt battery/tool system

7¼" circular saw, no. DCS575, \$300 (1 battery), \$380 (2 batteries)
8¼" tablesaw, no. DCS7485, \$500 (1 battery)
12" compound mitersaw, no. DHS716, \$650 (2 batteries)
12" sliding compound mitersaw, no. DHS790, \$800 (2 batteries)
6.0 amp-hour battery pack, no. DCB606, \$150
DeWalt
800-433-9258, dewalt.com





► See the miter-fold dado in action.
woodmagazine.com/miterfold



Make grain-wrapped joints in a one-cut setup

Perhaps you've seen the viral video of this unique dado set. Well, now it's close to being available for purchase (January). To make a miter-fold joint, you stack chippers and an outer blade next to the crowned-tooth blade (right), creating dados and grooves with the profile shown above left. After cutting, you simply fold the workpiece sections inward to create a precise joint that's a hybrid of a miter and dado. Best of all, you get a perfect grain wrap around the corners.

Miter-fold 8" dado set

no. 54799, \$300
 Rockler Woodworking & Hardware
 800-279-4441, rockler.com



► Watch how quickly and easily this tool kicks into gear.
woodmagazine.com/palmimpacter



Pressure-activated impact driver in a handy size

This pint-size cordless impact driver has a pressure-sensitive, variable-speed switch that you control simply by pushing down on the tool against a fastener. It works great in tight spaces, and a built-in LED helps you see the work area. And it has 400 inch-pounds of screwdriving torque. The tool comes with a charger and one battery, and is compatible with all Ridgid 12-volt battery packs.

12-volt palm impact driver

no. R8224K, \$99
 Ridgid
 866-539-1710, ridgid.com



Foam feathers fight off frustrations

Don't be quick to dismiss this as just another featherboard. The FeatherPro uses rigid-foam guides that hold work solidly against a fence without marring the wood, and also "lock" into each other in reverse direction, effectively preventing kickback on a tablesaw. The FeatherDuo twin-stack unit sells for \$60. Replacement "feathers" cost \$15 for a two-pack. 🌲

FeatherPro featherboard

\$30
 Bow Products
 844-895-4488, featherpro.com



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Become a Pen Pal

Learn to turn pens, and you've got all your holiday shopping done!



Creating pens on a lathe can be a fun and fulfilling way to get started in woodturning. Pen turning requires only a small investment—about \$200 if you already have a lathe and turning tools, or about \$600–\$800 if you're starting from scratch—and can be done in a workspace as small as a large closet. You simply buy the pen kits, turn the shafts from wood (or

multicolored composite material), and press the components together. With a little practice, you can easily make a pen in less than an hour.

We'll show you how to make a typical pen, using a Slimline kit. Although you can vary the shape of the turned elements to suit your taste, the process holds pretty true for most pen kits. Let's get started.

Tool up to spin pens

You'll need these tools and accessories to get started. (See [Source](#) on page 39.)

► **Lathe.** Get the biggest model your budget allows, letting you turn other projects as your skills develop. We recommend a 12" benchtop midi-lathe, with which you can turn a bowl or platter up to 12" in diameter. It might be the only lathe you'll ever need.

► **Chisels.** Start out with at least a roughing gouge and parting tool. Add other chisels as needed, such as a skew and ½" spindle gouge, or a ½" bowl gouge for turning bowls or platters.

► **Bench grinder.** Use this to sharpen your chisels. Get a 6" or 8" model with either a slow-speed (1,725 rpm) or variable-speed motor.

► **Mandrel.** This holds the wood blanks on the lathe as you turn them to shape. Get one with a Morse taper to match that of your lathe. Purchase bushings to match this mandrel to your pen kits.

► **Barrel-trimming kit.** Use this to square the ends of wood blanks to the glued-in-place metal barrels.

► **60° live cone center.** This supports the tail end of the mandrel.

► **Precision drill bits.** Get a metric set, because most pen kits use components measured in millimeters.

Optional equipment

► **Drilling center vise.** This grips the pen blanks so you can drill perfectly centered holes [Photo B].

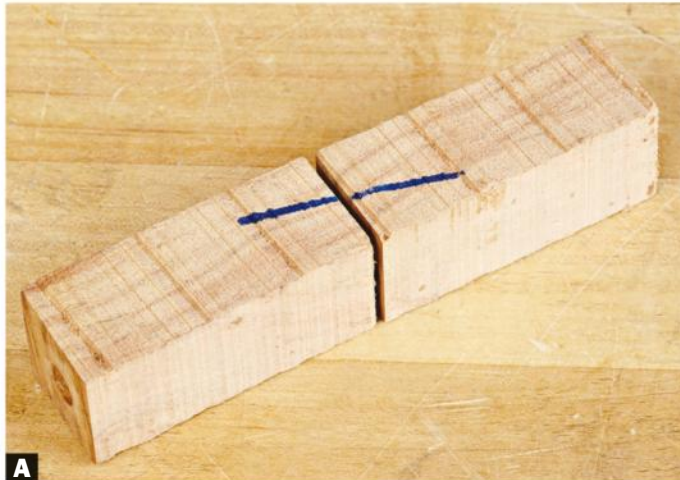
► **Pen press.** After turning the wood elements, you press the pen's working parts into them using this tool. Some models combine the centering vise with a press. (You can also do this with a clamp or bench vise. We'll show all three methods, but you need only one.)

► Read reviews of wood lathes and turning accessories. reviewatool.com/turning

Prep the blanks

1 Cut two wood blanks about ⅛" longer than the pen barrels in your kit. Mark the blanks to maintain alignment [Photo A].

2 Drill a centered hole through each blank to match the diameter of the pen barrels [Photo B].



A **Grain orientation matters.** To keep the wood grain aligned from one blank to the next—making a more attractive pen—mark each segment with a line across the middle cut.

3 To help the glue adhere better, scuff the barrels (sometimes called tubes) with 100-grit sandpaper to remove any polish or residue. Use medium-viscosity cyanoacrylate (instant) glue to secure a barrel in each wood blank [Photo C]. Trim each end of the blanks [Photo D] when dry.

Tip! To prevent overheating and burning while drilling, spray your drill bit prior to use with a dry lubricant, such as Bostik BladeCote.



B **Secure a pen blank** between the jaws of a drilling center vise, clamp the vise to the drill-press table, and bore through the blank. (Or, hold blanks with a wooden handscrew clamp.)



C **Glue fast.** Evenly space three thin lines of instant glue along half the length of the barrel. Insert the barrel fully into the blank, twisting it as you go. Work quickly, as most instant glues set up in 15 seconds or so.



D **Trim flush.** Using a drill press and the barrel-trimming shaft that matches your barrels' inside diameter, counterbore the wood blank flush with the end of the barrel. This squares the ends and cleans the barrel of any stray glue.

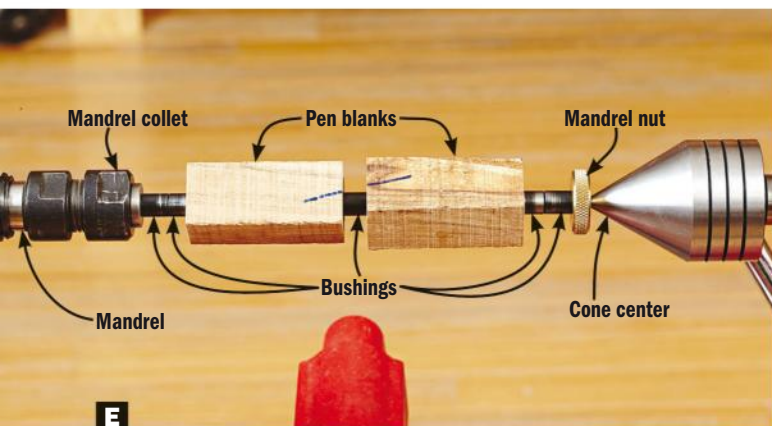
Now for the turning

1 Install the mandrel into the lathe's headstock spindle, and load the pen blanks and matching bushings onto the shaft, in

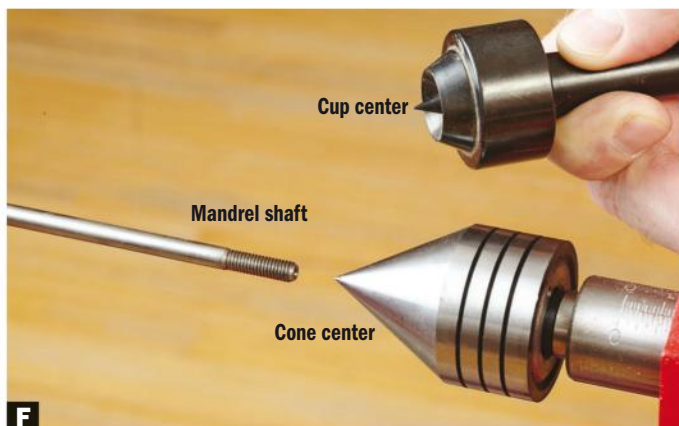
the order shown in **Photo E**. Secure the other end with the tailstock center [**Photo F**].

2 Adjust the lathe speed to 2,500 rpm, and turn the blanks round [**Photos G-J**]. For the

Slimline pen, we made them equal in diameter to the pen's components ($2\frac{3}{4}$ "). Sand the blanks smooth, starting with 220 grit and finishing with 600.



E **Fully loaded.** Mount the pen blanks onto the mandrel, maintaining grain alignment. The marks will be removed during turning.



F **Matched fit.** A 60° cone center perfectly fits this mandrel's tapered end. A cup center, typically with a steeper-angled tip, bottoms out in the mandrel without fitting against the sides, which can damage the center's tip and the mandrel.



G **Turn 'em round.** Using a roughing gouge, turn both blanks to cylinders slightly larger in diameter than final size. Then fine-tune the diameter by lightly paring away shavings, using your fingers to support the blanks on the back side to prevent flexing. Continue until each cylinder reaches the desired diameter and shape. After turning several pens, your bushings might become slightly smaller in diameter through contact with the chisels and sandpaper. Instead of relying on the bushings as your depth guide, measure the diameter of the wood so it matches the pen components.



I **Make it shine.** After sanding smooth, apply a polishing wax, such as Mylands friction polish, to the wood, and buff it with a clean paper shop towel. Note: Do not use cloth towels, as they can wrap around the spinning components. Paper towels will tear away instead.



J **Keep in line.** When finished polishing, remove the wood cylinders from the mandrel and place them onto a pipe cleaner in the same orientation. This keeps the pieces properly oriented as you move to assembly.

Bring it all together

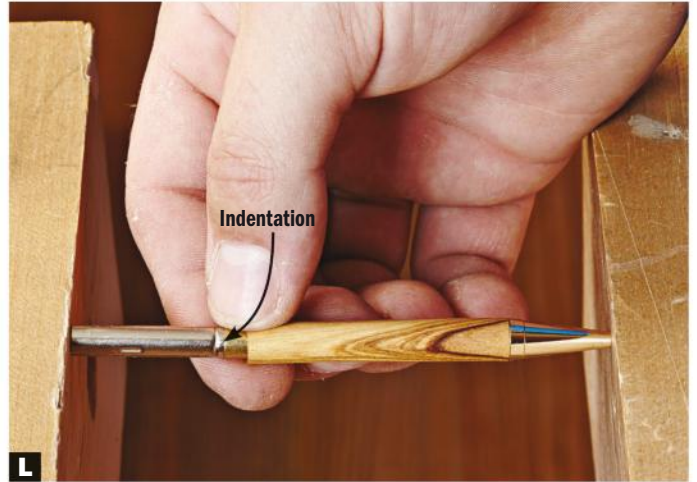
Assemble the pen by pressing the components into the wood-and-barrel cylinders (no glue needed), using one of the clamping

tools shown: a clamp, bench vise, or pen press [Photos K-M]. 🌲

Produced by **Bob Hunter** with **Brian Simmons**



K **Start with the tip.** Press the pen tip into the front end of one cylinder; seat it fully against the shoulder.



L **Now the twist.** Press the twist mechanism into the other end of that cylinder. Stop when the indentation aligns with the end of the cylinder.



M **Cap it off.** Insert the cap (and clip, if included) into the far end of the second cylinder, and press together. Insert the ink cartridge into the twist mechanism, add the center band, and use your hands only to press the two cylinders together, aligning the grain as you do so.

Source: Slimline 24kt gold pen kit, no. PK-PEN, \$2.85; 7mm Slimline kit bushing set, no. PKM-BUSH3, \$4; No. 2 Morse taper maxi-mandrel, no. PKM-FLC, \$17.95; 7-piece universal barrel trimming system, no. PKTRIMKIT, \$35.95; pen blank drilling center vise, no. DRILLCENT3, \$49.95; pen assembly press V5, no. PENPRESS5, \$49.95; Mylands friction polish, no. MYPOL, \$26.95; No. 2 Morse taper 60° live cone center, no. LCENTLT2, \$15.95; Penn State Industries, 800-377-7297, pennstateind.com.

► Watch a video of Brian turning a pen start to finish.

reviewatool.com/penturning

Find pen blanks in all types of wood and other materials, ranging from \$3 to \$30 at Penn State and other sources.

Body Mechanics: Jointing a Board

Moving a board across a jointer seems simple enough: Just hold the board down while moving it forward, right? While that gets the job done, it's the nuances of your movements that get the best results. Here's how to correctly joint a workpiece to flatten one face and then square an edge to that face.

First, stand just behind the cutterhead with your left foot forward and your weight balanced.

Grip a pushblock in each hand. Place the pushblock in your right hand near the end of the board or the infeed table, whichever is closest. (A hook at the heel of this pushblock helps move the workpiece forward.) With the workpiece clear of the cutterhead, switch on the machine.

Guard

Cutterhead



Move the board forward with your right hand, keeping the left hand near the cutterhead.



Joint an edge square to the freshly jointed face by pressing that face against the fence with your left hand while moving the board forward with your right.

Push the workpiece forward at a rate of about 2" per second, exerting little pressure downward. As your left hand and pushblock reach the outfeed table, exert only enough downward pressure to prevent the board from chattering, *above*. Allow the board to slide under your pushblock, if it will; otherwise, let your hand move forward about 8–12", then reposition it again just past the cutterhead. Shuffle-step forward as needed

to feed the board past the cutterhead until the guard closes over the cutters.

Use a similar procedure to joint the edge of a board, but also press the jointed face against the fence as you advance the board across the cutterhead, *above*. A pushblock to move the board forward isn't necessary for boards more than 4" wide, if you keep your hands along the top edge of the board. 🌲

Produced by Craig Ruegsegger

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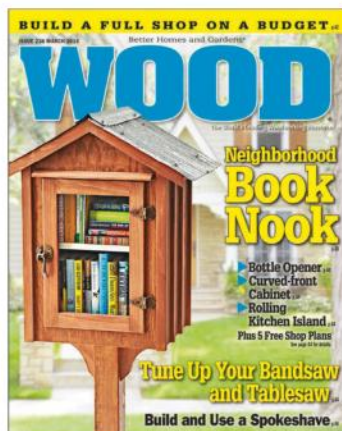


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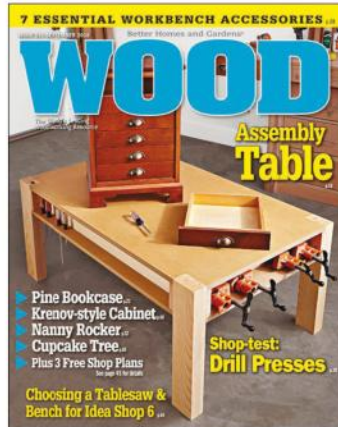
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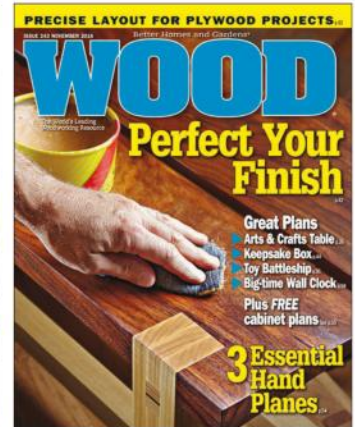
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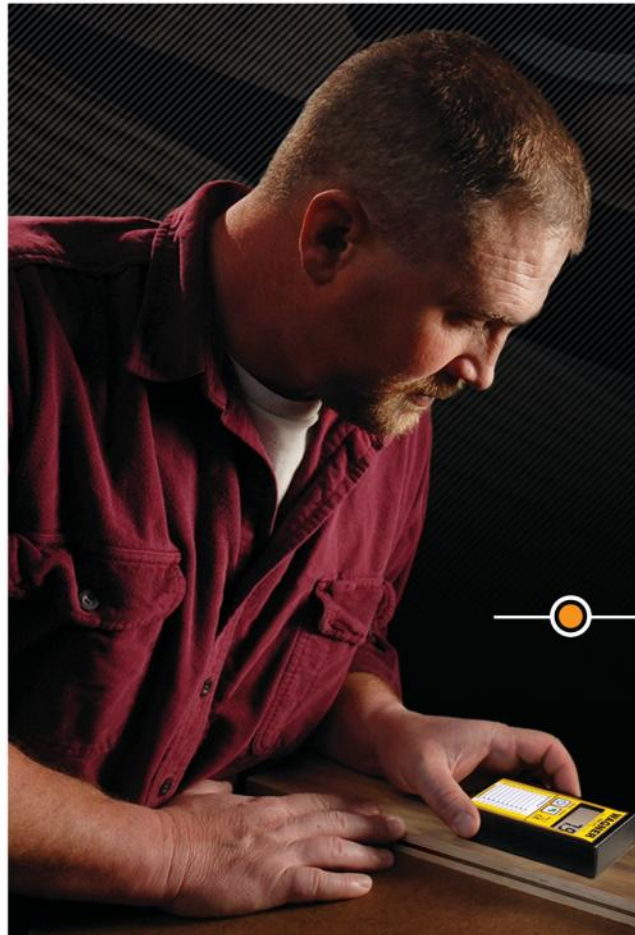
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clamps used in seat construction

Any time you want to make a project easier to build and more stable, just use plywood. When incorporated into a torsion-box design—a grid of crossmembers sandwiched between two plywood skins—even $\frac{1}{8}$ " plywood yields a super-strong and dead-flat surface. That's great for a table, but how do you build a comfortable chair using it? The solution: gently curved torsion boxes for the seat and backrest. Here's how to pull off this surprisingly simple engineering trick in your shop.

Note: Other good applications for torsion boxes include shelves, assembly tables, and even workbenches (requires an upper plywood skin at least $\frac{3}{4}$ " thick).

First up, the table

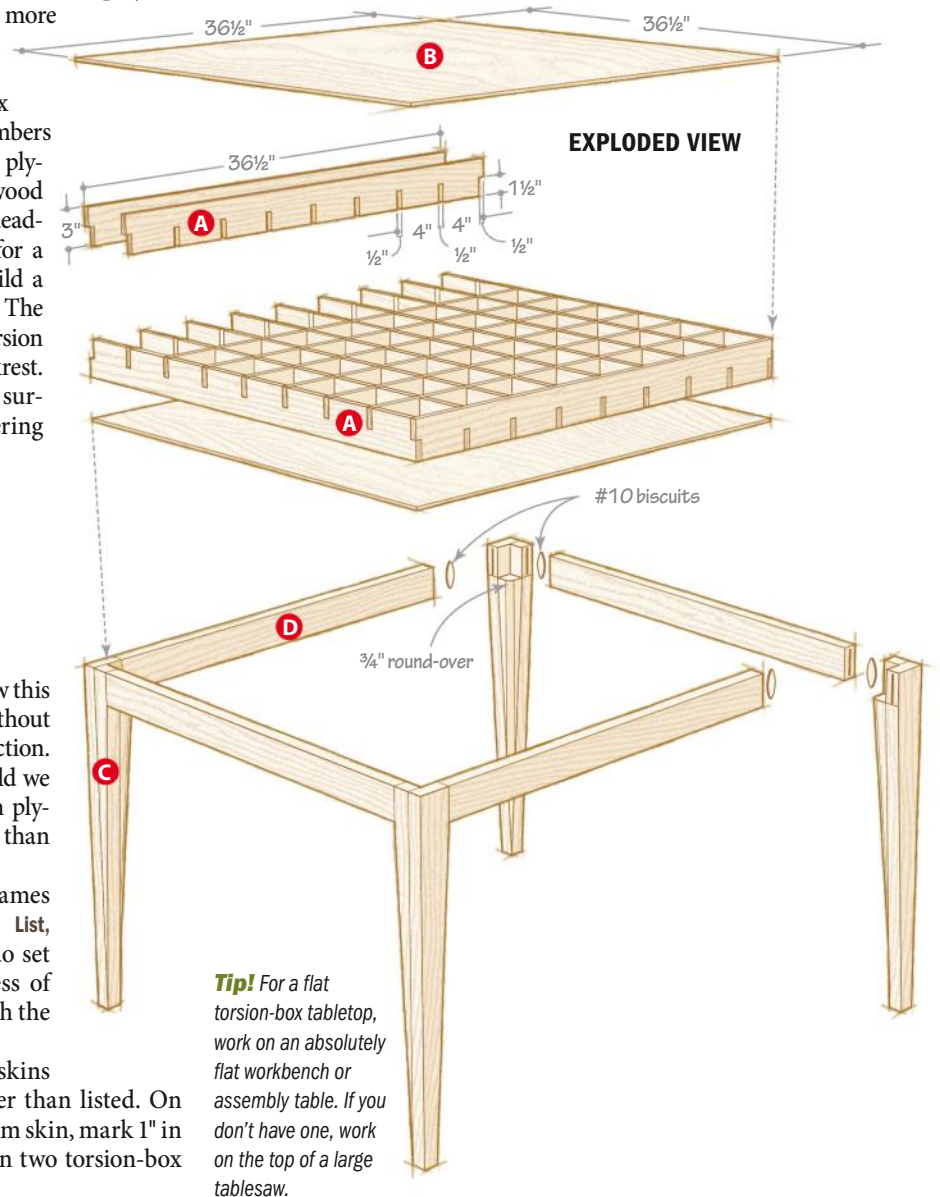
Start with the torsion-box top

You can lengthen or narrow this table by a foot or two without changing its basic construction. To ensure a successful build we used void-free Baltic birch plywood that has more plies than typical plywood.

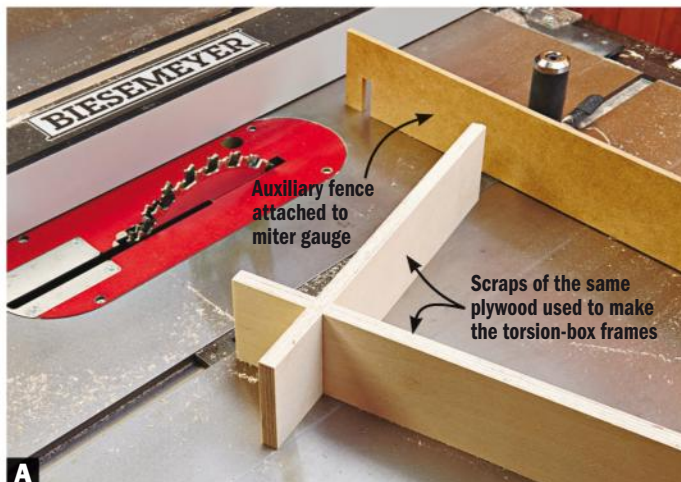
1 Cut the torsion-box frames (A) to size [Materials List, Exploded View]. Using a dado set that matches the thickness of the plywood [Photo A], notch the torsion-box frames.

2 Cut the torsion-box skins (B) 2" wider and longer than listed. On the inside face of the bottom skin, mark 1" in from all edges and glue on two torsion-box frames [Photo B].

Tip! Cut the notches so the frames come apart with little effort. If they're too tight you could have assembly problems.



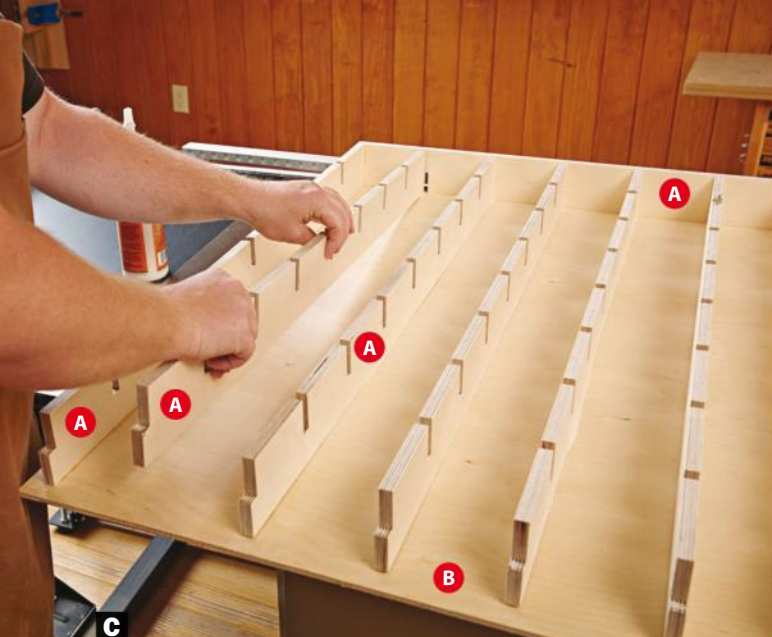
Tip! For a flat torsion-box tabletop, work on an absolutely flat workbench or assembly table. If you don't have one, work on the top of a large tablesaw.



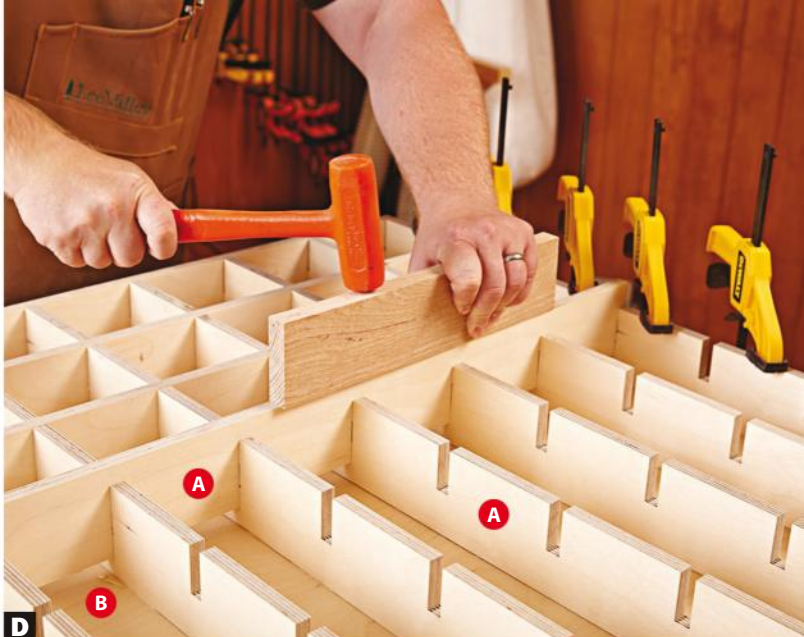
A Cut snug-fitting notches in test pieces before notching the torsion-box frames. For splinter-free results back the cut with an auxiliary fence attached to your miter gauge.



B Glue and clamp two adjacent frames just inside the marked lines. This provides a square and solid start to the frames' glueup.



C
Up with notches. Eyeball the placement of the notch-up frames, aligning them approximately parallel to each other and square to the outside torsion-box frames.



D
Down with notches. Working quickly, glue down the remaining frames. You may need to tap them using a mallet and wood block.



E
Hit the weights. Place a flat $\frac{3}{4} \times 36\frac{1}{2} \times 36\frac{1}{2}$ " plywood or MDF platen between the A/B assembly and a number of heavy objects—such as tool boxes or concrete blocks—to distribute the weight.

Tip! To make gluing up the torsion-box frames as manageable as possible, use a slow-setting glue, such as Titebond Extend, and have all your tools and heavy objects at the ready ahead of time.

3 Glue on the remaining frames (A) beginning with the notch-up pieces [Exploded View, Photo C]. Add the frames with notches facing down [Photo D]. “Clamp” the glued frames tight to the skin by stacking large heavy objects on top of the assembly.
4 After the glue dries, check the A/B assembly for flat using a straightedge. Remove any high spots with a hand plane.

5 Apply a narrow glue bead to all top edges of the frames (A) and center the other skin on top of them. Add a platen and heavy objects [Photo E].
6 With the glue dry, saw off most of the skin overhang. Trim the excess using a handheld router and flush-trim bit.

Tip! To minimize tearout when trimming the overhang, invest in a downcut spiral router bit.

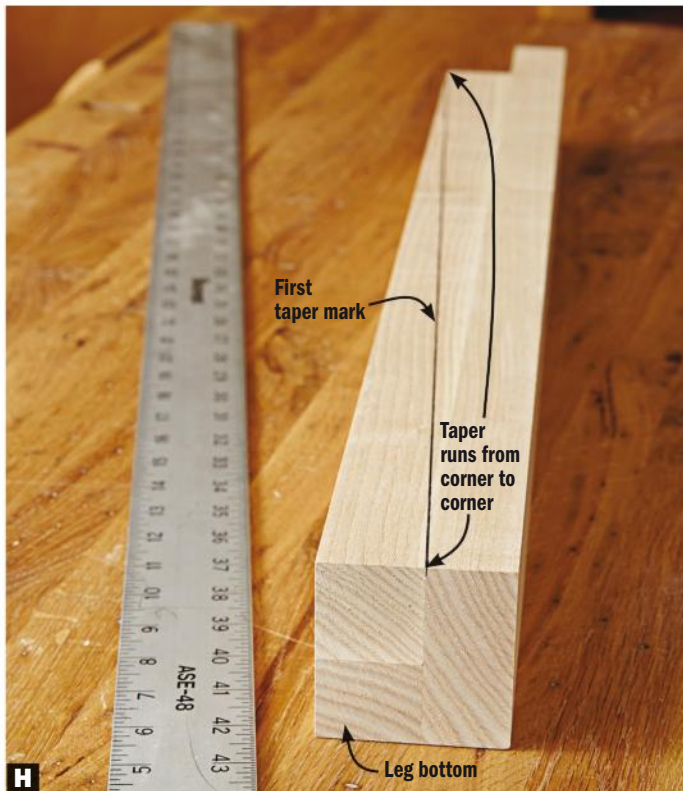


F

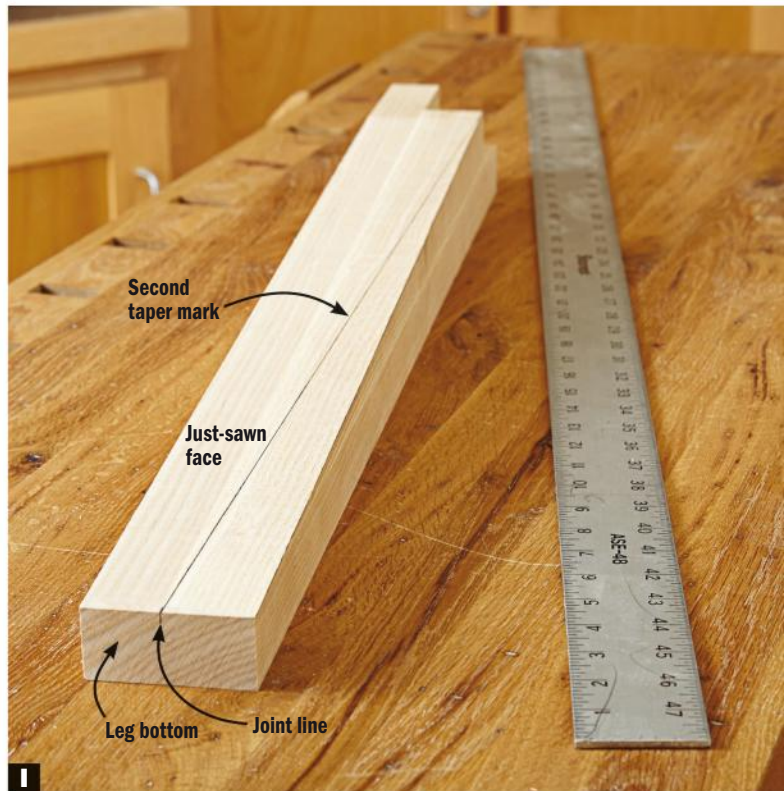


G

Go for the grain match. These photos show the same two pieces of wood. In the “good match” photo the narrower piece was rotated 180° for a better grain match.



H



I

Do the taper two-step. Mark the first taper on the 1½"-square piece of the leg glueup. Mark the second taper on the surface made by the first taper cut.

Tip! If you plan to make more than one table, or the chairs that go with it, build a tablesaw auxiliary fence like the one in Photo D on page 54 to make quick work of trimming excess skin material.

Now tackle the legs

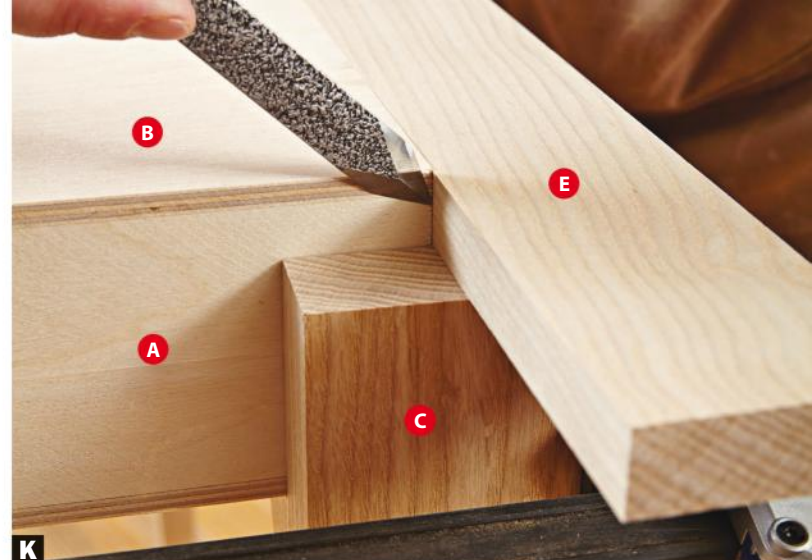
1 Each leg consists of three pieces of ash glued together to make a 2¾"-square blank. Begin by cutting four 1¼×4⅝×29¼" boards. Rip each board to yield a 2¾"-wide piece and a 1½"-wide piece. Glue the edge of each narrow piece to the face of a wide piece, flush at the ends and one edge. Strive for a good grain match [Photos F and G].

2 Cut four pieces of ash to 1½×1½×26½". Glue and clamp one of these to the inside corner of each leg, flush at the bottom.

3 Mark a taper on one inside face of each leg [Photo H]. Bandsaw along the mark. Then mark another taper on the just-sawn face [Photo I]. Bandsaw to the line, sand or hand-plane flat the bandsawn faces, and rout a ¼" round-over on the inside corner of each leg.



J Scribe and cut the aprons. Mark each apron (D) for a tight fit between the legs.



K Up your accuracy with a marking knife. After scribing both ends of each piece of top trim, run a sharp pencil down the knife cut to make it easier to see at the saw.

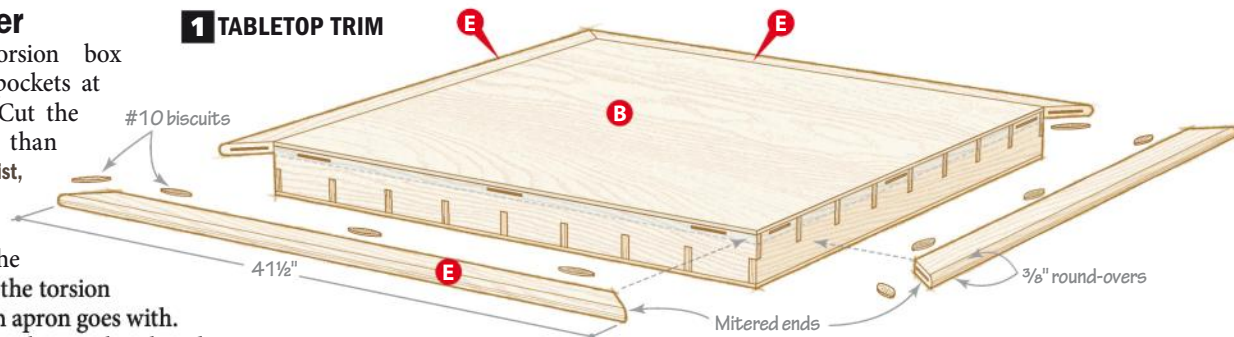
Put it all together

1 Dry-clamp the torsion box within the corner pockets at the top of each leg. Cut the aprons (D) 1" longer than listed [Materials List, Exploded View]. Scribe and cut each apron to length [Photo J]. Mark the position of each leg on the torsion box and which legs each apron goes with.

2 Cut the top trim (E) 2" longer than listed [Drawing 1]. Scribe the trim to fit [Photo K] and miter-cut to finished length.

3 Cut mating biscuit slots in the trim and torsion box. Remove the legs and glue

1 TABLETOP TRIM



the trim to the torsion box, being careful to pull tightly together the mitered corners during the clamp-up. After the glue dries, round over the trim (E).

4 Cut biscuit slots in the apron ends and leg edges [Exploded View]. Set the torsion box upside-down on a bench and glue the legs and aprons to the edges of the torsion box and the bottom of the trim.

5 Sand all surfaces to 150 grit if you plan to clear-finish the project, and to 220 grit if you will be staining it. Apply a clear top coat. We chose lacquer for its clarity; polyurethane provides tougher wear, but adds amber coloration.

Tip! To keep the final clamp-up manageable, start by gluing on an apron and two legs, then two more aprons, and finally the last apron and two legs.

Materials List-Table

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A torsion-box frames	1/2"	3"	36 1/2"	BBP	18
B* torsion-box skins	1/4"	36 1/2"	36 1/2"	BBP	2
C legs	2 3/4"	2 3/4"	29 1/4"	LA	4
D* aprons	1 1/4"	2 3/4"	33 1/2"	A	4
E* top trim	3/4"	2 1/2"	41 1/2"	A	4

*Parts initially cut oversize. See the instructions.

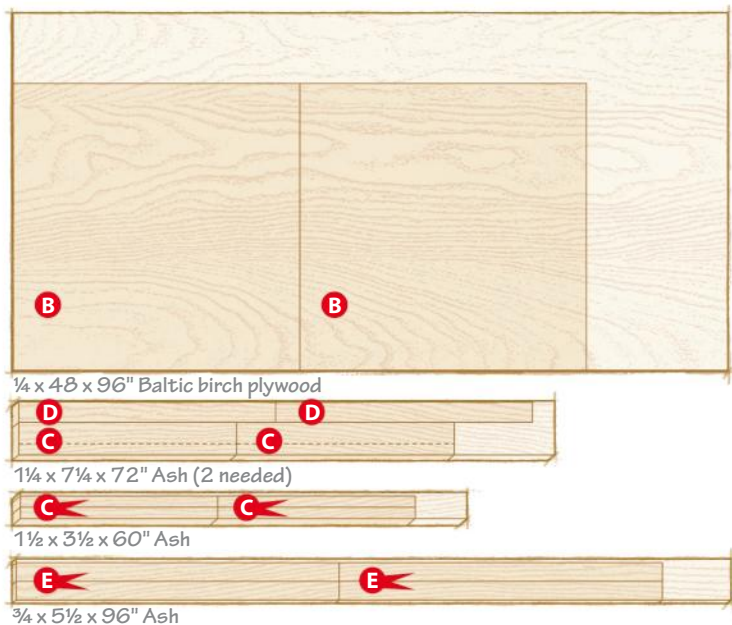
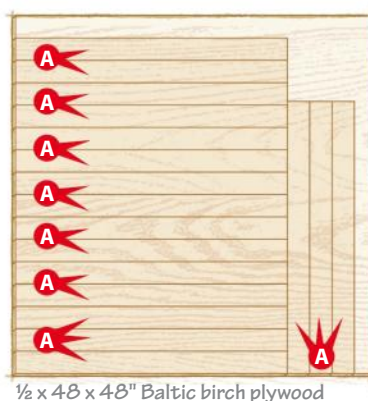
Materials key: BBP-Baltic birch plywood, LA-laminated ash, A-ash.

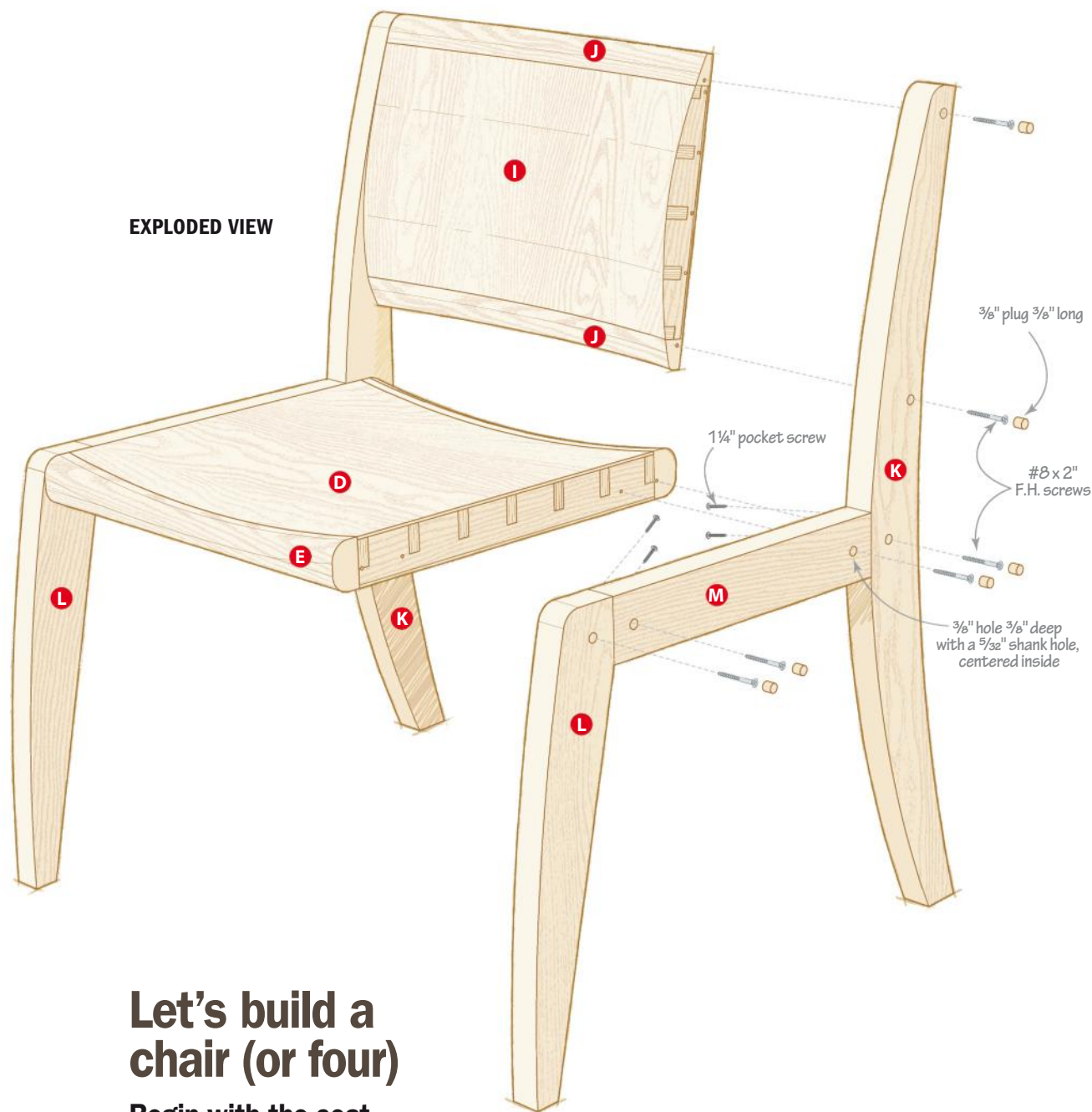
Supplies: #10 biscuits (24).

Blade and bits: Dado set; 3/8" and 3/4" round-over router bits; downcut spiral flush-trim bit.

Table Cutting Diagram

This project requires 4 board feet of 4/4 ash, 1.5 board feet of 5/4 ash, and 2.5 board feet of 6/4 ash.





Let's build a chair (or four)

Begin with the seat

► See the first step of the table build, and the accompanying tip, for advice on cutting clean and well-fitted notches.

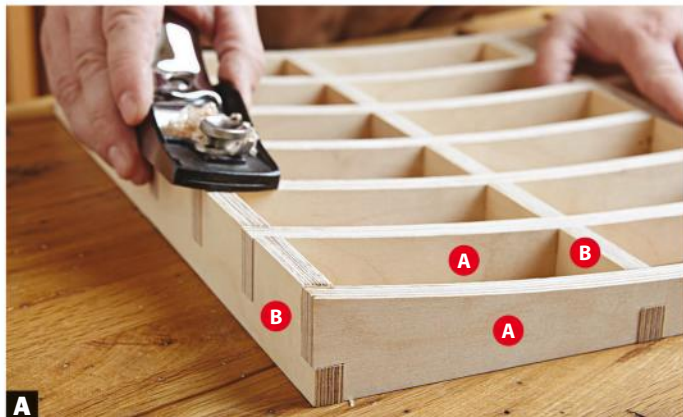
Tip! Save time cutting the arched supports (A) by stack cutting them.

► Build a simple fairing stick and use it to mark smooth curves.
woodmagazine.com/fairing

These instructions explain how to build one chair. If you're making a set, build them simultaneously to save on setup time.

1 Cut to size the supports (A, B) [Materials List, Drawing 2], and notch them [Drawing 3]. Mark the curve on the arched supports using a fairing stick, then bandsaw to shape and sand smooth.

2 Dry-assemble the supports (A, B). Mark the intersection of the arched supports (A) onto the straight supports (B). Tilt your tablesaw blade to match the angle, and bevel-rip the top of the straight supports as close as possible to the marked curve. Glue and clamp the supports assembly, then trim the top edges [Photo A].



A Smooth the way for gluing down the plywood skins by knocking down high areas with a block plane or coarse-grit sandpaper.



B Get out the clamps. You'll need 20 clamps and four cauls to apply even clamping pressure to the A-C assembly.



C Start from the middle when clamping down the upper skin (D). Use cauls with rounded corners down. Then add clamps all around the assembly as done for the lower skin.



D Trim the excess skin. For accurate trim cuts, clamp an auxiliary fence with a standoff to your tablesaw fence.



E Round over the seat-trim edges. For best results use a starting pin and be careful to hold the assembly as vertical as possible; it can tip slightly forward, but not backward.



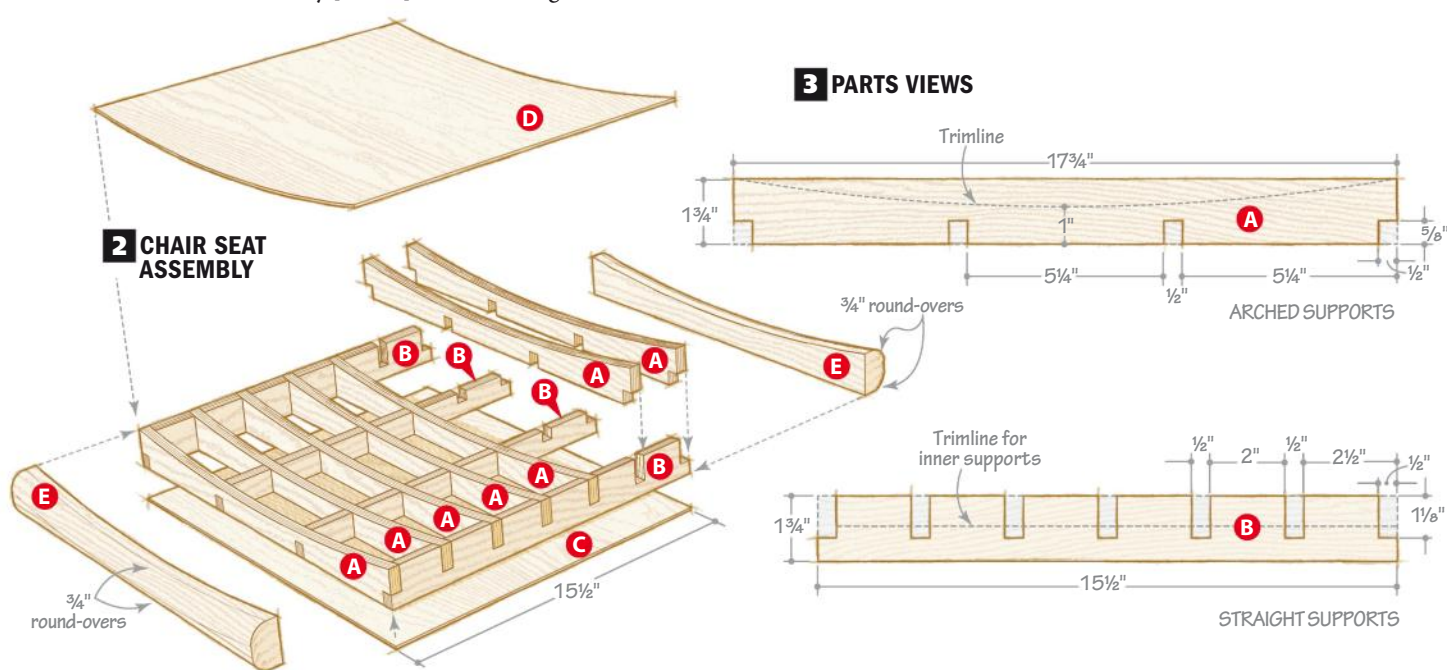
F Trim the trim. Using double-face tape, secure a runner to one end of the seat assembly before flush-cutting the seat-trim ends.

3 Cut the skins (C, D) 1" longer and wider than listed. Glue and clamp the A/B assembly, centered, on the lower skin [Photo B]. Then, glue on the upper skin [Photo C]. After the glue dries, trim the skins flush with the ends of the assembly [Photo D].

4 Cut the seat trim (E) 1" longer and ½" wider than listed. Stand the seat assembly on the seat trim and scribe the curve. Bandsaw just outside the line, then glue the trim to the seat assembly [Drawing 2]. After the glue dries, use a flush-trim bit at the

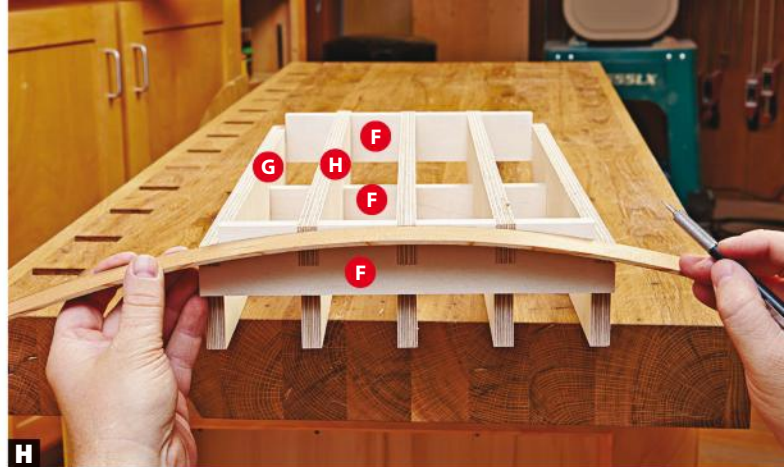
router table to blend the trim flush with the skin faces.

5 Round over the seat-trim (E) edges [Photo E]. Then cut the trim flush with the ends of the seat assembly [Photo F].

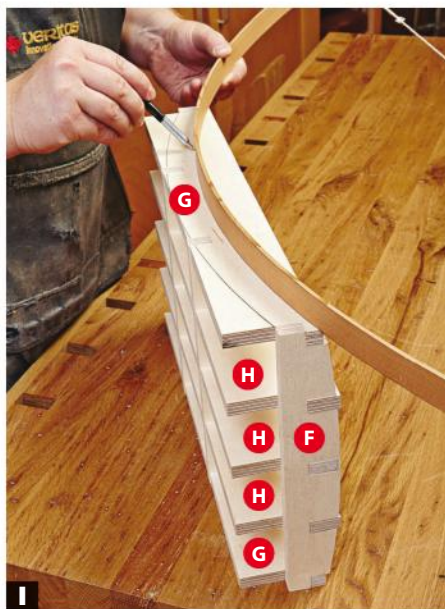




G
Stack and notch. The outer and inner horizontal supports (G, H) share notch sizes and locations. Clamp them tightly to prevent any workpiece creep.



H
Mark the curve on one vertical support (F), cut that curve to shape, and use it as a template to mark the curve on the other vertical supports. Then cut those to shape.



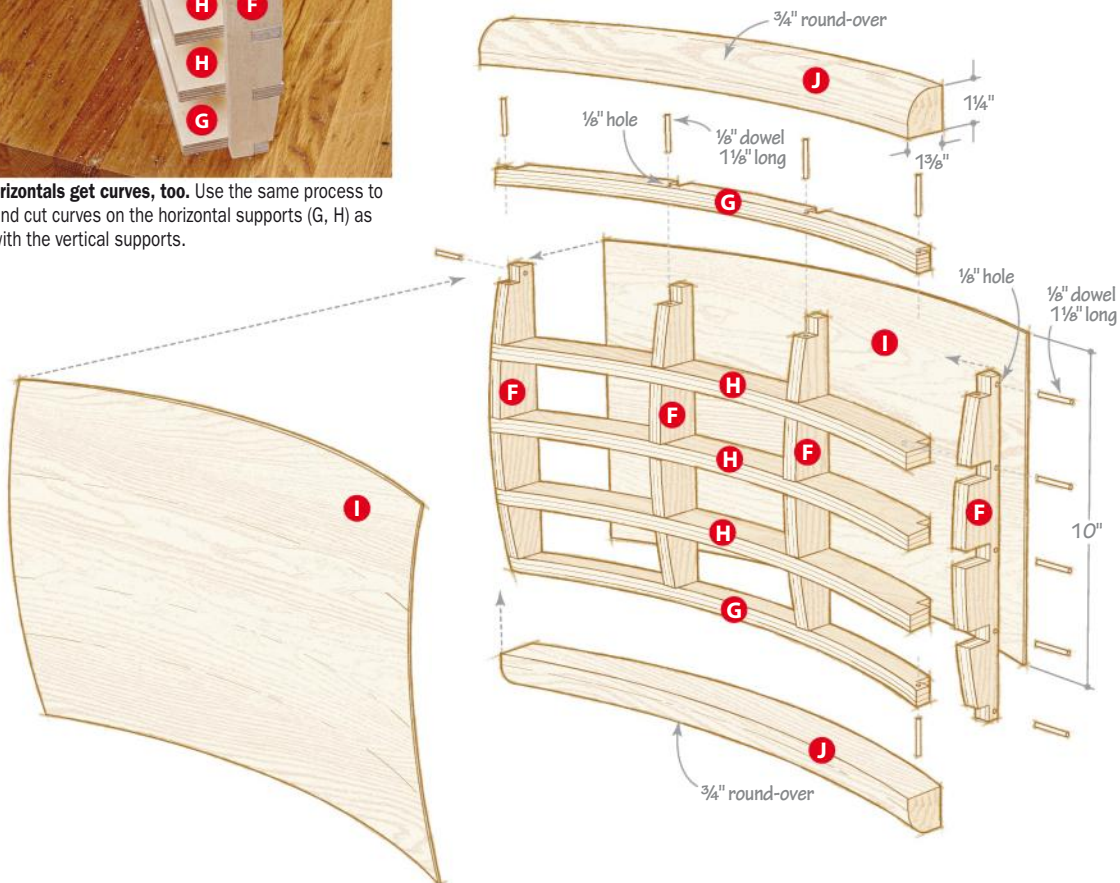
I
The horizontals get curves, too. Use the same process to mark and cut curves on the horizontal supports (G, H) as done with the vertical supports.

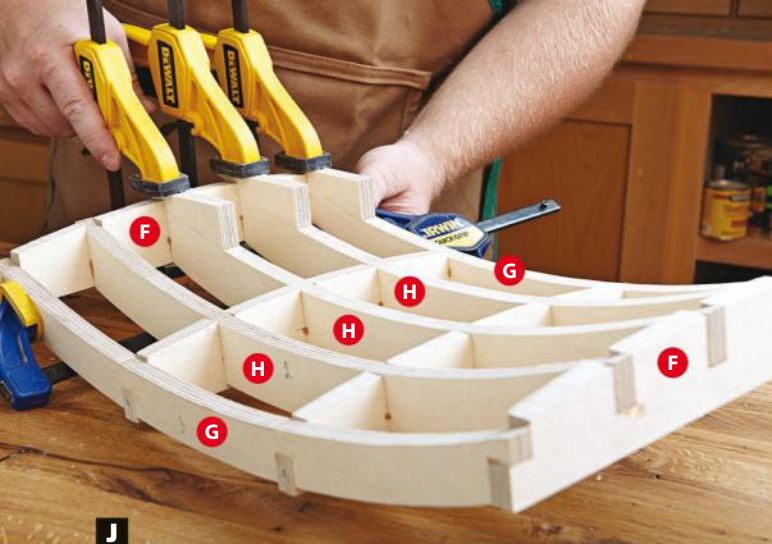
Next up, the back

1 Cut the supports (F, G, H) to size [Materials List, Drawing 4]. Cut the notches as done before [Drawing 5]. You can stack-cut the G and H supports [Photo G].

2 Dry-assemble the back supports and mark and cut the curves on the vertical supports (F) [Drawing 4, Photo H]. Reassemble and mark and cut the curve in the horizontal supports (G, H) [Photo I]. Save the offcuts.

4 BACK ASSEMBLY





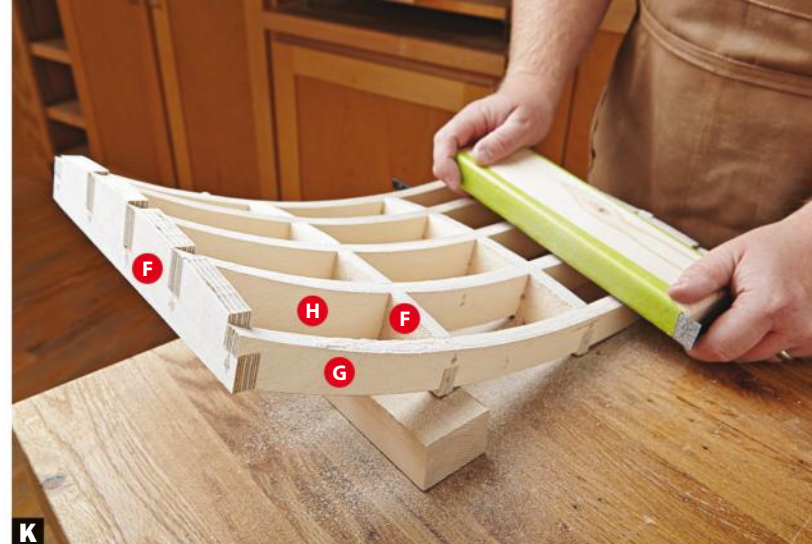
J

Assemble the back supports. Use the outer-most cutoffs from the horizontal supports as cauls when clamping the glued supports.

► Though the torsion-box support frames of the table and seat bottom do not require reinforcement, the stresses created by the compound curves of the seat back demand dowels at outside joints.

3 Glue and clamp the back support assembly (F-H) [Photo J]. After the glue dries, reinforce the outside joints with dowels [Drawing 4]. Then, sand the back and front into a continuous curving plane using 60-grit abrasive and a 2×4 block [Photo K].

4 Cut the front/back skins 1" longer and wider than listed. Glue on the back skin first, then the front [Photo L].



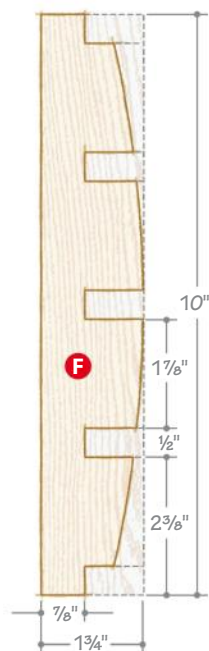
K

Sand it smooth. Hand sanding gives you the most control, but don't be afraid to knock down the high spots with a power sander—if you're experienced in using one.

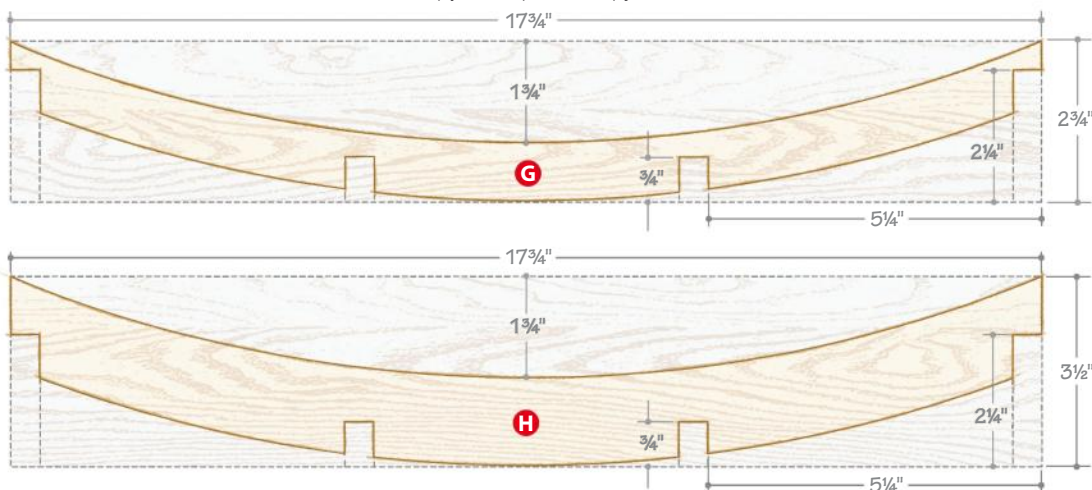


L

Prevent skin damage. The front skin requires lots of clamping pressure, so place strips of 1/8" plywood to pad all clamp jaws front and back.

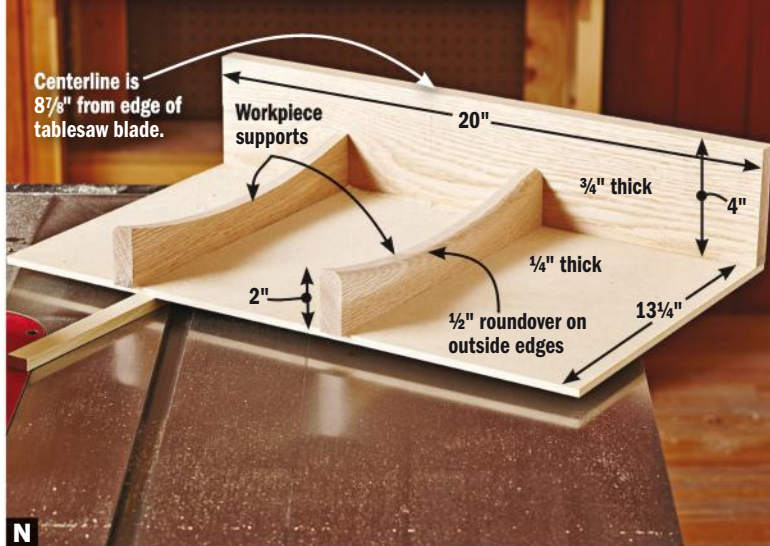


5 BACK SUPPORTS





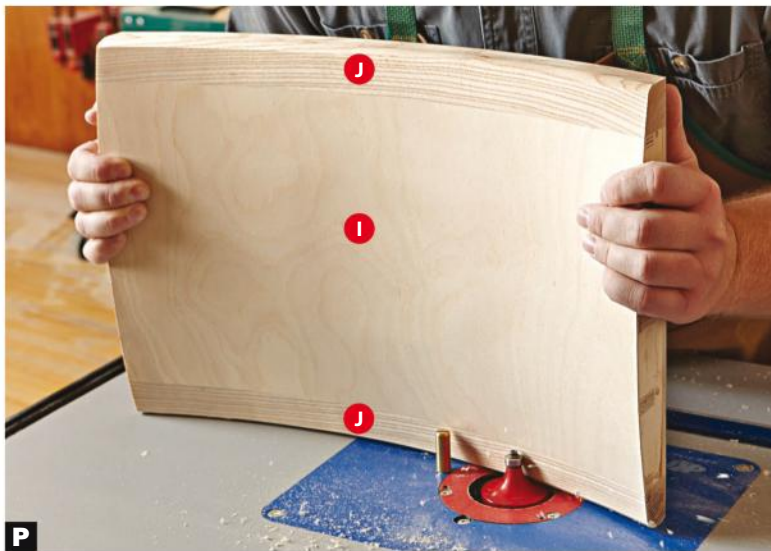
M **Rocking through the cut.** Gently rock the curved back assembly as you carefully feed it through the saw to remove excess skin.



N **Build a jig** for trimming the seat-back ends. Mark the curve on the workpiece supports using a fairing stick adjusted earlier to the curve of the inner vertical supports (F).



O **Crosscut the ends of the seat back** with its center aligned with the center of the jig. Apply masking tape to the exit side of the cut to reduce tearout.



P **A round-over and a round-over we go.** Round over the back trim before and after bringing it perfectly flush with the skin. A starting pin lends control to this tippy setup.

5 After the glue dries completely, trim flush the overhanging skin at the top and bottom (but not the sides) at the tablesaw. You can't use a runner as done with the seat, so sand down the high spots on the skin edges to get those parallel to the top or bottom, then rip away the excess [Photo M].

6 To make the back trim (J) trace the top and bottom edge of the back assembly onto a 1/4"-thick board that's as long as the skins. Bandsaw the trim, staying just outside the marked lines. Glue and clamp the trim to the top and bottom edges. At the router table, rout the front and back faces of the trim flush with the skins. The bit won't trim perfectly flush because of the compound shape of the seat back, but that's okay—you'll fix that in Step 8.

7 Build a trimming jig [Photo N] and use it to flush-cut the ends of the seat back [Photo O].

8 Round over the front edges of the trim [Photo P, Drawing 4]. Finish flush-trimming

Tip! The bearing on the round-over bit may leave an indentation in the trim because of the trim's compound shape. Raise the wood fibers back up by rubbing with a wet rag.



Q **Take fine control of stock removal** using a spokeshave to bring the back trim flush with the front skin. Work from the ends toward the center.

the trim with a spokeshave and sandpaper [Photo Q]. Then round over the front edges again.

Give it some legs to stand on

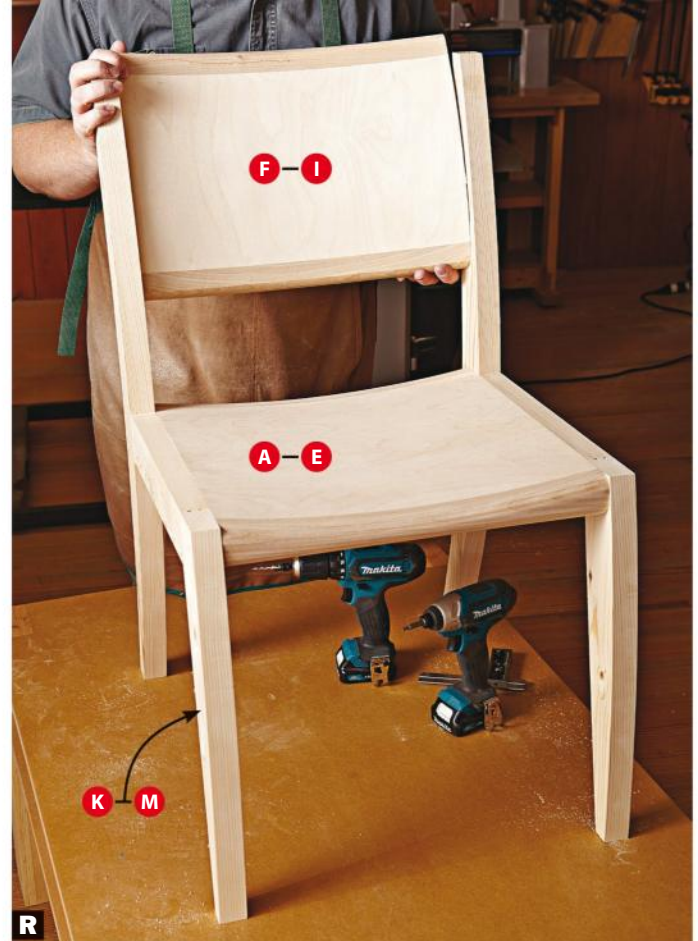
1 Cut the legs (K, L) from oversized blanks, then bandsaw and sand them to shape [Leg Gridded Patterns]. Transfer the hole locations to the outsides of the legs. Cut the side rails (M) [Materials List].

2 Attach the side rails (M) to the legs with glue and pocket-hole screws to make mirrored assemblies [Exploded View].

3 Clamp the seat between the leg assemblies, then drill counterbored holes where marked on the outsides of the legs. Screw on the seat and check the fit of the back [Photo R].

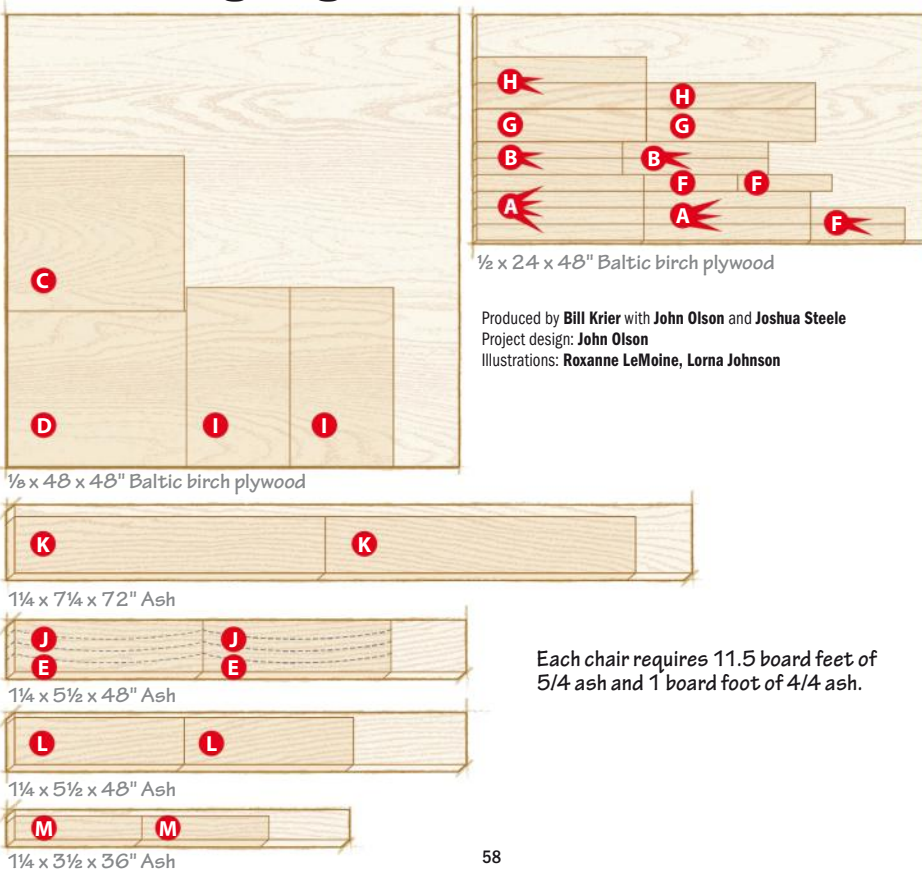
4 Fill the counterbores with matching plugs and trim them flush after the glue dries. On the top corners of the front and back legs, file and sand round-overs that blend with the curves of the seat and back. Ease any sharp edges with 180-grit sandpaper. Set the chair on a flat surface such as a tablesaw top. If the chair teeters, saw or sand material from the end of the leg that's too long.

5 Sand the entire chair to 220 grit. Be careful not to sand through the plywood veneer. When choosing a finish, be aware that oil-based varnishes and polyurethanes will yellow the light-colored wood. We applied lacquer for its clarity. 🌲



R Check the back's fit. If it's too wide, trim to size and attach it with screws. If it's too narrow, remove the seat screws, screw the back to the legs, and trim the seat.

Chair Cutting Diagram



Materials List—Chair

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
Seat					
A	arched supports	½"	1¾"	17¾"	BBP 7
B	straight supports	½"	1¾"	15½"	BBP 4
C*	lower skin	⅛"	15½"	17¾"	BBP 1
D*	upper skin	⅛"	15½"	18"	BBP 1
E*	seat trim	1¼"	2"	17¾"	A 2
Back					
F*	vertical supports	½"	1¾"	10"	BBP 4
G	outer horizontal supports	½"	2¾"	17¾"	BBP 2
H	inner horizontal supports	½"	3½"	17¾"	BBP 3
I*	front/back skins	⅛"	18"	10"	BBP 2
J*	back trim	1¼"	2¾"	17¾"	A 2
Legs					
K*	back legs	1¼"	5½"	32"	A 2
L*	front legs	1¼"	4¼"	18"	A 2
M	side rails	1¼"	2½"	13½"	A 2

*Parts initially cut oversize. See the instructions.

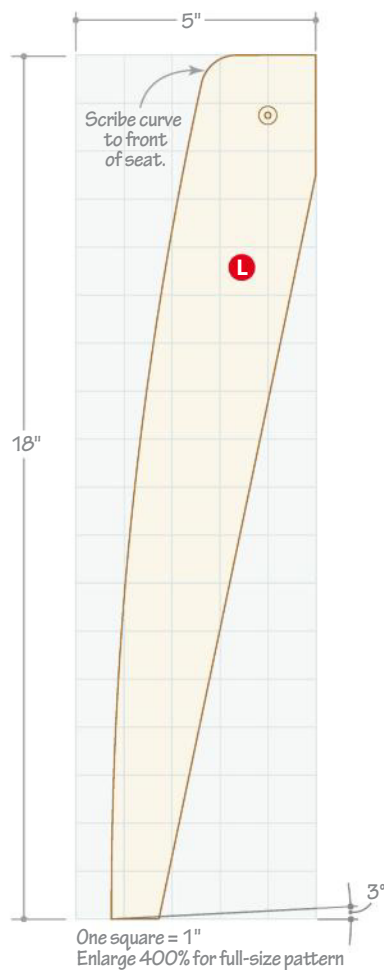
Materials key: BBP—Baltic birch plywood, A—ash.

Supplies: 1 1/4" pocket screws (8), #8x2" flathead screws (12), 1/8" dowel rod 36" long.

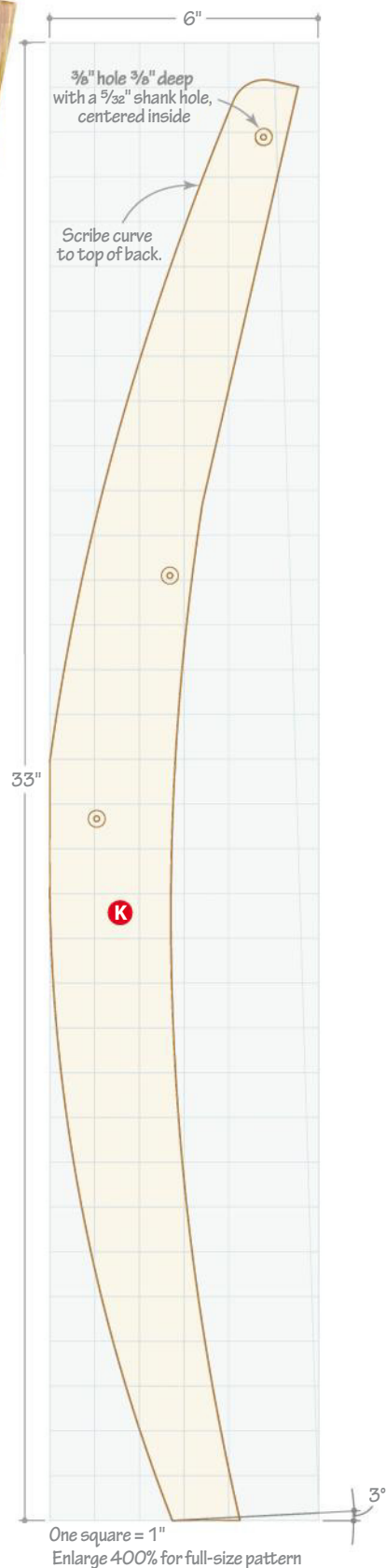
Blade and bits: Dado set, 3/4" round-over router bit, 3/8" plug cutter.



Download the patterns
for this project.
woodmagazine.com/244patterns



FRONT LEG GRIDDED PATTERN



BACK LEG GRIDDED PATTERN



Try your hand at bending solid African mahogany to form the strong, gracefully arced legs.

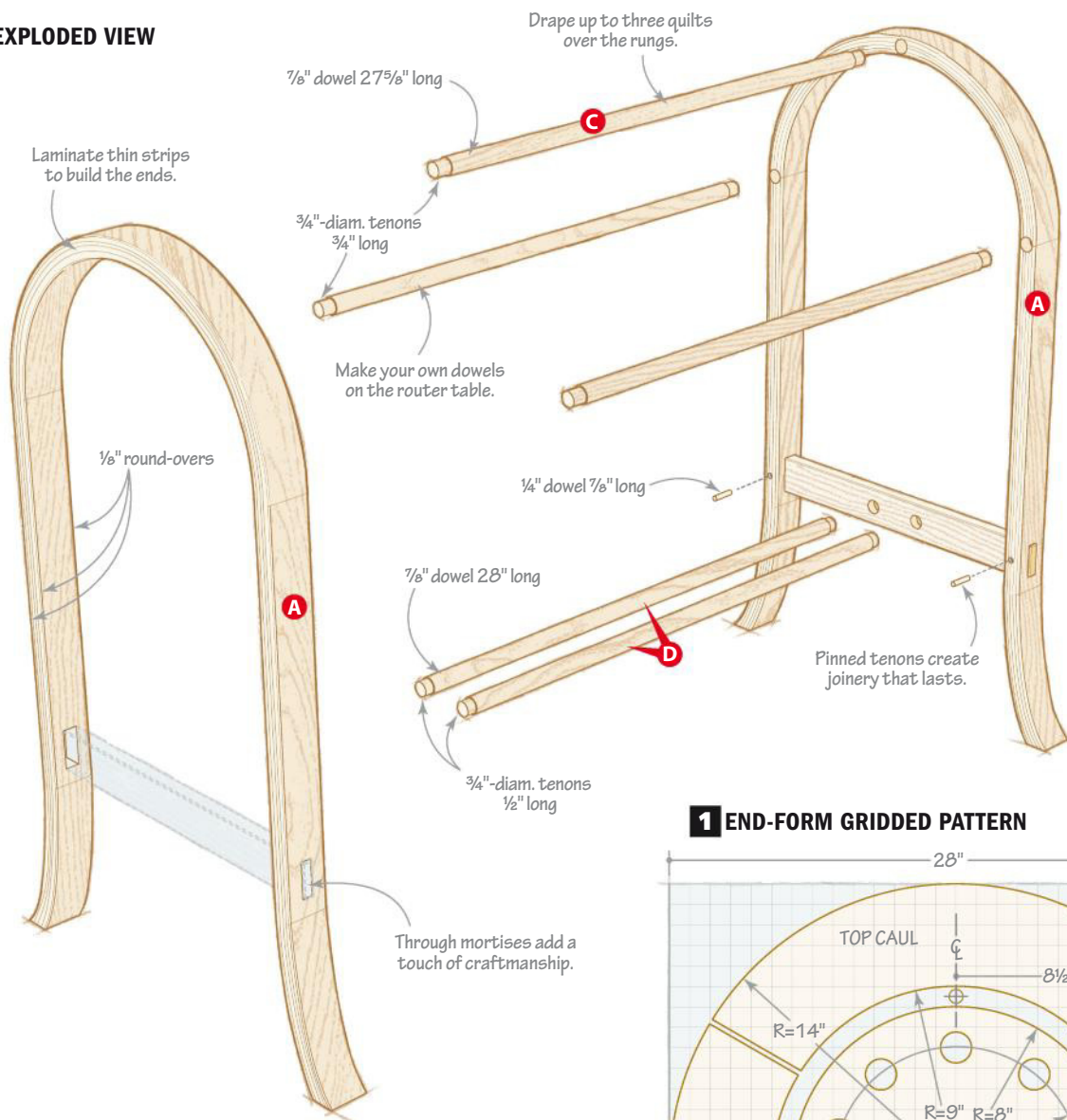
Curvaceous Quilt Rack

D I M E N S I O N S
36" H x 22½" D x 29½" W

Approximate materials cost:
\$55

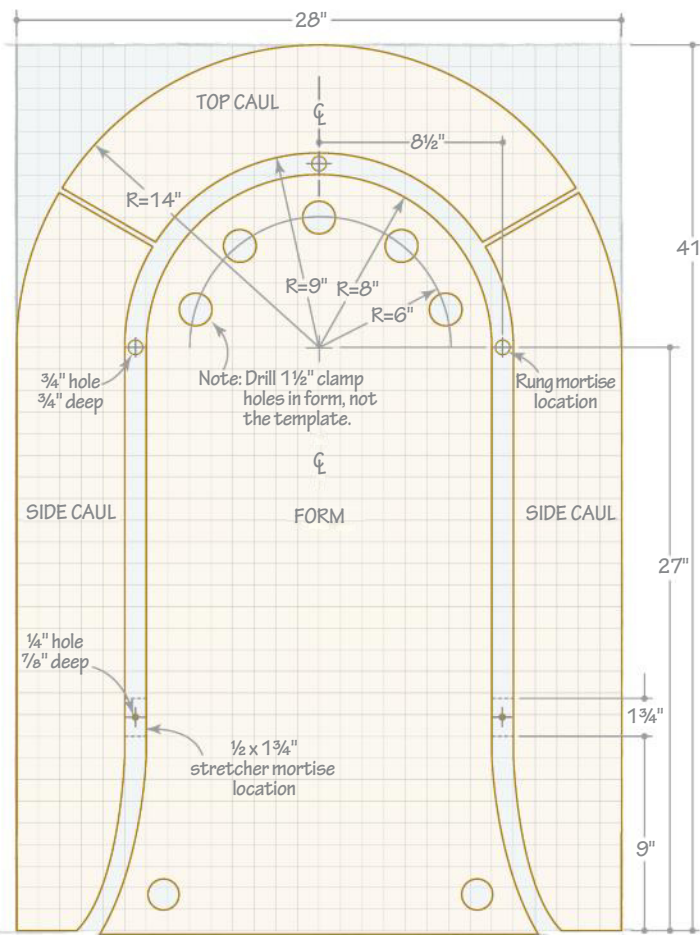
26⅞"
between ends

EXPLODED VIEW



► Watch a video of routing the form to shape.
woodmagazine.com/quiltform

1 END-FORM GRIDDED PATTERN



Start with a form

1 Cut three 28×41" pieces of 3/4" MDF. On one, lay out the 14" caul radius and the 6" radius for the clamp holes [Drawing 1]. Laminate the MDF, with the layout lines on top, keeping the edges flush.

2 Make a 1/4" hardboard template of the form (not the cauls) and screw the template to the MDF lamination flush at the bottom and centered side-to-side. Install a 1 3/8"-OD guide bushing and 3/4" straight bit in your router. Rout around the template in successively deeper passes to separate the form from the blank.

3 Remove the bushing, install a pattern bit, and rout the form flush with the template.

4 Cut apart the cauls and cut them to shape [Drawing 1]. Remove the template and drill the clamp holes in the form. Apply clear

► Purchase the router bits needed for this project.
woodmagazine.com/244bits

Tip! If your pattern bit isn't long enough, rout as deep as possible, then flip the form, and use a flush-trim bit to complete the work.



► Watch a video of this glue-up.
woodmagazine.com/quiltglueup

A

Roll out the bead of glue with a disposable roller. Cover the surface completely, and don't worry about squeeze-out. It gets cleaned up later.

► Each end (A) requires eleven strips. The extras are in case one breaks or cracks.

Tip! To avoid problems at glue-up, practice clamping unglued strips in the form.

► Liquid hide glue provides up to 20 minutes of open time, allowing you to coat, assemble, and clamp the stack before the glue sets. You'll still need to work quickly.
woodmagazine.com/liquidhideglue

packing tape to the mating faces of the form and cauls to prevent the laminations from sticking later.

5 Draw on the centerlines and lay out on the form the locations of the mortises [Drawing 1].

Strip it down and glue it up

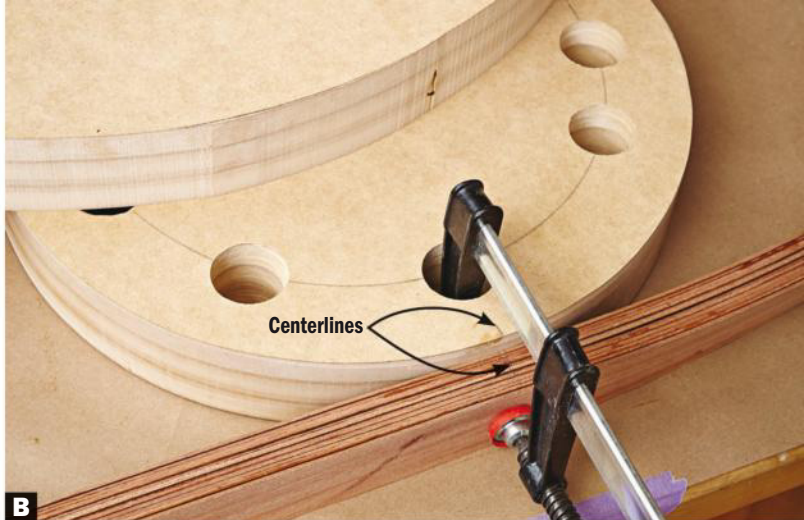
1 From 8/4 stock, mill 24 strips $\frac{3}{32} \times 88"$. Keep them in sequential order for the most seamless glue-up.

2 Cover your benchtop with paper to prevent gluing the laminations to the bench. Apply a bead of liquid hide glue down the center of a strip [Photo A]. Stack another strip on top of it and repeat the process, keeping the ends and edges as flush as possible, until you've stacked eleven strips. Mark the centerline of the length on the edge of the stack; then follow the steps in Photos B-F.

3 After the glue dries, smooth the top edge of the lamination using a dado clean-out bit [Photo G].

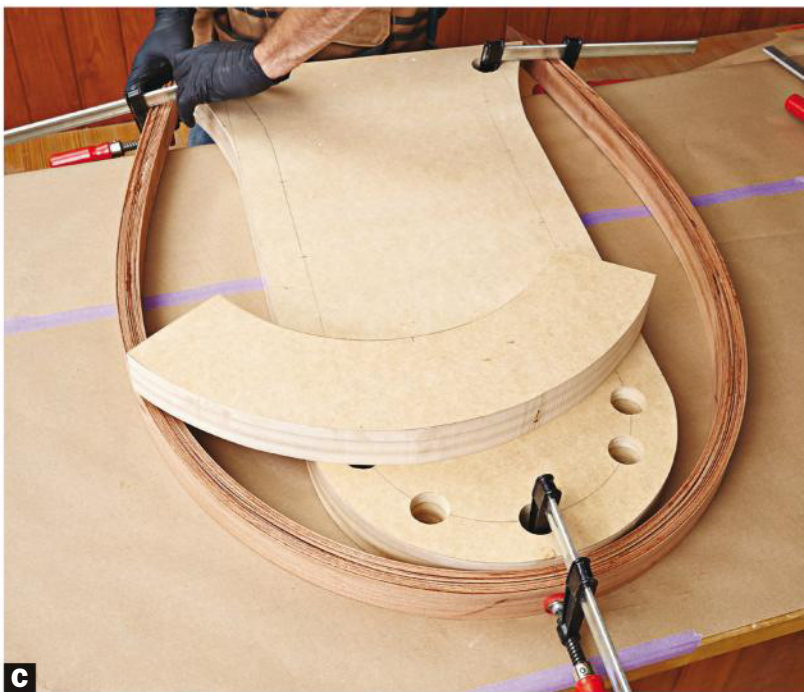
4 Flip the assembly over, loosen the clamps and push the trimmed edge of the end (A) flush with the top (now bottom) of the form. Reclamp, and trim the exposed edge to bring the end to finished width. Cut the ends to length [Photo H].

5 Transfer the layout lines for the mortises to the end (A). Then repeat Steps 2-5 to create the second end.



B

Align the centerlines of the stack and the form and clamp the stack in place temporarily. If needed, use a mallet and a piece of scrap to tap the edges of the strips flush.



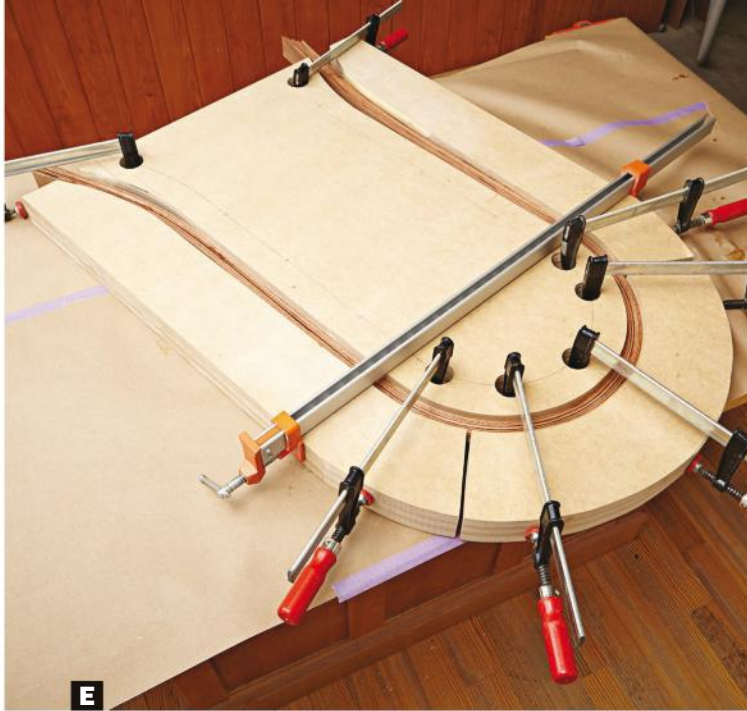
C

Loosely clamp the ends to the form. Again, keep the edges of the strips flush.



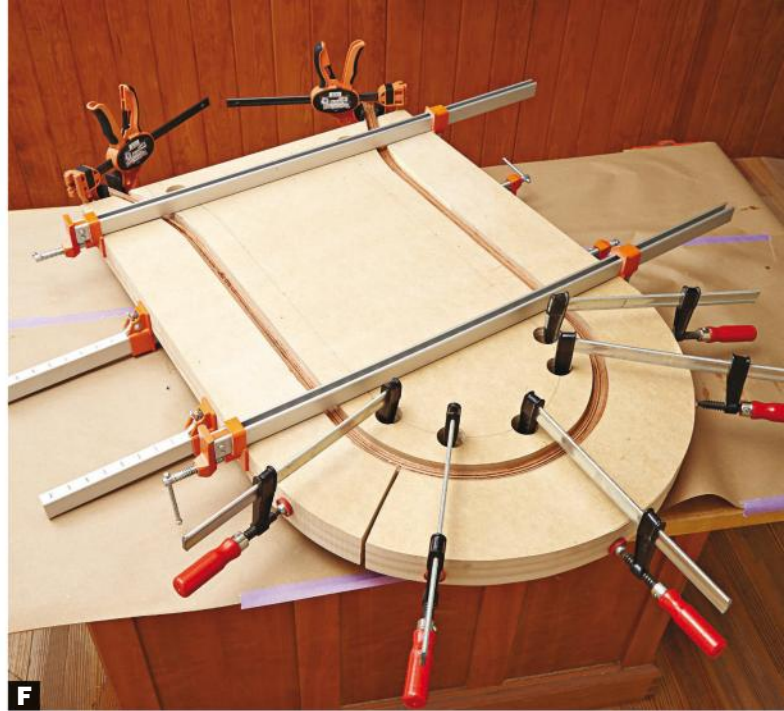
D

Squeeze the strips with the top caul. Apply the center clamp first, then add two more clamps. Note: Keep the faces of the cauls and the form flush as you work to enable cleaning up the edges later [Photo G].



E

Secure the side cauls using F-style clamps. Then, add a long bar clamp toward the top of the side cauls.



F

Add more long bar clamps as needed, alternating them on the top and bottom faces. Clamp the tails of the laminations that extend beyond the form. Allow the glue to dry overnight.



G

Set the bit to remove about $\frac{1}{16}$ " of the end (A). The bit's bearing rides against the form. Remove a few clamps at a time, trim the edge, then reinstall the clamps. Readjust the bit as needed for further clean-up.



H

Guide a handsaw along the end of the form and side cauls to trim the laminated ends.

A note for the quilters

The quilt displayed on the rack in the photo on page 60 and at right is called *Regimental Stars* by quiltmaker Janelle Swenson. It was featured in our sister publication, *Quilt Lover's Favorites*, Volume 14. You can purchase the pattern for the quilt at apqshop.com.





I Drill centered through-mortises at the drill press, using a 1/2" Forstner bit. Then square up each mortise with a chisel. Switch to a 3/4" Forstner bit to drill the rung mortises.



J Leave a short length unrouted at each end of the rung blank to prevent it from rolling. Cut away the square portions when cutting the rungs to length.

On to the joinery

1 Transfer the stretcher mortise locations to the inside faces of the ends (A). Form the mortises for the stretchers (B) and rungs (C, D) [Photo I].

2 Cut the stretchers (B) to size [Drawing 2], form the tenons, and drill the holes. Round over the stretcher edges, and the ends of the tenons. Finish-sand the stretchers.

3 For the rungs (C, D), mill five 7/8x7/8x30" blanks. Rout 1/16" round-overs on all four edges [Photo J]. Cut the rungs to length [Exploded View] and sand them to blend the round-overs.

4 Form tenons on the rungs [Photo K]. Note that the tenons on the lower rungs (D) are shorter than those on the upper rungs (C) [Exploded View].

5 Assemble the quilt rack by gluing the stretchers in place. Drill a stopped hole into each tenon, and glue in a 1/4" dowel [Drawing 1, Exploded View]. Allow the glue to dry. Sand the dowels flush.

6 Glue all five rungs to one end/stretcher assembly, then add the remaining end and clamp across the assembly. Stand the rack on a flat surface to check for twist.

7 Apply a film-forming finish, such as polyurethane or lacquer, buffing lightly between coats with a 320-grit sanding sponge. Allow the finish to cure fully before draping quilts over the rungs. 🌳

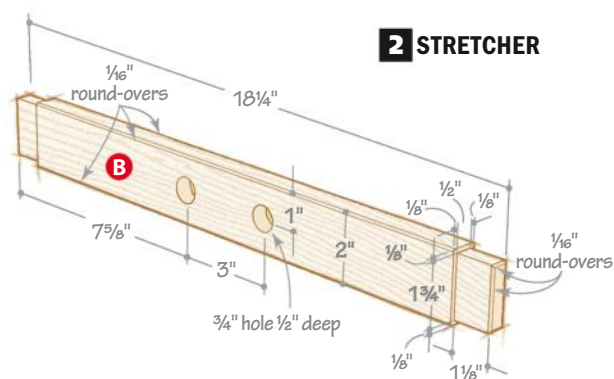
Tip! Don't have a 7/16" round-over bit? Use a 1/2" bit, raised 7/16" above the router table. Then sand away the flat areas between adjacent round-overs.

Tip! To prevent glue showing on the tenon's exposed end, apply glue only to the tenon, keeping it at least 3/16" from the end.

Tip! Make your own mahogany dowel stock using the same method as for the rungs, and a 1/8" round-over bit.



K Raise the blade 1/16" above the table, push the rung over the blade's highest point, and rotate the rung. Repeat, working your way out to create the tenon.



Cutting Diagram



1 3/4 x 5 1/2 x 96" Mahogany *Plane or resaw to the thicknesses listed in the Material List.



1 x 5 1/2 x 60" Mahogany

Produced by **Craig Rueggesser**
with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine,**
Lorna Johnson

Materials List

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* ends	1"	1 5/8"	82 1/4"	LM	2
B stretchers	3/4"	2"	18 1/4"	M	2
C* upper rungs	7/8" diam.		27 5/8"	M	3
D* lower rungs	7/8" diam.		28"	M	2

*Parts initially cut oversize. See the instructions.

Materials key: LM—laminated mahogany, M—mahogany.

Bits: 3/4" straight, pattern, flush-trim, dado clean-out router bits; 1/2", 3/4" Forstner bits; 1 1/2" Forstner or spade bit.

Supplies on Demand:

Get liquid hide glue. woodmagazine.com/liquidhide

Purchase pattern, flush-trim, and dado clean-out router bits.

woodmagazine.com/244bits

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Idea Shop 6:

Dust Collection and What's Next

Just two paychecks remain in outfitting a fully functional Idea Shop 6. But as this series wraps up, know that your workshop will continue to improve, as will your skills. To that end, we conclude with a list of additional tool purchases you may want to consider as your budget and space allow.

► Watch a video of the shop growing, updated with each paycheck.
woodmagazine.com/is6progress



Learn through this series of Idea Shop 6 articles how to set up a shop by working within a budget of \$150 every two weeks over 26 pay periods. Coinciding with each paycheck, we provide online a collection of related articles, plans, and videos. To get an e-mail reminder of that posting, sign up for our newsletter at woodmagazine.com/newsletter. The first article in this series appeared in WOOD® 238 (March 2016). Catch up with previous installments at woodmagazine.com/ideashop6.



► Find free plans for all the jigs and fixtures shown in Idea Shop 6. woodmagazine.com/ideashop6

Paycheck 25

This check and a bit of savings purchase the materials to build an upgraded router table that provides a more stable worksurface, an improved fence, better dust collection, and integrated storage. By mounting the router to an insert plate recessed in the tabletop, it's easier to remove the router for bit changes and height adjustments—or even for a quick handheld task. Hang on to your portable, sawhorse-straddling router table built with paycheck 7; it serves well when you need to work away from the shop.

An improved router table eases your work. You'll love the more comfortable working height, as well as having bits, wrenches, push pads, and other accessories at your fingertips.



Paycheck 26

The final budgeted purchases for your shop help control dust, keeping your shop cleaner, and reducing the health risks of airborne particles. A 1-hp dust collector hooked to a 4"-diameter hose provides far more airflow than a shop vacuum, and maintains airflow even as the bottom bag fills with chips. This unit will handle all the dust generated by your tablesaw, jointer, planer, and router table. An expandable flex hose and a selection of attachments allow you to connect the dust collector to whatever machine you are using.

Moving more air moves more chips. A dust collector does that by spinning an impeller (9" in diameter on this model) with an induction motor. Learn more at woodmagazine.com/choosedc.



Are you connected? A flex hose attaches to a quick-fit attachment secured to the dust port of each machine. Reducers allow you to use the dust collector on tools with smaller ports, such as the router table or thickness planer.

Now, keep growing

As you're certainly aware, plenty more tools could be part of a woodshop. Fortunately, if you maintain this budget-oriented approach, you can continue adding new machines and accessories. The type of work you choose to do will help determine which tools to buy, or which tools to upgrade. Consider adding these items to your shop. Then, enjoy a lifetime of woodworking! 🌲

Produced by **Craig Ruegsegger** with **Lucas Peters**



Air compressor A blast of air will clear away dust and debris. Add a brad nailer for quick assembly of project parts.



Low-angle block plane Use it to fine-tune part dimensions, cut chamfers, smooth joint lines, and remove tool marks.



Bandsaw With a narrow blade, it cuts curves. Change to a wider, stiffer blade and use it to resaw boards into thinner workpieces. It can rip stock, too.



Drill press This helps you drill holes accurately, and can also be outfitted with a drum sander or mortising attachment.



Miter saw You'll find this tool especially useful for crosscutting stock to rough length, and for cutting miters and bevels on boards too long to handle on the tablesaw.

► Find more information about all of these tool choices.
woodmagazine.com/ideashop6



More clamps By now, you know the importance of clamps and that you can never have too many. Add more bar clamps as needed and F-clamps (right) in 6", 12", and 18" lengths. A half-dozen handscrews (above) of differing sizes will come in handy, too.



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Model	10" Swing Variable Speed	12" Swing Variable Speed
Belt Positions	2 positions	2 positions
Speeds	Variable 400-1400 1000-3800 RPM	Variable 400-1400 1000-3800 RPM
Headstock Between Centers	1" x 8tpi, #2MT 18"	1" x 8tpi, #2MT 18"
Weight	82 lbs.	106 lbs.
Footprint	31" x 7-1/4"	31" x 9-1/2"
INCLUDED WITH LATHE PURCHASE		
Toolrest(s)	6" toolrest	6" & 12" toolrests
Faceplate	3" faceplate	3" faceplate
#2 Spur Center	included	included
Heavy-duty Tailstock Center	included	included

	10" Swing Variable Speed			12" Swing Variable Speed		
	Lathe Only \$369. ⁹⁵	Basic Starter Set \$419. ⁶⁵	Advanced Starter Set \$669. ⁸⁵	Lathe Only \$469. ⁹⁵	Basic Starter Set \$539. ⁶⁵	Advanced Starter Set \$757. ⁸⁵
UPS Shipping Cost	\$50	\$58	\$60	\$55	\$65	\$65
Item #	#KWL-10VS	#KWL-10SSB	#KWL-10SSA	#KWL-1218VS	#KWL-12SSB	#KWL-12SSA
Lathe	✓	✓	✓	✓	✓	✓
Slimline Pen Kits		5 (24 kt Gold)	20 (Variety)		5 (24kt Gold)	20 (variety)
Slimline Pencil Kits		5 (24 kt Gold)	20 (Variety)		5 (24kt Gold)	20 (variety)
Pen Mandrel		✓	✓		✓	✓
Mandrel Wrench			✓			✓
3pc Carbon Steel Chisels		✓			✓	
Mini Pen Blank Mix		✓ (Makes 10 kits)	✓ (Makes 40 kits)		✓ (Makes 10 kits)	✓ (Makes 40 kits)
Mid Cure Epoxy Glue		✓	✓		✓	✓
7mm Barrel Trimmer		✓	✓		✓	✓
Tube Insertion Tool			✓			✓
Shellawax Creame		✓ (30ML)	✓ (250ML)		✓ (30ML)	✓ (250ML)
Pen Assembly Press			✓			✓
Pen Making DVD		✓	✓		✓	✓

SHOP TEST: 18- to 20-volt Drill/Drivers



Ridgid R86009K, \$160
866-539-1710,
ridgidpowertools.com

Milwaukee 2606-22CT, \$180
800-729-3878, milwaukeetool.com



DeWalt DCD780C2, \$180
800-433-9258, dewalt.com



Bosch DDS181A-02, \$170
877-267-2499, boschtools.com



Porter-Cable PCK600LB, \$130
800-544-6986, portercable.com

Today's battery-powered drill/drivers pack more capability into smaller packages than ever before. The compact tools we tested for this review weigh the same or less than a 12-volt drill from a decade ago. Yet despite their small sizes, these drills deliver surprising power and run time.

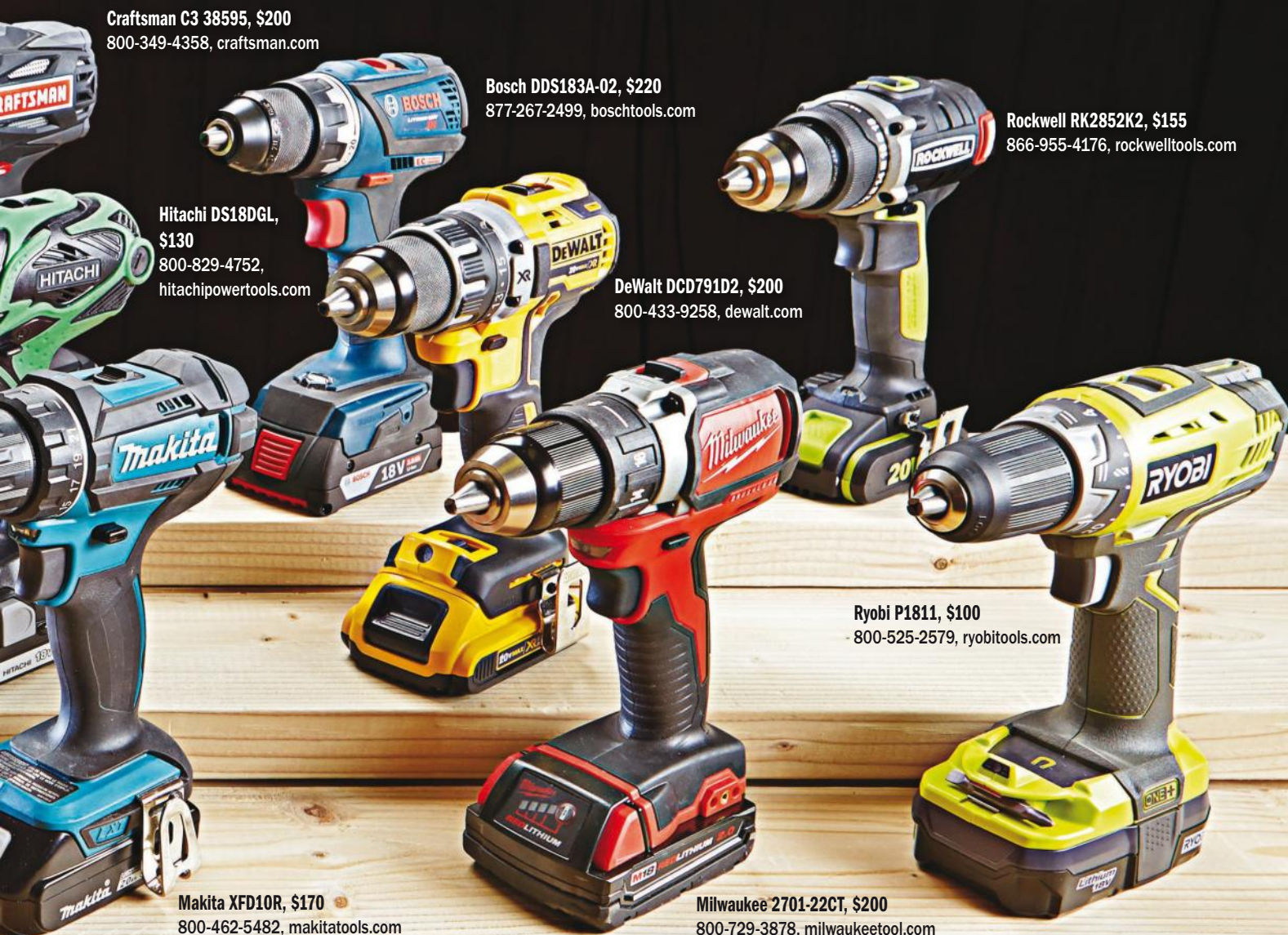
Although all of the tested drills are rated from 18 to 20 volts, all 13 pack essentially the same voltage. Here's why. Each drill comes with a compact battery pack containing five 3.6-volt lithium-ion cells, working together to generate 18 volts. Some manufacturers claim up to a 20-volt power rating

(albeit brief) for fully charged packs, but they all agree the nominal voltage is 18. So despite the marketing one-upsmanship, all of these drills operate on the same "apples to apples" playing field. With that said, let's find out which models fared best.

Torque twisters

A battery pack's voltage refers to its capacity to deliver power to the motor. But torque measures the drill's power where it really counts: at the chuck. We tested each model for its ability to drive progressively larger lag screws in pressure-treated 4x4s in low gear.

► Read reviews of other drills and cordless tools.
reviewatool.com/cordless



All the drills fully seated a ½×3" lag screw, but the Makita and both Milwaukee drills went a step further and stripped out the wood with the lags. Bottom line: Each of the drills has excellent torque.

Run, baby, run

To determine how much work each drill could achieve on a fully charged battery, we drilled 1" holes in pressure-treated 2×6s, averaging the results of four tests. The Craftsman drill topped this test with an average of 79 holes per charge. The Ryobi drilled the fewest (30), but that's still more

▶ A typical cordless drill motor uses replaceable carbon brushes to convert the battery's electrical energy into motor rotation. A brushless drill instead uses direct electronic energy to spin the motor.

Cordless-tool batteries 101

Lithium-ion (Li-Ion) technology has supplanted nickel cadmium (Ni-Cd) and nickel metal hydride (Ni-MH) for today's cordless tools. This lighter-weight chemistry typically delivers the same power, longer run times, faster charges, and the ability to hold a charge longer when sitting idle for a month or more. To better understand voltage and amp-hours, think in terms of a car: The engine equates to voltage (power), while the gas tank equates to run time. The bigger the tank (more amp-hours), the longer the run time, when battery cells are comparable.



Get a quick read on a battery's charge level by pressing the indicator button. The Milwaukee battery shown here has about three-quarters of a charge remaining.



Light 'em up! The LED on DeWalt's brushless drill (DCD791D2) floods the work area with bright, shadow-free light. And it has a slide switch with three brightness levels—very handy.

than adequate run time for a workshop drill. The six drills with brushless motors (see the chart on the *next page*) tended to have slightly greater torque and markedly longer run time than most carbon-brushed drills, sometimes despite lower amp-hour ratings.

All the drills we tested come with battery packs measuring from 1.3 to 2.0 amp-hours, a rating of run time. You can buy packs with higher amp-hour ratings if you desire longer run time per charge. In woodworking, you'll seldom use up a battery's charge before the other pack has charged. (The Craftsman drill, though, comes with just one battery pack.) Four models recharged their battery packs in 37 minutes or less: Craftsman, Makita, Milwaukee 2606-22CT, and Porter-Cable. The others required between 40 and 65 minutes.

We like drills or battery packs with charge-level indicators that let you know whether to swap out packs before starting a job (or climbing up a ladder or into a crawlspace). And of those, we prefer indicators located on the battery pack (*above*), so you can check the charge level without putting it on the drill (as with the Porter-Cable).

Craftsman's indicator light displays only green (charge remaining, but no indication of how much) or red (dead) when pressed. The DeWalt DCD780C2, Hitachi, and Ryobi have no charge indicators.

Feel and control matter

► **Ergonomics.** A drill should fit comfortably in your hand, but "feel" is subjective, based on hand size. Drills with battery packs that slide-mount horizontally have slimmer grips than those with stem-type packs that fit vertically into the handle (Craftsman and Ryobi). So if you have small hands, opt for a drill with slide-mount batteries. The Craftsman, tallest and heaviest in the test, felt bulky and unbalanced compared to the others. And the many squared-off edges and touch points on the Porter-Cable made it uncomfortable and awkward in use.

► **Chuck.** All the drills have a three-jaw metal chuck capable of holding up to a ½"-diameter bit. Although we experienced no bit slippage with any of the chucks, we liked the Bosch, DeWalt, Makita, and Milwaukee chucks just slightly better than the others for quicker operation and locking.

► **Clutch.** Each drill uses a built-in clutch to avoid stripping out or breaking off screws. We did not detect much difference between the many middle levels with these clutches, but did with the low-number settings. The DeWalt, Ridgid (with 100 settings!), and Ryobi clutches worked best when driving small brass screws, which can break off easily. But the Milwaukee brushless drill (2701-22CT) generated too much torque at its lowest clutch setting, regularly breaking off small brass screws.

► **Controls.** Most of the drills have triggers that you can finger-control easily (called feathering). The others, while still good, proved just a little stiffer to pull; same with the forward/reverse switches. Each drill has a speed-selector switch on top, and all worked fine except for the stiff slides on the DeWalt models.

► **Lights.** Each drill has a built-in LED work light. Those with lights mounted just above the battery mount (*above*) brighten the area where you're drilling or driving screws better than those mounted below the clutch.

Produced by **Bob Hunter** with **Doug Ley** and **Tom Brumback**

Compact cordless drill/drivers pack a punch

MODEL	PERFORMANCE RATINGS (1)									MOTOR		BATTERY PACKS				NUMBER OF CLUTCH SETTINGS	NUMBER OF DRIVER BITS INCLUDED	LEFT/RIGHT BELT HOOK? (YES, NO)	TYPE OF CASE (4)	WEIGHT WITH BATTERY PACK, LBS-OZ	WARRANTY, YEARS (5)		COUNTRY OF ASSEMBLY (6)	PRICE OF REPLACEMENT BATTERY PACK (7)	DRILL KIT PRICE (7)
	PRIMARY		SECONDARY							TYPE (2)	SPEED RANGES (0-MAX, RPM)	RATED VOLTAGE	AMP-HOUR RATING	CHARGE-LEVEL INDICATOR? (YES, NO)	MOUNTING STYLE (3)						TOOL	BATTERY PACKS			
	TORQUE	RUN TIME PER CHARGE	BATTERY CHARGE TIME, MINUTES	OVERALL FEEL AND BALANCE	EASE OF USE																				
					CHUCK	CLUTCH	POWER SWITCH	FORWARD/REVERSE SWITCH	SPEED-RANGE SELECTOR																
BOSCH DDS181A-02	A-	A-	65	A	A	B	A	A	A	C	500/1,900	18	2.0	Y	S	20	1	Y	C	3-7	1	1	M	\$70	\$180
BOSCH DDS183-02	A-	A-	61	A	A	B	A	A	A	B	600/1,900	18	2.0	Y	S	20	4	N	C	3-5	1	1	M	\$70	\$200
CRAFTSMAN C3 38595	A-	A	36	C	A-	B	B	B	B	B	470/1,800	19.2	2.0	Y	V	22	1	N	C	4-5	1	1	C	\$49	\$200
DEWALT DCD780C2	A-	B-	45	B+	A	A	A	A	C	C	600/2,000	20	1.5	N	S	15	0	Y	P	3-7	3	2	U	\$80	\$180
DEWALT DCD791D2	A-	A-	53	A	A	A	A	A	C	B	550/2,000	20	2.0	Y	S	15	0	Y	P	3-6	3	2	X	\$90	\$200
HITACHI DS18DGL	A-	B	60	A-	A-	B	B	B-	B	C	450/1,250	18	1.3	N	S	22	1	N	P	3-7	L*	2	C	\$69†	\$130
MAKITA XFD10R	A	A-	35	A	A	B	B	A	A	C	600/1,900	18	2.0	Y	S	21	0	Y	P	3-6	3	3	C	\$80	\$170
MILWAUKEE 2606-22CT	A	B	32	A-	A	B	A	A	B	C	400/1,800	18	1.5	Y	S	17	0	N	P	3-13	5	2	C	\$70	\$180
MILWAUKEE 2701-22CT	A	A-	41	A-	A	C	A	A	B	B	450/1,800	18	2.0	Y	S	18	0	N	P	3-12	5	2	C	\$80	\$200
PORTER-CABLE PCCK600LB	A-	B	37	C+	A-	B	B	A-	B-	C	400/1,600	20	1.5	Y	S	23	1	Y	C	3-9	3	2	C	\$70	\$150
RIDGID R86009K	A-	B+	54	B	A	A	A	A	B-	B	500/1,850	18	2.0	Y	S	100	1	Y	C	3-15	3**	L*	C	\$70	\$160
ROCKWELL RK2852K2	A-	A	62	B	A	B	B	B+	B	B	600/2,000	20	2.0	Y	S	19	1	Y	C	3-7	3	20*	C	\$60	\$155
RYOBI P1811	A-	C	54	B-	A-	A	A	A-	A	C	440/1,660	18	1.5	N	V	23	1	N	C	3-10	3	3	C	\$40	\$100

1. **A** Excellent **B** Good **C** Fair
 2. (B) Brushless (C) Carbon-brushed
 3. (S) Horizontal slide onto handle base (V) Vertical stem inside handle
 4. (C) Canvas bag (P) Plastic case
 5. (L*) Lifetime upon registration (20*) Upon registration (***) Lifetime service agreement upon registration
 6. (C) China (M) Malaysia (U) United States (X) Mexico
 7. Prices current at time of article production and do not include shipping, where applicable. (†) 1.5 amp-hour pack

The one to buy

Although any of the drills would make a good tool for your workshop or home, one stood out from the field: the Makita XFD10R, our Top Tool. This drill earned excellent scores in torque, run time, charge time, and overall feel and balance, beating out six brushless drills in areas where that technology usually prevails.

For the Top Value award, it was tempting to go with one of the lower-priced models. But in the end, we agreed that the free replacement batteries offered by the Ridgid R86009K for life and the Rockwell RK2852K2 (20 years) represent true value. (Both models require online registration to qualify for these programs.)



Modern Wall Shelf

Here's a true weekend project: Build it on Saturday, apply finish on Sunday, and present it on Monday. Done!



D I M E N S I O N S :
33 3/4" W x 9 1/2" D x 20 1/4" H

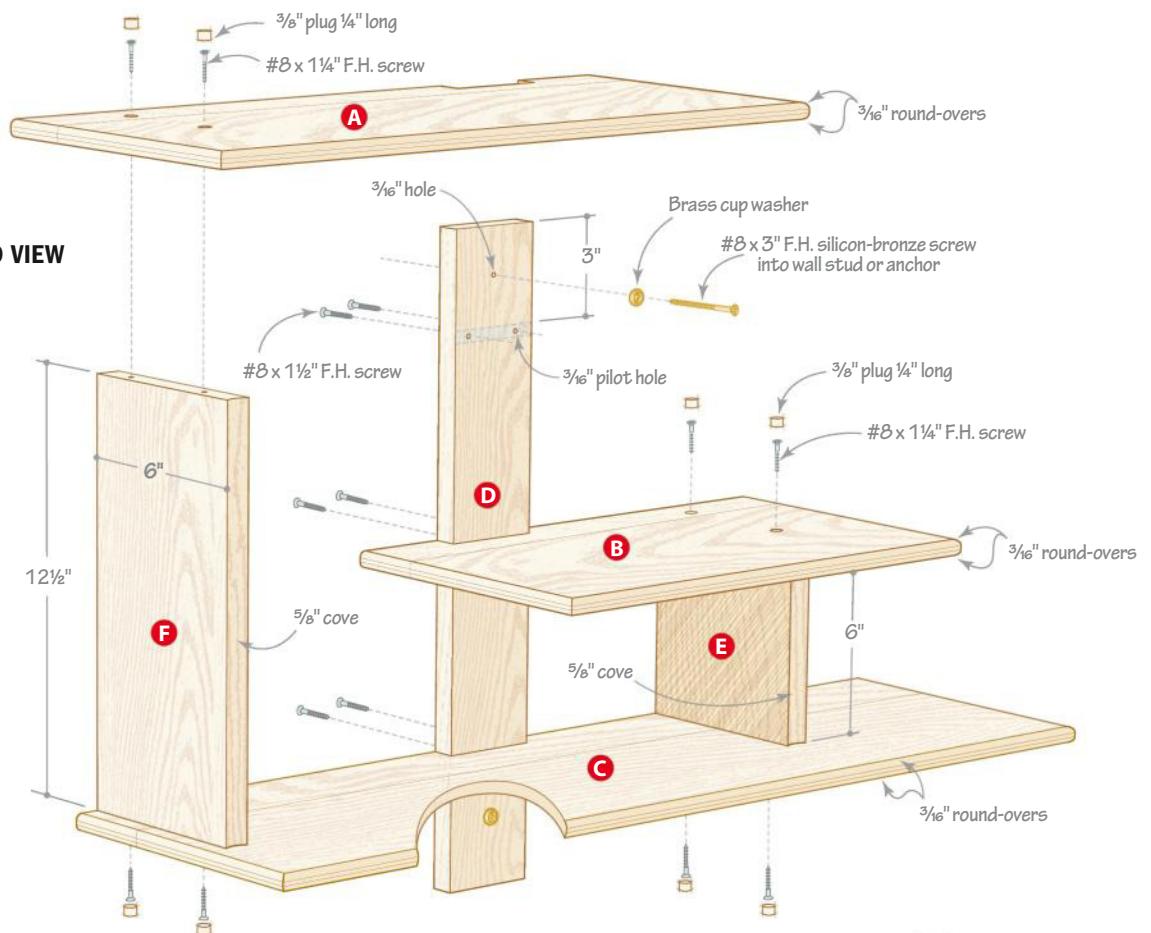
Approximate materials cost:

\$30

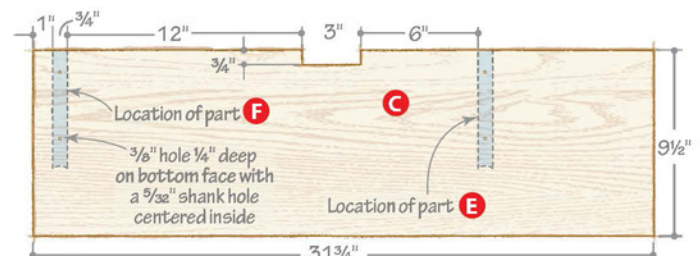
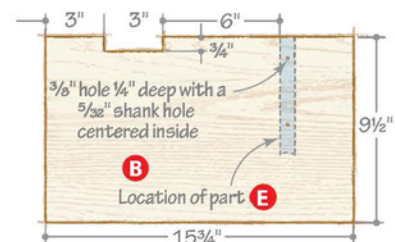
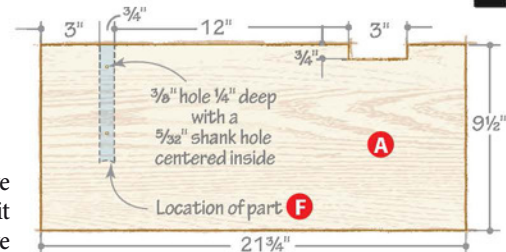
16

screws and two
cup washers
only required
hardware.

EXPLODED VIEW



1 SHELVES (Top view)



Tip! To minimize warping, glue up the shelves from at least three boards. As much as possible, match the grain and color of the boards in each shelf.

First, cut all parts

We planed the shelf stock to 1/2" thick to give the piece a lighter look, but you could build it entirely from 3/4" material if you don't have access to a thickness planer.

1 Glue up oversize blanks and cut to final size the shelves (A–C) [Materials List]. Rout round-overs on the ends and front edge of each shelf [Exploded View]. Finish-sand them to 150 grit if you will be clear-finishing the project, or to 220 grit if you plan to stain it.

2 Cut the spine (D) to finished size. Drill centered holes 1 1/2" from both ends of the spine [Exploded View]. Finish-sand the spine.

3 On the back edge of each shelf mark the center of its notch [Drawing 1]. Stack the shelves, aligning the marks. Clamp the stack together along the front edges.

4 Center the spine on the marked notches and scribe its width onto the shelf stack using a marking knife. Cut the notches [Photo A], staying just within the scribed marks, then test the fit of the spine in the notches. Take light cuts at the notch ends until the spine fits snugly.



A **Line 'em up and make the cut.** With a tall fence on your table saw's miter gauge, pass the clamped shelf stack repeatedly through the blade to cut a notch in each shelf.



B **A spacer and clamp ensure manageable and precise assembly** when attaching the middle shelf (B) and short side (E) to the C/D assembly.

5 Cut the sides (E, F) to size. Also cut a scrap-wood spacer matching the length of the short side (E). On the front edges of both sides rout a cove [Drawing 2]. Finish-sand the sides.

Put it all together

1 Mark $3\frac{3}{4}$ " up from the bottom of the spine, align that mark with the bottom of the bottom shelf (C), and fit the two pieces together. Secure the bottom shelf with countersunk screws [Exploded View].

2 Screw the short side (E) to the middle shelf [Photo B, Exploded View, Drawing 1]. Then attach the spine to the middle shelf as done for the bottom shelf.

3 Now, screw the long side (F) to the bottom shelf (C) [Exploded View, Drawing 1]. Clamp and screw the top shelf (A) in position, again using the 6" spacer.

4 Cut eight $\frac{3}{8}$ " plugs matching the color and grain of the shelves. Glue the plugs into the counterbored holes, then saw and sand flush.

Final touches

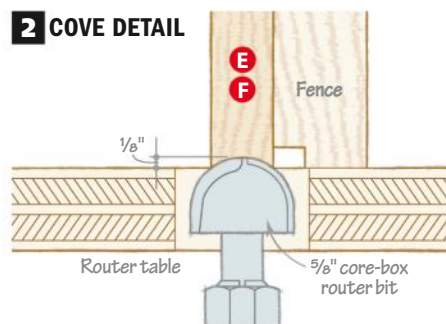
1 Apply a finish of your choice. Our walnut didn't require a stain, so we simply sprayed on three coats of aerosol lacquer.

2 With a level resting on the bottom shelf, install the unit using silicon-bronze screws and brass cup washers for a decorative effect [Exploded View]. Sink the screws into a wall stud or use hollow-wall fasteners rated for the loaded weight of the shelf. 🌳

Tip! Assemble this project on a dead-flat workbench or table saw top to ensure flush alignment and an assembly that rests flat against a wall.

► Learn to cut plugs flush without marring.
woodmagazine.com/flushplugs

2 COVE DETAIL



Tip! Use a featherboard to hold each side steady against the router-table fence. To ensure a centered cove, make a second pass with the opposite face against the fence.

Produced by **Bill Krier** with **Kent Welsh**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Materials List

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* top shelf	$\frac{1}{2}$ "	$9\frac{1}{2}$ "	$21\frac{3}{4}$ "	W	1
B* middle shelf	$\frac{1}{2}$ "	$9\frac{1}{2}$ "	$15\frac{3}{4}$ "	W	1
C* bottom shelf	$\frac{1}{2}$ "	$9\frac{1}{2}$ "	$31\frac{3}{4}$ "	W	1
D spine	$\frac{3}{4}$ "	3"	$20\frac{1}{4}$ "	W	1
E short side	$\frac{3}{4}$ "	6"	6"	W	1
F long side	$\frac{3}{4}$ "	6"	$12\frac{1}{2}$ "	W	1

*Parts initially cut oversize. See the instructions.

Material key: W=walnut.

Supplies: #8x1 $\frac{1}{4}$ " flathead screws (8), #8x1 $\frac{1}{2}$ " flathead screws (6), #8x3" silicon-bronze flathead screws (2), brass cup washers (2).

Bits: $\frac{5}{8}$ " core-box router bit, $\frac{3}{16}$ " round-over router bit, $\frac{3}{8}$ " counterboring drill bit, $\frac{3}{8}$ " plug cutter.

Source: Order the router and drill bits listed above at woodmagazine.com/244shelfbits.

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We like spokeshaves for shaping wood, especially curvy stuff, because when sharp and well-tuned, they cut fast and smooth. Having a couple with different cutting angles gives you more options for working different shapes and types of wood. We recommend these four spokeshaves.

Best for finish work Lie-Nielsen Boggs flat spokeshave, \$135

Lie-Nielsen Toolworks, no. 1-SP-Boggs-F, 800-327-2520, lie-nielsen.com

If you can get only one shave, buy this one. Designed in conjunction with renowned chairmaker Brian Boggs, this tool is superbly made, with no flaws or tooling marks, and smooth hickory handles. The sharp blade cut perfectly right out of the box, and held an edge well. The mouth around the blade is very tight: great for finishing cuts, but not for rough shaping. It does not have blade-adjustment screws, but we found it easy enough to set the cutting depth.

► Learn more about using spokeshaves and how to sharpen their blades.
woodmagazine.com/shaves



Best for fast material removal Veritas flat spokeshave, \$95

Lee Valley, no. 05P33.01, 800-871-8158, leevalley.com

With bubinga handles shaped similarly to those of the Lie-Nielsen, this shave handles and works nicely. The threaded adjusters make setting blade depth a cinch, and the 1"-wide sole provides a stable platform. The slightly wider mouth opening lets you take more aggressive cuts, and the reliefs cut into the corners prevent clogging. Included shims allow you to close up the mouth if need to make finer cuts or prevent tear-out.



Best for tight curves Woodjoy Razor's Edge spokeshave, \$115

Woodjoy Tools, 508-669-5245, woodjoytools.com

Our favorite low-angle shave, this mahogany "woody" is comfortable to hold and use. We found it easy to set blade depth and close up the opening as tight as desired. It's a simple design well executed, and it works really well, especially on end grain and tight inside curves.



A nod to the classics Pinnacle no. 151 spokeshave, \$105

Woodcraft, no. 152803, 800-225-1153, woodcraft.com

Woodcraft's tribute to the classic Stanley 151, this all-metal shave performs admirably. It needed little tuning up, except for sharpening. Setting blade depth can be finicky because the adjusters have three-quarters of a turn of backlash, but once set, it cut well.



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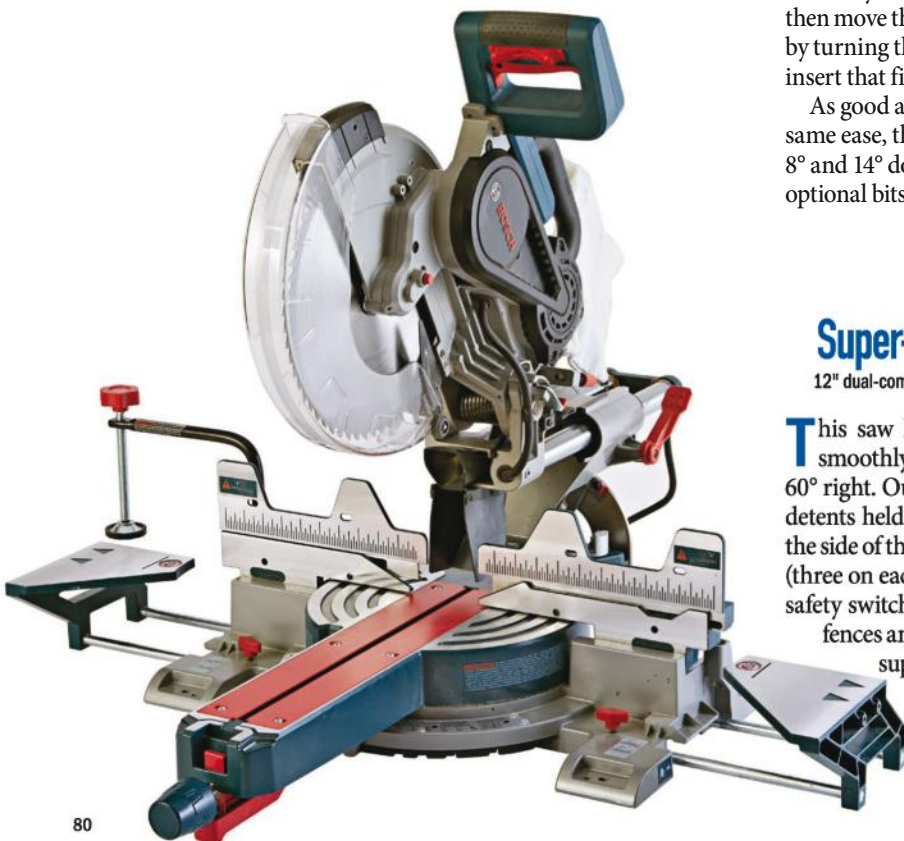
Turn half-blind dovetail cutting on its head

Router-table dovetail jig, no. RTJ400, \$359, 800-663-8932, leighjigs.com

I never knew routing half-blind dovetail joints could be this easy. All jigs I've used in the past required using a handheld router, to varying degrees of success and time required. Leigh's RTJ400 uses a single fixed-spacing template and clamping mechanism to hold the tail board vertically and pin board horizontally, offset by included spacers. You then move the jig over the bit to rout the joint. Adjust the joint tightness by turning the elliptical guide bushing slightly. (The jig requires a table insert that fits standard 1½" guide bushings.)

As good as the RTJ400 is with half-blinds, it also routs, with the same ease, through-dovetail joints and box joints. The jig comes with 8° and 14° dovetail bits and ⅜" and ½" straight bits. You can also buy optional bits to make different size joints.

—Tested by Pat Lowry



Super-smooth slider packed with features

12" dual-compound sliding mitersaw, no CM12SD, \$550, 877-267-2499, boschtools.com

This saw handles and cuts like a dream. It glides front to back smoothly on its rails, and rotates just as smoothly, from 52° left to 60° right. Out of the box, the saw's miter scale was spot-on, and all 10 detents held solidly without slop. I found the bevel lock, mounted to the side of the rear pivot, easy to engage, and the turret-style bevel stops (three on each side) handy and accurate. The handle has a two-trigger safety switch that's intuitive to use right- or left-handed. And the tall fences and table extensions slide in and out to maximize workpiece support and cutting angles. At 65 pounds, I wish it were lighter, but I'll gladly trade weight for its many features.

—Tested by Bob Baker

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Bare-bones planer for a bargain price

15" 3-hp planer, no. G0815, \$895

Grizzly's newest 15" planer, sold without a stand, sells for \$300 less than the next-closest-priced machine. At the two feed speeds of 16 and 30 feet per minute, the three-knife cutterhead makes 81 and 151 cuts per inch, respectively. The optional stand (no. T27650) sells for \$79.95.

800-523-4777, grizzly.com

Hitachi launches brad nailer kit

Brad nailer/compressor combo kit, no. KNT50AB, \$250

Hitachi's newest pneumatic combo kit combines a 6-gallon pancake-style air compressor with an 18-gauge brad nailer and 25' hose. The compressor's oil-free pump produces 2.8 cubic feet per minute of airflow at 90 psi, and the unit weighs just 36 pounds. The nailer, no. NT50AE2, has been in Hitachi's lineup for several years. It fires brads from 5/8" to 2" long and has a dual-mode firing switch.

800-829-4752, hitachipowertools.com



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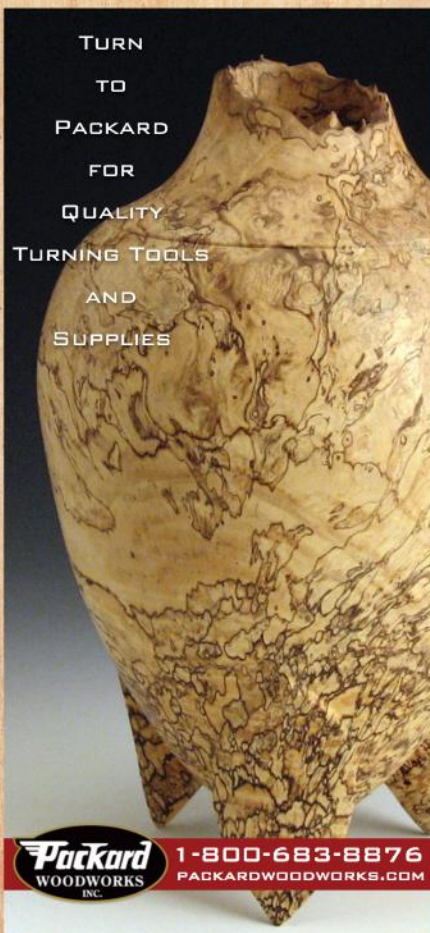


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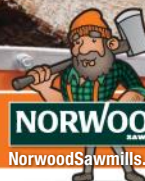
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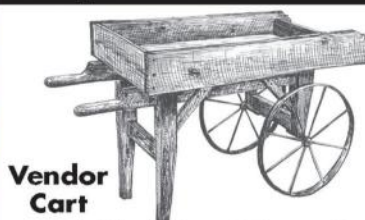
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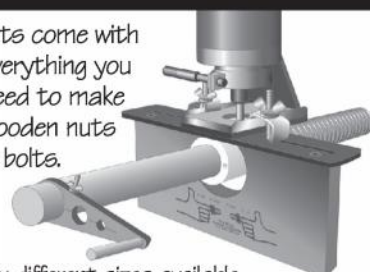
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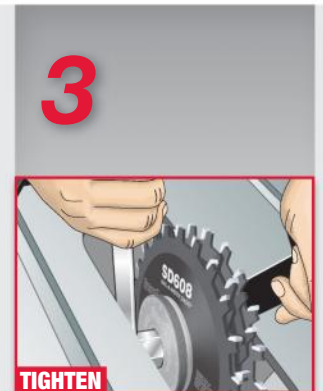
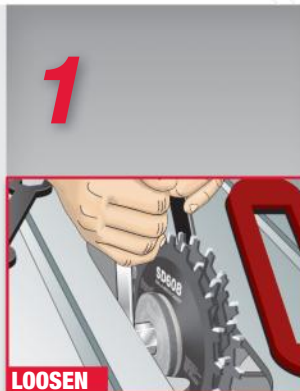
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