TAKE YOUR PROJECTS FROM GOOD TO *GREAT* p.38

ISSUE 245 MARCH 2017

Better Homes and Gardens®

WOOD®

The World's Leading Woodworking Resource

Resaw Like a Boss

p.52

Plus Great Plans

- Party-ready Bar p.26
- Indoor/Outdoor Bench p.56
- Chinook Helicopter Toy p.44

Choose the Right Dust Ducts p.74

Create a Stunning Waterfall Joint p.60

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- Table tilt: 45° R, 10° L
- Floor-to-table height: 37½"
- Cutting capacity/throat: 16¼"
- Blade length: 131½" (⅛" to 1" wide)
- Approx. shipping weight: 342 lbs.

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- Rip capacity: 30" R, 15" L
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- Approx. shipping weight: 330 lbs.

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with RIVING KNIVES & CAST-IRON ROUTER TABLE

- Motor: 5 HP, 240V, single-phase
- Precision-ground cast-iron table size with wings: 48" W x 27" D
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- Max. depth of cut: @ 90° 3", 45° 2⅛"
- Approx. shipping weight: 542 lbs.

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8" JOINTERS

- Motor: 3 HP, 240V, single-phase, TEFC, 3450 RPM, 9A
- Max. depth of cut: ⅛"
- Max. rabbeting capacity: ½"
- Precision-ground cast-iron table size: 9" x 72½"
- Cutterhead diameter: 3", Speed: 4800
- Cutterhead knives: 4 HSS; 8" x ¾" x ⅛" (G0656)
- Cuts per minute: 20,000 (G0656), 21,400 (G0656X)
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- Approx. shipping weight: 522 lbs.

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4 KNIFE CUTTERHEAD
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SHOP FOX

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- Precision-ground cast-iron table measures 14⅛" x 10" x 7/16"
- Max planing width: 7"
- Max planing height: 7½"
- Cuts per minute: 14,000
- 2 HSS knives
- Approx. shipping weight: 324 lbs.

$109 shipping

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15" PLANERS

- Motor: 3 HP, 220V, single-phase, 15A
- Max. cutting width: 15", Depth: ⅛"
- Max. stock thickness: 8", Min: 3/16"
- Min. stock length: 8"
- Feed rate: 16 & 30 FPM
- Cutterhead diameter: 3", Speed: 4800 RPM
- Power feed rollers: solid serrated steel
- Precision-ground table size: 15" x 20"
- Overall size: 32½" W x 42" D x 45⅞" H
- Approx. shipping weight: 675 lbs. (G0453), 672lbs. (G0453Z)

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- Floor-to-table height: 34¼"
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- Spindle travel: ⅞"
- Spindle diameter: ½"
- Spindle length: 3"
- Spindle capacity under nut: 2⅜"
- Spindle speed: 8900 RPM
- Overall dimensions: 27" W x 23" D x 40¼" H
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Doing good better

The talented crew that designed and built this great project *(L to R)*: John Olson, yours truly, Kevin Boyle, Craig Ruegsegger, Lucas Peters, Karl Ehlers, Sheryl Munyon, and Bob Hunter.

For each of the past 15 years, our company, in cooperation with Rebuilding Together (rebuildingtogether.org), has invested a day or more of corporate resources into improving the lives of those less fortunate. Typically this involves paint-up/fix-up/clean-up of houses and parks in a deteriorating neighborhood.

On these work days, the *WOOD*® staff often takes on the special projects that require above-average how-to skills. One year, for example, we built a 1,000+ square-foot "treehouse" for disabled children and adults (see issue 169, page 8). Another year, we crafted rolling portable pantries for the local Boys & Girls Club.

Last fall, we were tasked with fencing-in the student-tended vegetable garden at Capitol View Elementary School. Thanks to a great design by Senior Design Editor Kevin Boyle, the *WOOD* staff built most of the fence panels in our parking lot one morning, then installed them on-site the next. The students and staff hardly knew we'd been there, but for the brand-new fence—complete with a sturdy gate—that magically appeared before lunch recess. (And the thank-you notes the students sent were priceless.)

It might have been easier to simply slap up some pre-fab privacy-fence panels and call it good. But with just a little more effort, a little more caring, we made something we were all proud of.

That's true of woodworking projects, too: The difference between good and great is often just a little extra effort in just the right places. In the article on *page 38*, we'll show you some small things you can do when planning and building your own projects that will make a big impact.

See you in the shop!

Dave Campbell
dave.campbell@meredith.com
Facebook and Twitter: @WOODeditor

On-site, design editors Kevin Boyle and John Olson assemble the gate *(background)*, while deputy editor Craig Ruegsegger custom-builds the final fence panel to fit *(foreground)*.

Digital content manager Lucas Peters *(right)* and I filled each frame with wire-mesh fencing held in place with narrow crown staples. (Note the stack of completed panels behind Lucas.)

Illustrator Lorna Johnson drilled more than 400 pocket holes (using a Kreg Foreman) to assemble the inside frames.

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WOOD®
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Build this miter sled in an evening and enjoy perfect tablesawn miters for years to come. woodmagazine.com/deadonmiters

FREE SHAPE-UP-YOUR-SHOP PLANS

Rock-solid worksurface, plenty of bit storage, and our recommendations for routers and accessories—Looks like it's time for a new router table in your shop. woodmagazine.com/deluxeRT

These handy folding sawhorses require only inexpensive pine, common T-hinges, and deck screws. woodmagazine.com/folduphorse

This compact sheet-goods station packs loads of lumber in only 18" of width and doubles as a panel saw. woodmagazine.com/sheetstation

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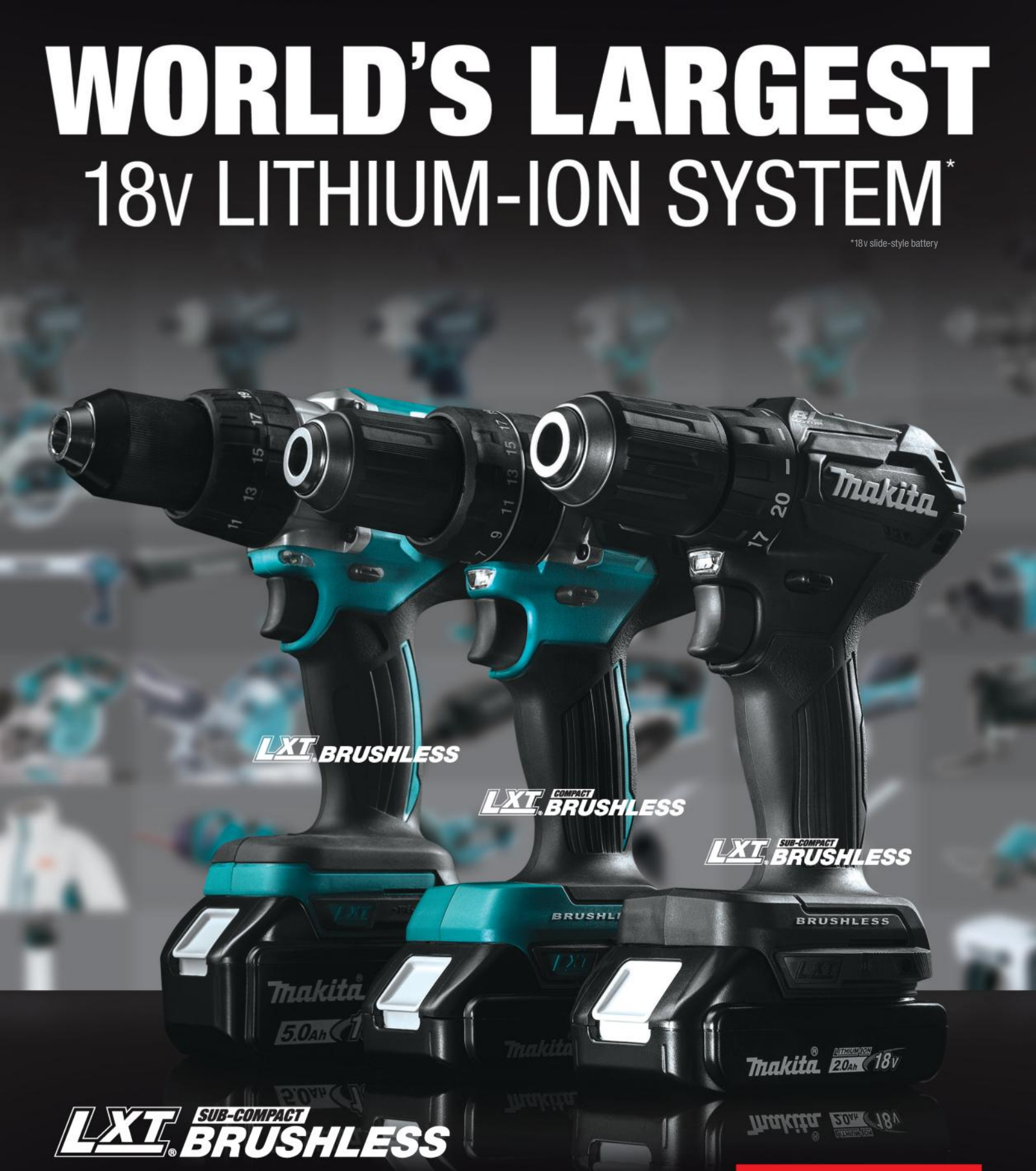

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Making a good case for marriage

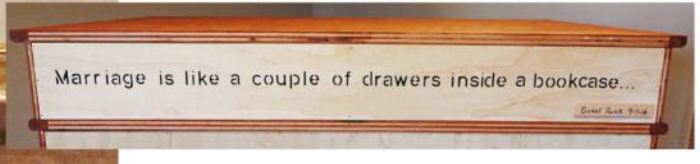
While searching for a wedding gift idea for my son and his future bride, I found the Display Bookcase on the cover of issue 232 (May 2015). It was perfect. To make it more personalized, I routed their names in the back of the drawers, and included a card with the following note:

> Marriage is like a couple of drawers in a bookcase: You can only get out of them what you put into them. Fill them with faith, hope, and love, and the drawers of your marriage will never be empty.
> Love, Dad

I also inscribed part of that note onto the back of the bookcase as a permanent reminder.

Thanks for the inspiration!

—Gerry Pavlik
Big Lake, Minn.



Article update

In issue 244 (Dec/Jan 2016/2017) on p. 39, the link to the pen turning video should be woodmagazine.com/penturning.

Let's give the planes a hand

I love your magazine, especially the Essential Hand Planes article in issue 243 (November 2016). You made some great choices for a basic set.

For those on a budget—and willing to do a little work—I recommend getting some old Stanley planes. Low- and standard-angle block planes in nice shape are easy to find on eBay for less then $50. I've also found a number of no. 5s for under $50. If you pair a low-angle block plane with a blade ground at 38 degrees, you have a great tool for tough figured wood.

—James Gibson
via e-mail

You're right, James. You can often find real treasures in others' trash. And you can find some helpful plane-restoration tips here:

- How to Restore a Hand Plane woodmagazine.com/planerehab
- Removing Rust with Electrolysis woodmagazine.com/electrolysis
- Tune That Old Plane to Perfection woodmagazine.com/tuneplane

What's on your woodworking bucket list?

We asked our Facebook fans and Twitter followers to name the projects on their bucket lists. Here are some responses:

David Morley Chippendale highboy
Judd Kaiser Maloof-style rocker
@LeroyTheLips Carousel horse and a shuffleboard table
David RustedRain Mora grandfather clock (*right*)
Chris Mohney Solid-body electric guitar
Scott Sprowls Sounds morbid, but my own casket
Kevin Hall Cedar-strip canoe
John Winter Wood-and-fabric airplane
@WildernessAle Morris chair, Prairie settle, barrister bookcase

Buy plans and parts for this Mora clock from Klockit at klockit.com/mora

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continued on page 8

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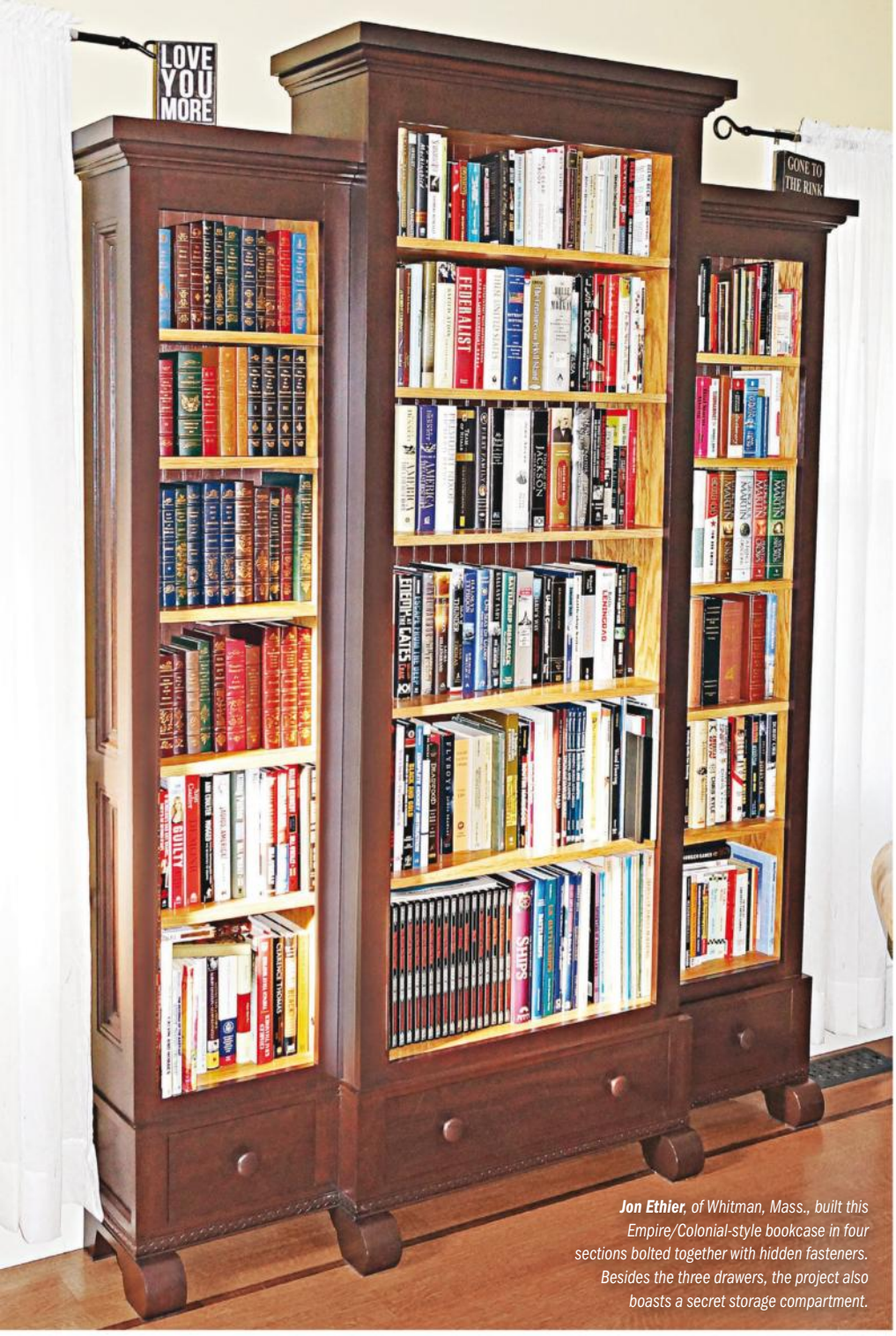
Sounding Board

YOUR PROJECTS

*It took **Denny Edwards**, of Johnstown, Pa., 1,105 pieces of maple, yellowheart, chakte viga, and padauk—and one piece of wenge—to make his "Flower" bowl. To watch him build and turn this bowl, visit dennyedwards.com or search "Dennis Edwards Flower" at youtube.com.*



***Jon Ethier**, of Whitman, Mass., built this Empire/Colonial-style bookcase in four sections bolted together with hidden fasteners. Besides the three drawers, the project also boasts a secret storage compartment.*

*Father/son woodworking team **Bob and Todd Grisso**, of Salem, Va., crafted this beautiful chessboard from maple, walnut, and makore cherry.*

*After a large oak tree on his property toppled, **Roger Spears**, of Gardner, Kan., salvaged this oblong section and fashioned it into a side table.*

Send us a photo of your work

Want to see your work showcased in WOOD® *magazine? Send a high-resolution digital photo of your completed project to* woodmail@woodmagazine.com.

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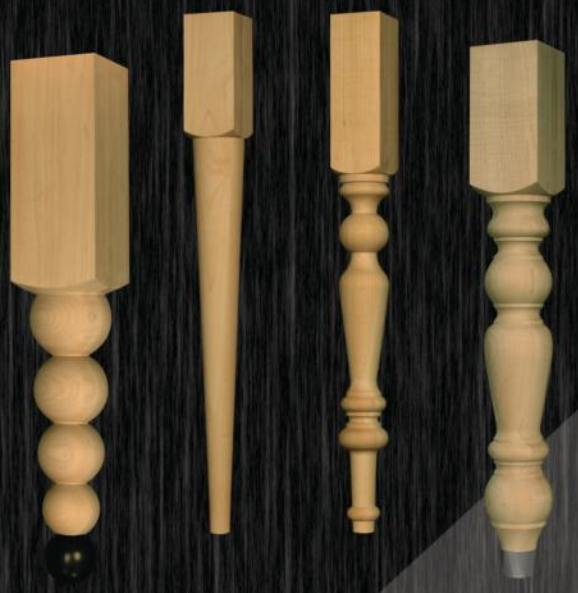
Kitchen Island Legs



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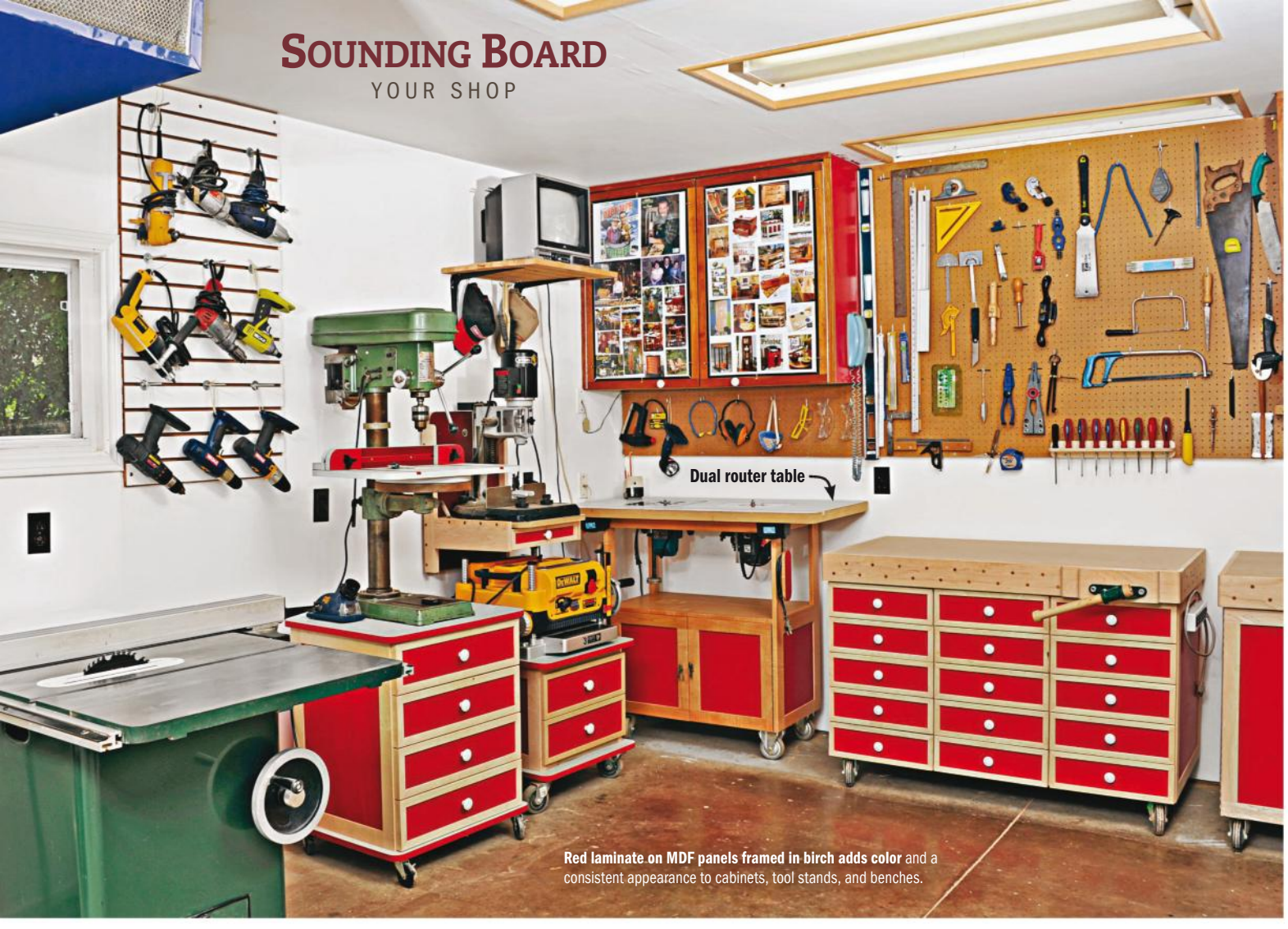


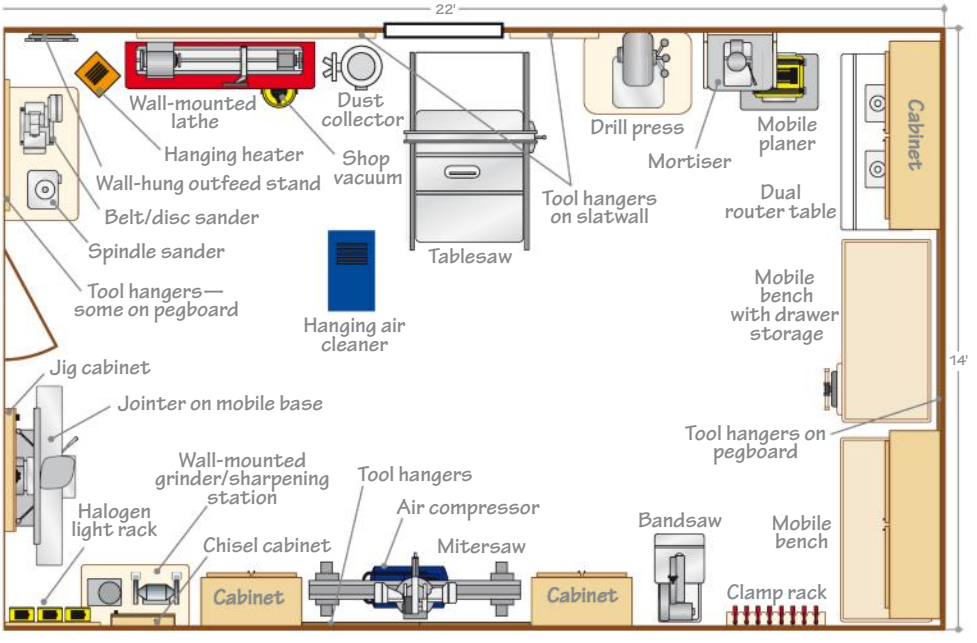
Red laminate on MDF panels framed in birch adds color and a consistent appearance to cabinets, tool stands, and benches.

Compared with the coal cellar where he once set up shop, Rick Campbell now works in palatial surroundings. Daylight streams through the windows into his 14×22' shop, and he can stand up instead of being hunched beneath low joists.

"The only tools I keep in my shop," Rick explains, "are the ones I use regularly. And I'm ruthless when it comes to lumber storage, buying materials only for the project I'm working on. I have a 4×10' lean-to shed outside my shop with one lumber rack, but everything else gets burned in the fireplace or taken to the recycling center."

"I probably get more comments about my two workbenches than anything else," Rick says, "because they're so versatile. I replaced a long bench with two smaller ones—each about 2×4'. They're both on casters, so I can position them end-to-end or side-by-side. Or I split them apart as infeed or outfeed support for my tablesaw.

continued on page 12



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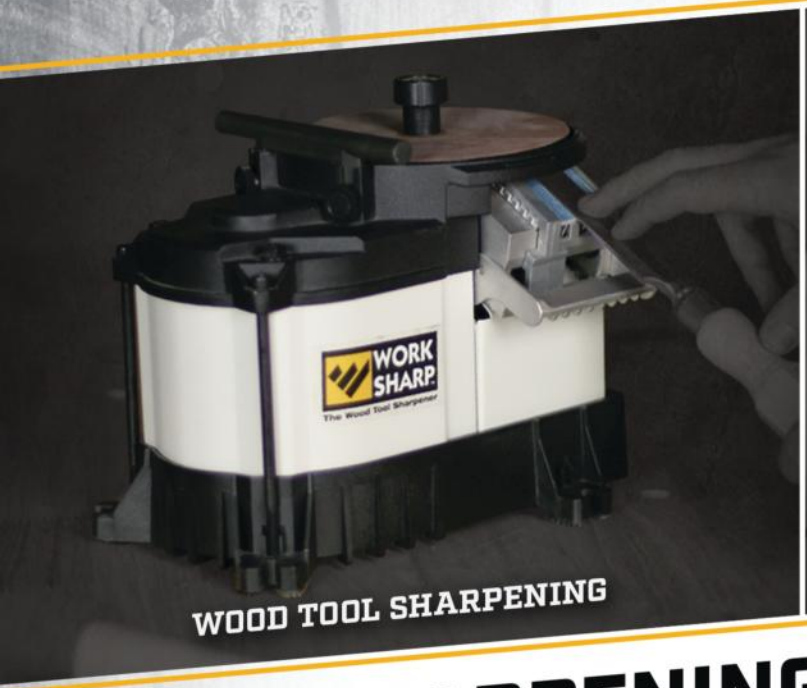

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continued from page 10

Rick stands outside the entrance to his backyard shop. The simple design allowed him to spend more on interior fixtures and equipment.

"I kept the tops simple—a torsion box sandwiched between ¾" plywood sheets. The hardwood sides of the box stand ¼" proud of the ¾" plywood top, creating a recess for a replaceable ¼" hardboard top. When it gets worn, I pop it out and drop in a new one.

"The other tool that catches people's eyes is my dual router table [**opening photo**]. It's a real time-saver—plus it improves accuracy. If a project requires two bits to cut a rabbet and an ogee profile, for example, I keep both bits in a router. I don't lose any time with setups—especially if I make a mistake and need to cut a replacement part."

Show us your shop

Send high-resolution digital photos of your shop to woodmail@woodmagazine.com *and we may showcase it in the magazine!*

Every tool has a home. Slatwall and custom movable panels hang on beveled cleats (also called French cleats).

Correct the cup at warp speed

I left the unfinished top for a blanket chest in my truck on a hot, humid day, and it cupped. Can I get the top flat again without planing it (and reducing thickness)?

—Paul Salisbury, Waukee, Iowa

A painful arch. This edge-glued panel, shown here on a tablesaw top, cupped due to prolonged exposure to heat and humidity.

Before trying anything else, Paul, try reversing the process by putting it back in the truck with the opposite face up (cupped face down) for a similar amount of time and in similar conditions. That *might* equalize things and reverse the cup. Keep an eye on it: When it looks like all the "repair" that will take place is done, take the top into the house or shop. Place it on several 1"-thick scraps and let it stabilize for a few days. Then finish it and install on the chest.

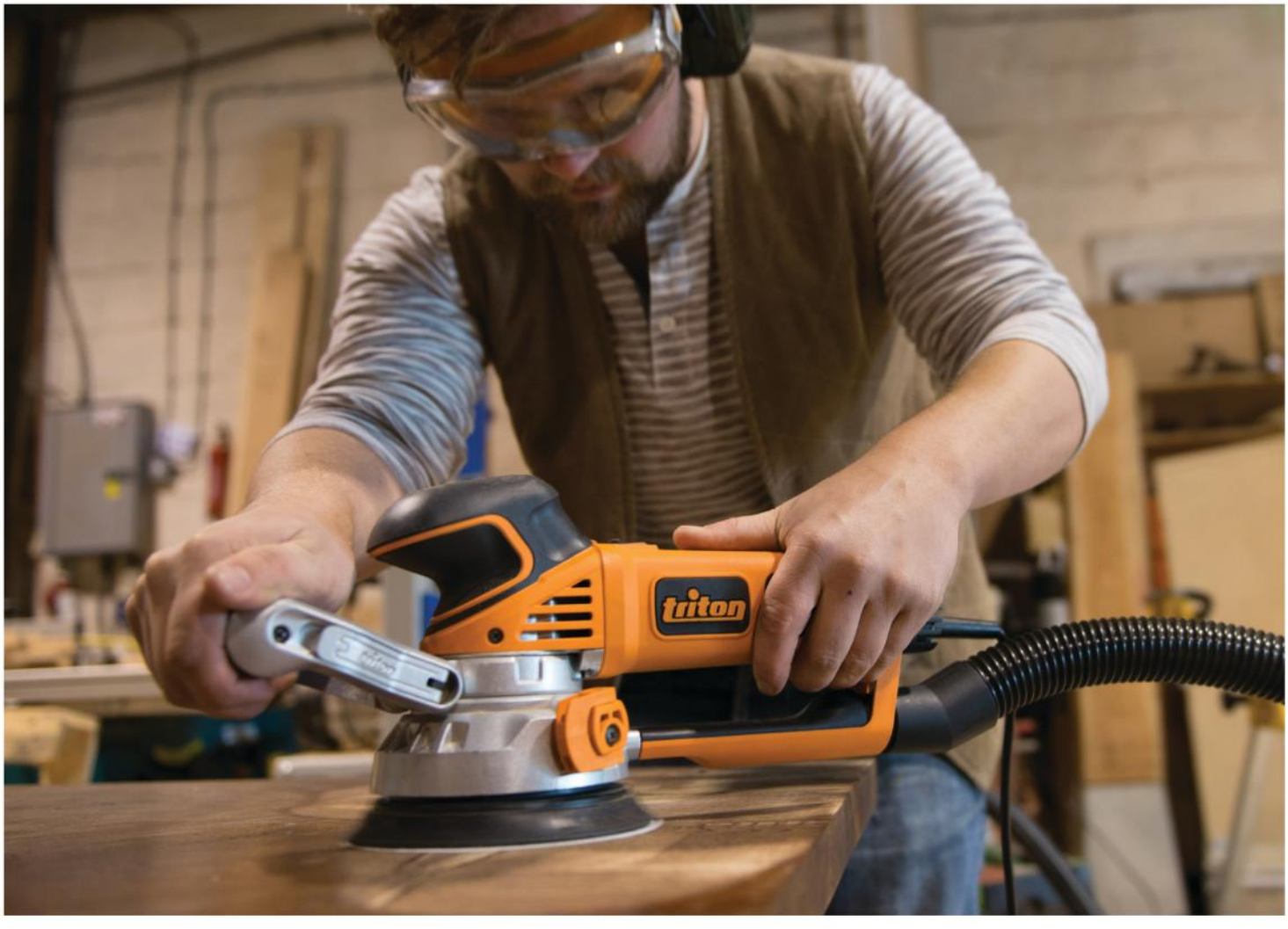
If that doesn't remove the cup, you can save thickness by ripping the top into narrower pieces, flattening them, and rejointing the edges. Then glue the top back together. The trade-off? You might need to add more stock (width) to replace that lost to the cutting.

For future projects, once you get a glued-up panel flat and sanded, apply finish as soon as possible on all surfaces to better stabilize it. Also, leave it in the shop or a controlled environment until ready to install or deliver to its final destination.

Turn the tables. Luckily, repeating the conditions that caused the cupping reversed it when the top was turned cup-face down.

Have a question? Drop us an e-mail. askwood@woodmagazine.com

Engineered Precision



Tough Starts and Fine Finishes

Equipped with a powerful 500W motor and all-metal gearing, the Triton Eccentric Orbital Sander tackles the most demanding sanding and polishing tasks with two sanding modes in one tool.

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Fast and simple way to ground PVC dust piping

Static electricity can build up in plastic dust-collection ducting if that energy can't dissipate via a ground wire. After installing a PVC-pipe system, I considered doing what many have done: wrap a grounded copper wire around the piping. Then a much simpler solution popped into my head.

I wrapped aluminum duct tape, barber-pole-style, around the ducting and hooked it to the grounded screw holding the faceplate of an electrical outlet. Problem solved, quickly and inexpensively. Before getting started, narrow the tape by cutting its roll in half; doing that makes the tape easier to wrap and makes it go twice as far.

—Eddie Fischer, Norfolk, Va.

TOP SHOP TIP

For sending this issue's Top Shop Tip, Eddie receives a Festool RTS 400 EQ Orbital Finish Sander and abrasives worth $300.

continued on page 18

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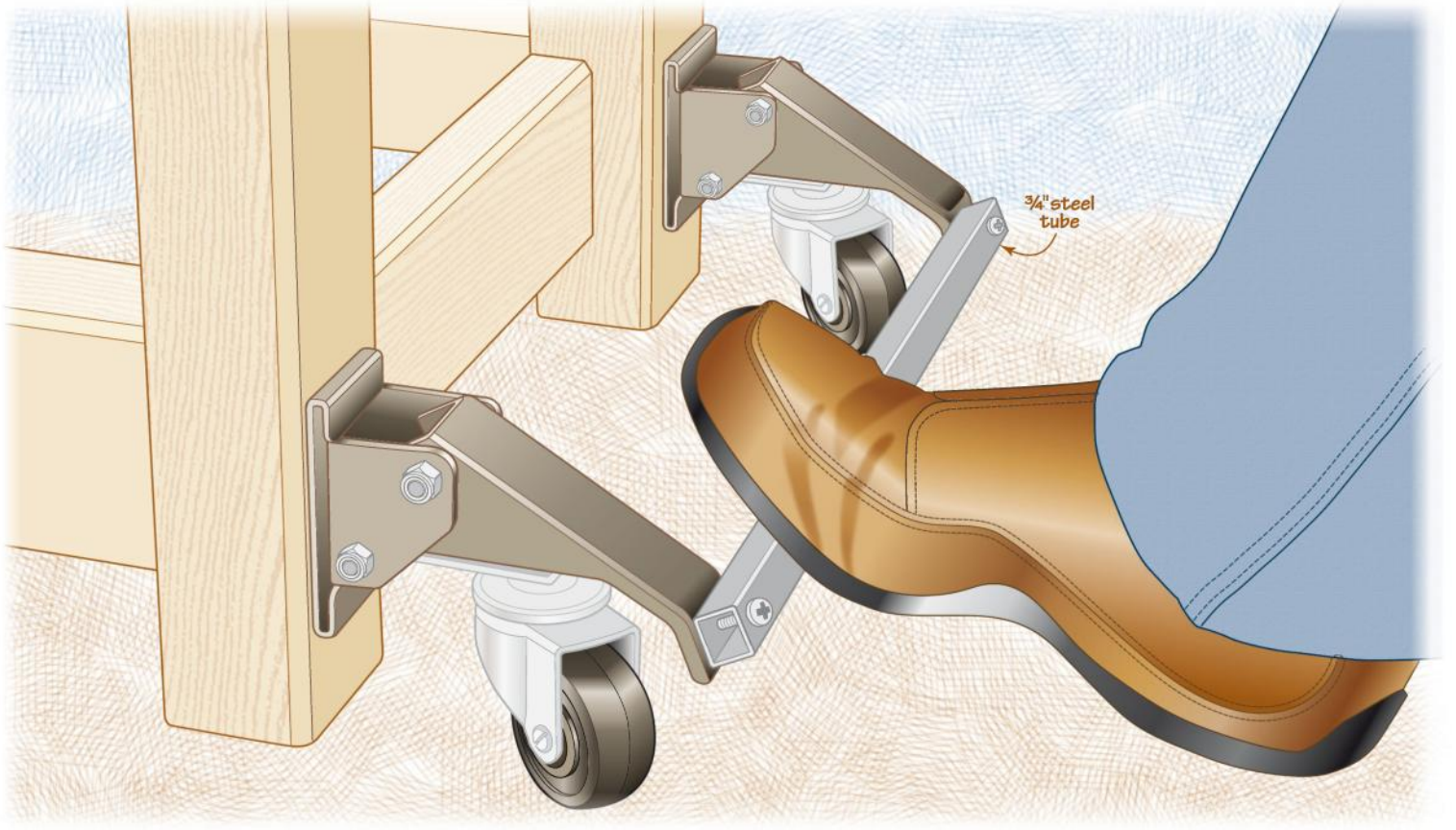
Leg lifts made easy

Shop space constraints demand that my workbench be mobile. So I purchased a set of casters that individually lift each leg of the bench when foot pressure is applied to them. The mechanisms work fine, but I was concerned with the long-term effect of racking the bench base when lifting each leg by itself.

The solution: Connect the foot pedals with ¾" steel tube as shown. Now you can lift or drop both casters with one application of your foot. No racking *and* less effort! You can find this type of workbench caster at woodmagazine.com/benchcasters.

—Grant Pacey, Ottawa, Ont.



Stow safety glasses in plain sight

We all know the importance of safety glasses. But we often forget to put them on, or we make a cut or two without them because they're across the shop.

To eliminate that excuse, while always reminding me to put them on, I place safety glasses in a highly visible and readily accessible location at every machine, as shown. You can easily move a holder if its location proves inconvenient.

—Jon Myers, Kimberly, Idaho

continued on page 20

"Complete" Horizontal Router Table Package

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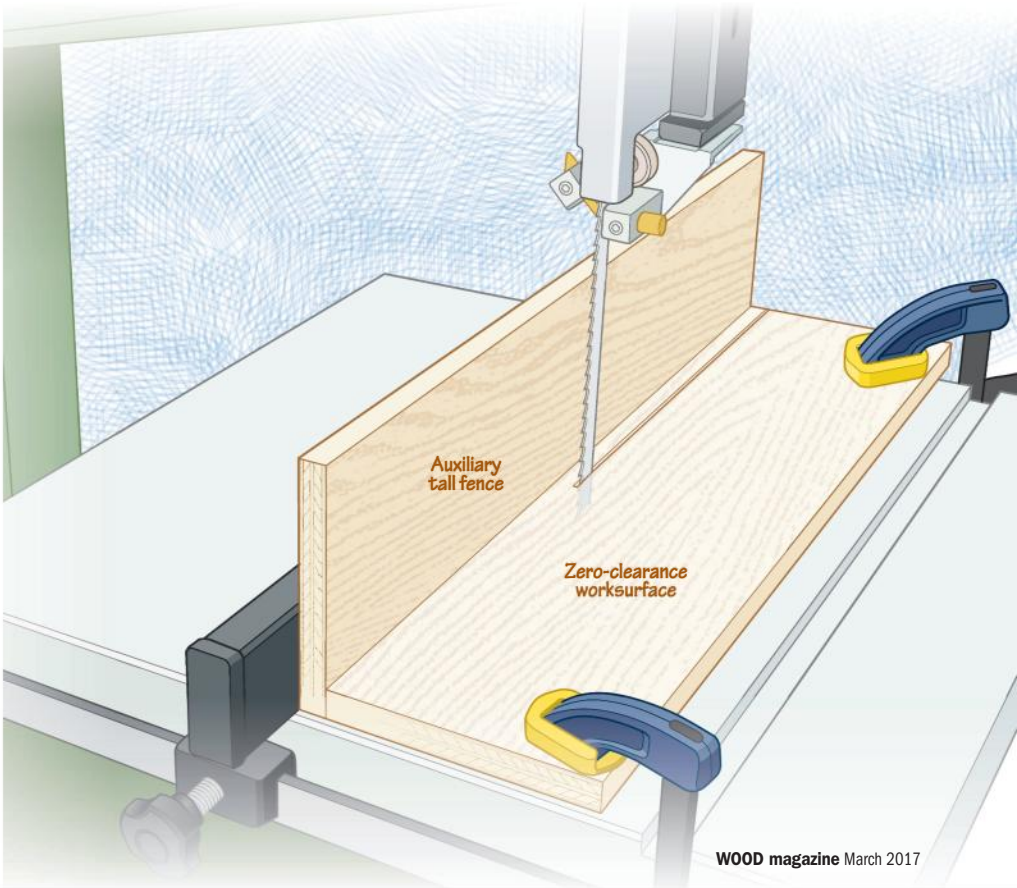
Better resawing with a zero-clearance surface

When resawing narrow or especially thin pieces on the bandsaw, such as inlay banding, they can be grabbed by the blade and pulled toward an unstable or chewed-up blade insert, possibly ruining the cut. To fix that situation, and provide better overall workpiece support, glue together at a right angle two pieces of ¾" plywood or other sturdy and flat sheetgood scrap. Feed this fixture into the blade, stopping at about its midpoint. Then clamp it to the bandsaw table. In addition to providing zero-clearance support, the auxiliary worksurface verifies the thickness of cut before putting sometimes-expensive wood through the blade.

—Chuck Lickwar, Brazoria, Texas

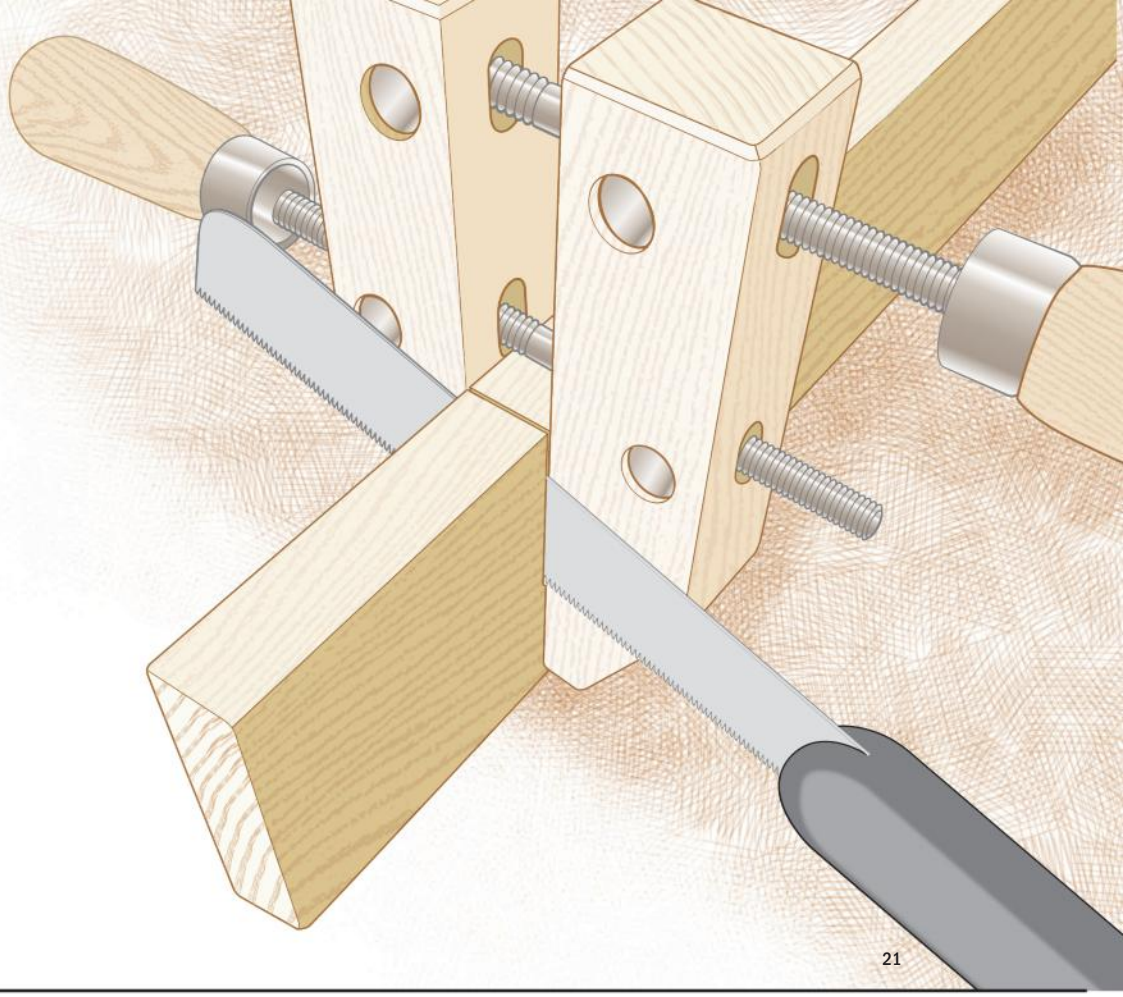


Get perfect cuts with your Japanese pull saw

I enjoy the ease and control of a pull saw, but those qualities still don't guarantee perfect cuts. To achieve that, use a handscrew clamp to guide the cut.

First, align the clamp alongside the cut mark using a square. Then, rest the body of the saw blade against the clamp and use your fingertips to maintain that contact. A sharp blade and your focus on the sawing action will yield a perfect cut.

—Bill Murr, Brooklyn, Md.



To Trust or Reinforce?

Why one woodwoodworker relies on mechanical joinery, not just glue.

by Richard Maguire

Glue is one of those miracles, like sending an email, that does its job without leaving any hint of how it happens. That disturbs my simple woodworking mind.

In traditional woodworking, most of the joints we make have some mechanical strength, in addition to being glued. And a well-cut mechanical joint holds together without any adhesive at all—the glue is just there as a bonus.

But edge-jointing and gluing long boards, especially for wide panels, can be an exception. For these joints, we often trust the glue alone to hold the two pieces of wood together. (Glue is one of those miracles, like sending an email, that does its job without leaving any hint of how it happens. That disturbs my simple woodworking mind.) For small glue-ups, such as the top for a side table, I'm happy to appreciate this miracle.

But as the joint gets longer and thicker, I start to lose trust in glue alone. For these joints, I like to add mechanical reinforcement for peace of mind. For instance, on a large table I'm building, I've opted for loose tenons, drawbored into each board, that physically hold the two pieces together (on *page 24*). I can see how it works, and that makes me happy.

With modern wood glues this may seem like overkill. And adding these extra tenons makes a lot of work. A good friend said that my joints are outdated because manufacturers claim modern glues are stronger than the wood itself. But I have two problems with this.

Strength is important, but when building furniture we want a balance between strength and flexibility. I look for joinery that sympathizes with the nature of the wood, its elasticity, and its will to move. We don't simply stick the end grain of an apron to the side of a leg with super glue, for example; we use a mortise-and-tenon joint. I don't consider it overkill to take the same approach when edge-jointing long boards. In fact, I find it quite strange that it's so uncommon to take this approach today.

The second problem I have with putting all my faith in a glue is consistency of application. In my testing, good joints would not give, no matter what. But bad joints plopped apart with a mere touch. That's because gluing is very scientific. It's affected by humidity and temperature, surface prep,

When building furniture, we want a balance between strength and flexibity.

continued on page 24

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Drawbored loose tenons add mechanical strength to an edge joint while allowing for seasonal movement.

If the glue line should open up, the pinned tenons keep the joint together, while allowing enough give for the timber's seasonal movement. And they look rather fetching.

and whether you've applied too little or too much clamping force. I learned that some glues will not reach their stated strengths if there's any more than 2 percent difference in the moisture content between the pieces of wood being joined. This is easy to avoid by using kiln-dried timbers, but large sections can have more than 2 percent variation within themselves.

Building workbenches for a living gives me more reason than most to obsess about glue lines. For my benchtops, I add tongues between each face-to-face joint. I'm not against glue lines. There is world-class furniture held together with the stuff. It all depends on your application, and because my methods are traditional, I find it suits best to stick, if you will, with what has always worked.

So, yes, modern glues are great. But I'll keep my trust in reinforcements I can see.

Richard Maguire, a UK-based furnituremaker, works solely with hand tools. He's best known for his fine workbenches, and produces hand-tool educational videos. Visit him online at theenglishwoodworker.com.

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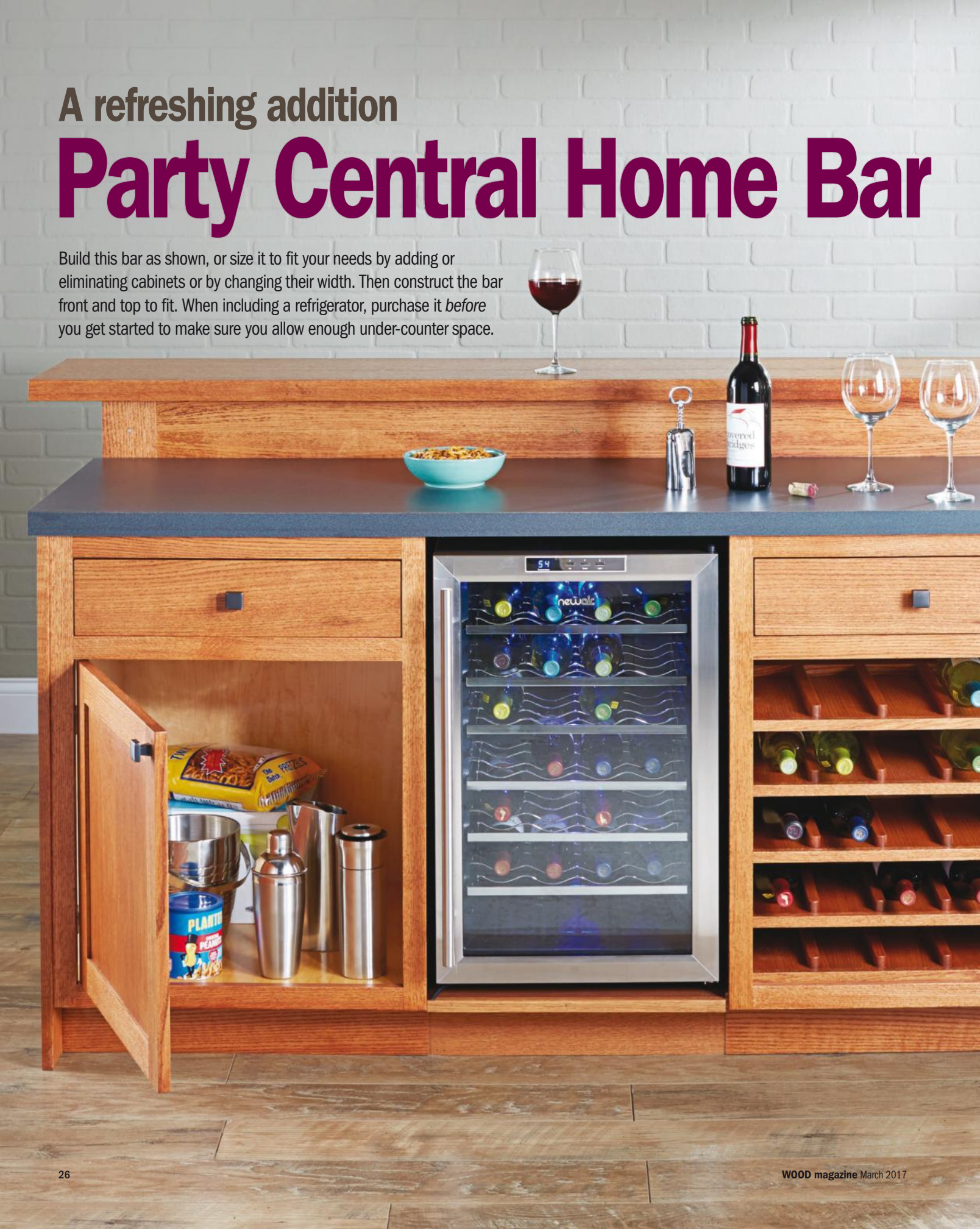
A refreshing addition

Party Central Home Bar

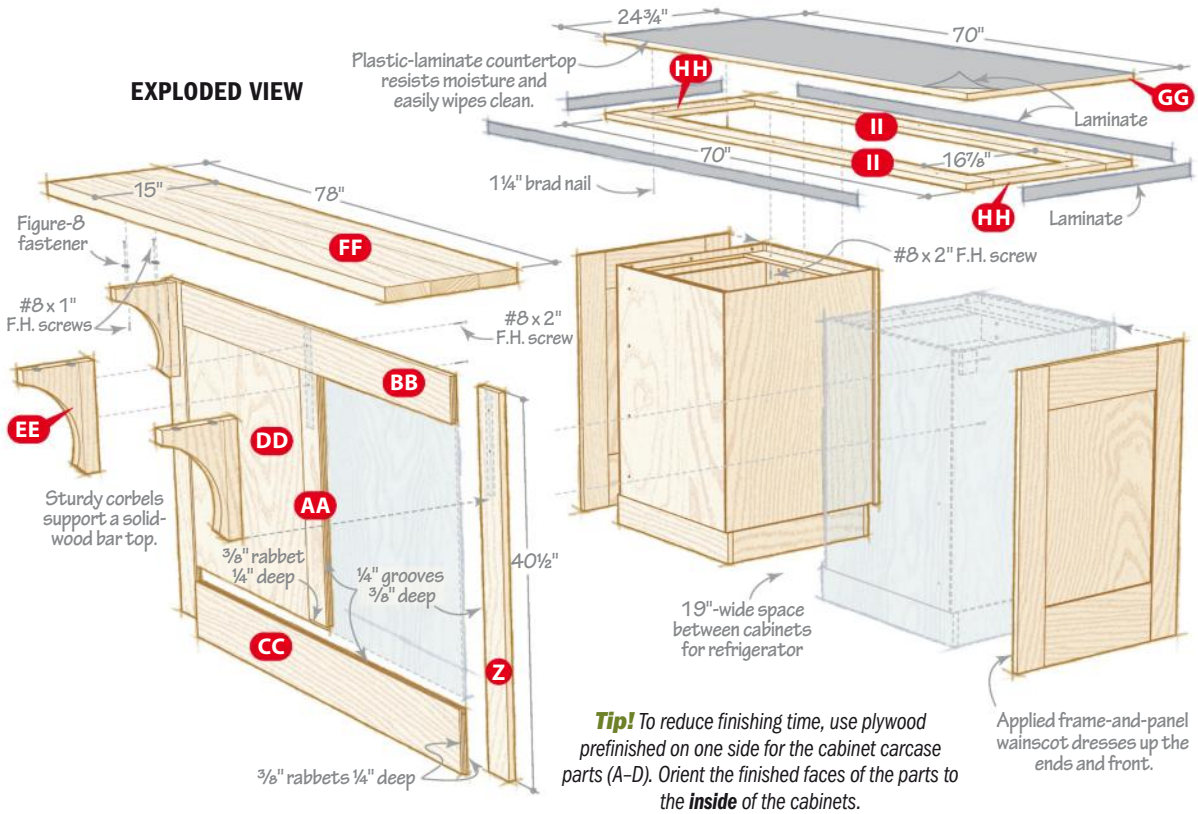
Build this bar as shown, or size it to fit your needs by adding or eliminating cabinets or by changing their width. Then construct the bar front and top to fit. When including a refrigerator, purchase it *before* you get started to make sure you allow enough under-counter space.



DIMENSIONS
42" H × 37½" D × 78" L

Approximate materials cost:
$575

8 components, infinite possibilities



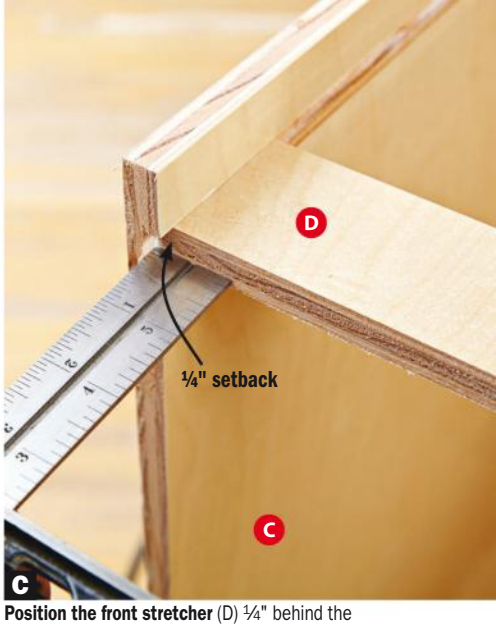
Tip! *To reduce finishing time, use plywood prefinished on one side for the cabinet carcase parts (A–D). Orient the finished faces of the parts to the* ***inside*** *of the cabinets.*

Build the cabinet carcases

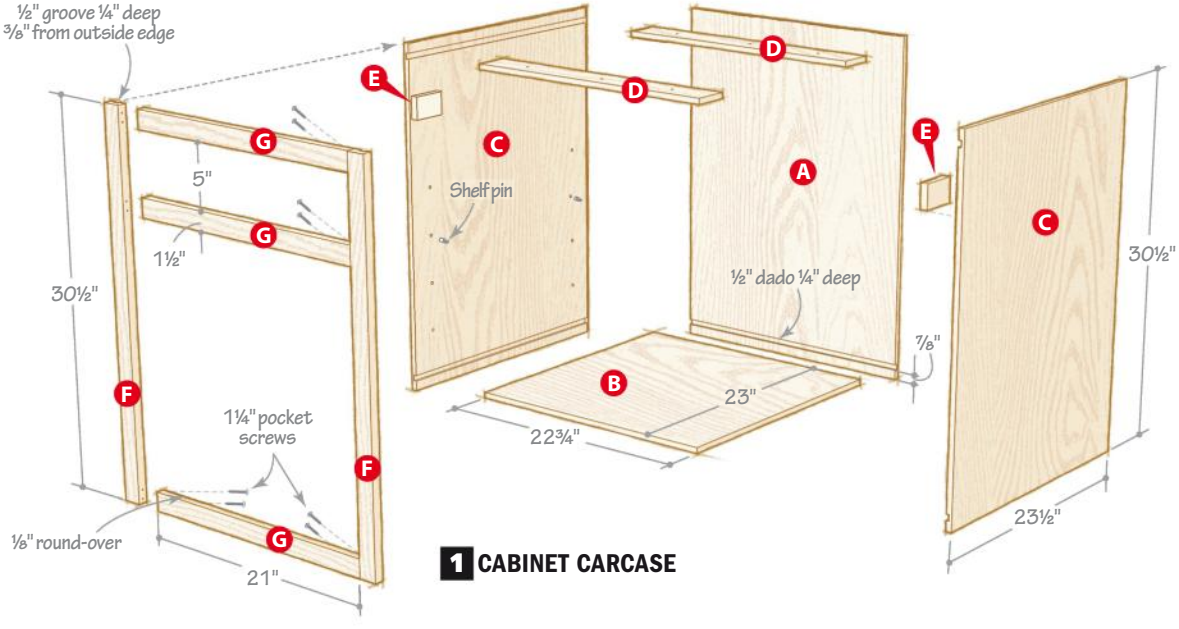
1 Cut the cabinet backs (A), bottoms (B), sides (C), and stretchers (D) to size [**Materials List**]. Cut dadoes and rabbets in the backs and sides to match the mating parts, making sure you have two right-hand and two left-hand sides [**Drawings 1 and 2**]. Make note of that dado setup–you'll use it again. Drill shelf-pin holes [**Drawing 2**].

Use 1¼" narrow-crown staples to secure the back (A) to the bottom (B) using a squaring brace to align the parts. A guideline drawn on the back helps center the staples on the dadoes.

Let gravity help you. Stand a back/bottom assembly (A/B) on edge then glue and staple the sides (C) in place.



Position the front stretcher (D) ¼" behind the front edges of the sides (C).



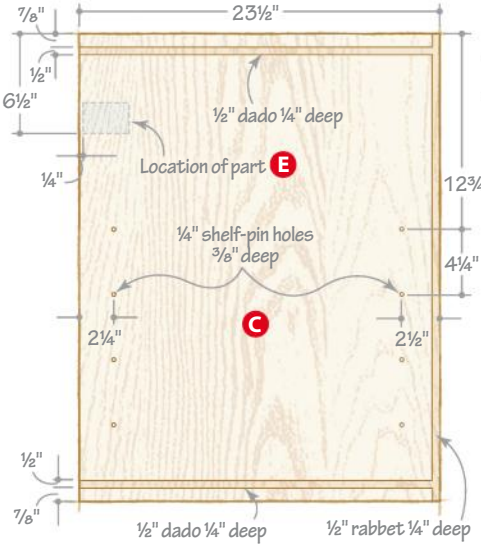
1 CABINET CARCASE

Make your own squaring braces. woodmagazine.com/clampingbrace

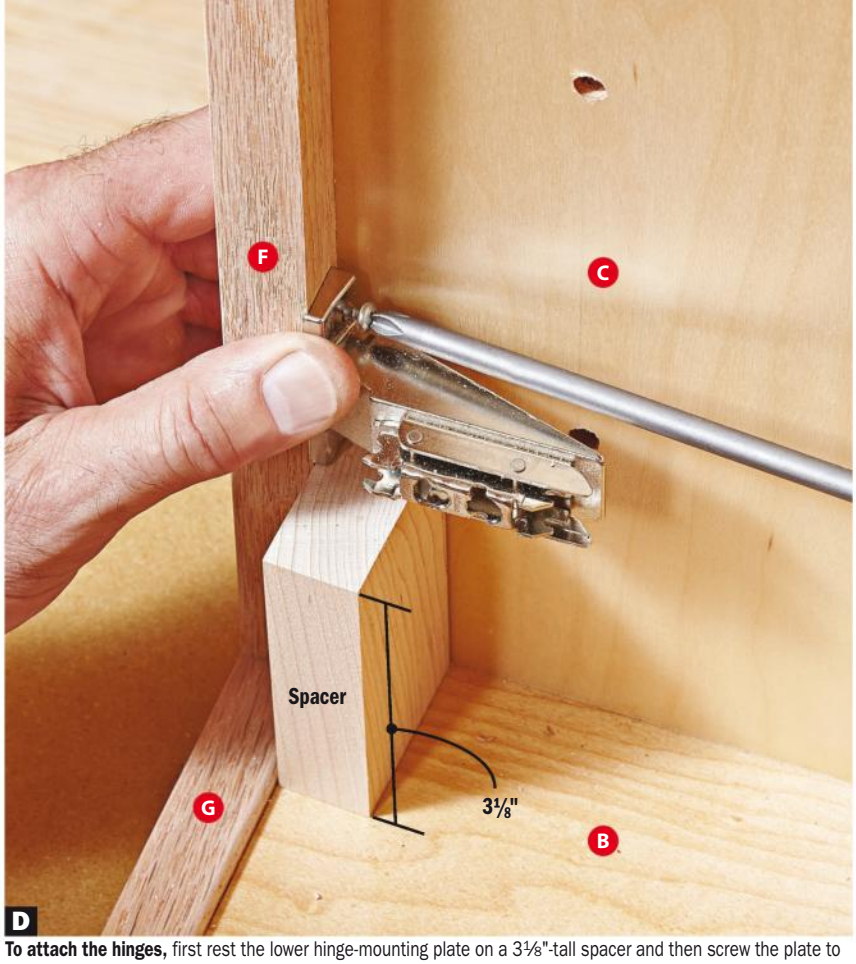
2 Glue, clamp, and staple the bottoms (B) to the dado in each back (A) [**Photo A**].

3 Glue and staple one side (C) to a back/bottom assembly (A/B) [**Photo B**]. Because the sides, but not the bottoms, fit into grooves in the backs of the face frames, the sides protrude ¼" beyond the front edge of each bottom. Repeat with the other side and the second cabinet.

4 Spread the sides and insert the rear stretcher (D) into the dadoes as close to the back as possible. Apply glue to the dadoes at the rear and slide the stretcher into place against the back (A). Likewise, glue the front stretchers [**Drawing 1, Photo C**]. Staple both stretchers in place. Repeat for the other cabinet.



2 CABINET SIDE (Left inside face shown, right side is mirror image)



To attach the hinges, first rest the lower hinge-mounting plate on a 3⅛"-tall spacer and then screw the plate to the face-frame stile.

Finish the hinge installation by snapping the lower hinge onto the lower hinge-mounting plate, positioning the upper mounting plate against the face-frame stile, and screwing the plate in place.

5 Cut the mounting blocks (E) to size and set them aside.

Attach the face frames

1 Cut the stiles (F) and rails (G) to size. Round-over the top inside edge of each bottom rail [**Drawing 1**].

2 Drill pocket holes in the rails (G) and pocket-screw the face frames.

3 With the same dado setup previously used, cut grooves in the stiles (F) [**Drawing 1**]. (The grooves will not intersect the pocket screws.) Glue and clamp the face frames onto the cabinet carcases.

Make the door

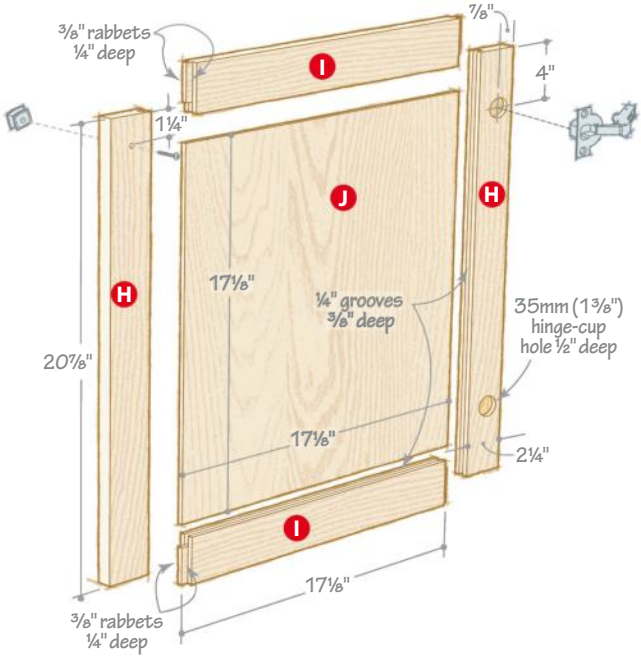
__Note:__ Build a door only for a cabinet where you desire concealed storage. Skip the door for a cabinet outfitted with wine trays.

1 Cut the stiles (H) and rails (I) to size. Cut centered grooves to match the door-panel (J) thickness and rabbet the ends of the rails to form stub tenons [**Drawing 3**].

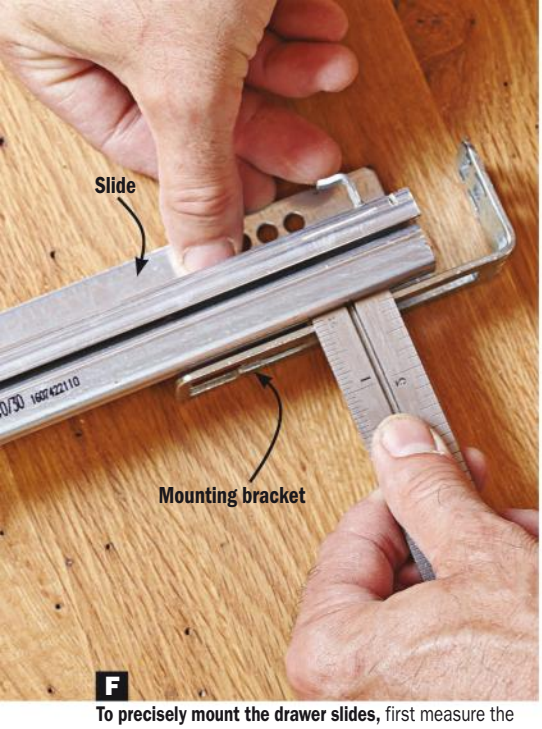
2 Cut the panel (J) to size. Assemble the door, applying glue sparingly to the grooves and tenons. After the glue dries, drill holes for the hinge cups and knob. Finish-sand the door frame and attach the knob [**Source**].

3 Install the hinges as shown in **Photos D and E**. Then attach the door stop [**Drawing 6, Source**].

3 DOOR (Viewed from back)

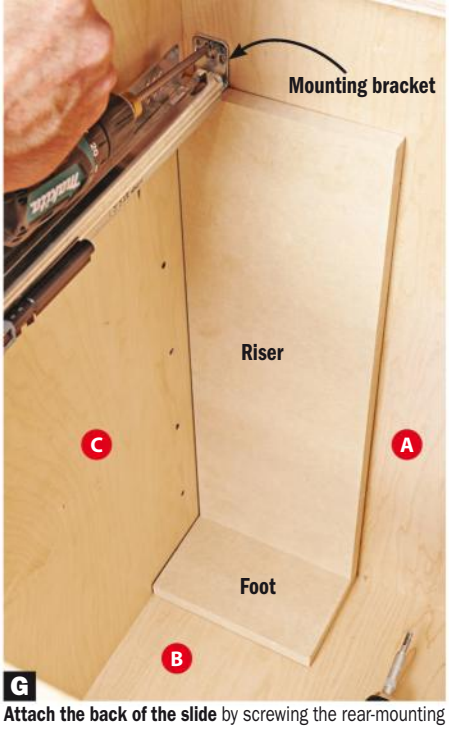


***Tip!** When making frame-and-panel assemblies such as the doors and wainscots in this project, finish-sand the plywood panels before assembly.*



F

To precisely mount the drawer slides, first measure the dimension from the bottom of the drawer slide to the bottom of the rear mounting bracket.



G

Attach the back of the slide by screwing the rear-mounting bracket to the cabinet back. Do not make any side-to-side adjustment.

H

Position the drawer-slide mounting clips in the bottom front corners of the drawers and screw them to the drawer fronts.

Add drawers and wine trays

1 Cut the drawer sides (K), fronts/backs (L), and bottoms (M) to size. Finish-sand the bottoms. Cut grooves to fit the drawer bottom in parts K and L. Dado and rabbet the drawer sides and fronts/backs [**Drawing 4**].

2 Glue and clamp the drawers, check them for square, and place them on a flat surface to dry. Notch and drill the drawer backs [**Drawing 4a**]. Finish-sand the drawers.

3 Retrieve the mounting blocks (E). Attach one block to each cabinet side (C) with one end against the back of the stile (F) and the bottom edge even with the top edge of the middle rail (G) [**Drawing 6**].

4 To support the rear ends of the drawer slides during installation, attach the rear mounting brackets to the drawer slides and measure as shown in **Photo F**. Subtract this dimension from the distance between the top edge of the middle rail (G) and the cabinet bottom. Cut a scrapwood riser to the resulting dimension. Attach a foot to the face of the riser as shown in **Photo G** to keep the riser upright.

5 Position the front ends of the drawer slides ⅞" back from the front faces of the face frames, the bottoms of the slides flush with the bottoms of the mounting blocks (E), and the rear ends supported by the riser. Screw the drawer slides to the mounting blocks, and then to the cabinet backs (A) [**Photo G**].

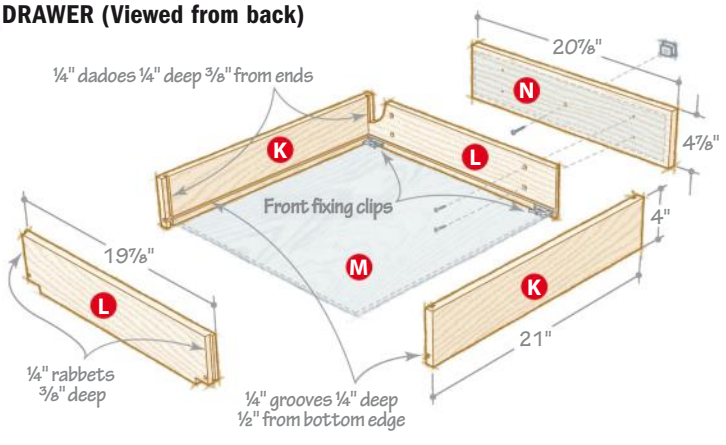
6 Attach the drawer-slide mounting clips to the drawers [**Photo H**]. Slide the drawers onto the slides, slipping the drawer-slide locating pins into the holes in the drawer backs and engaging the mounting clips at the front.

7 Cut the drawer faces (N) to size, drill the knob holes, finish-sand the faces, and install the knobs [**Drawing 4**]. Apply double-faced tape to the backs of the faces, center them in the face-frame openings, and press

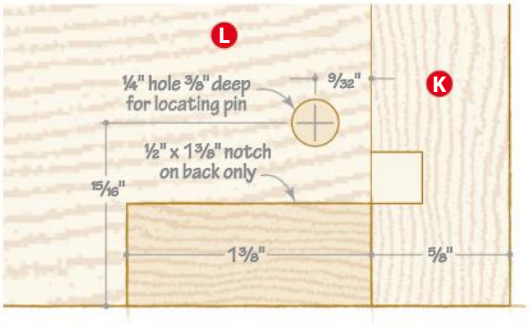
Tip! *Check a drawer for square by measuring diagonally from corner to corner. Equal diagonal measurements ensure a square drawer.*

Note: *Screwing the drawer slides to the mounting blocks at the front of the cabinet fixes the side-to-side locations at the back. The rear-mounting brackets allow side-to-side movement so the slides self-align when the drawer closes.*

4 DRAWER (Viewed from back)



4a DRAWER BACK DETAIL



the faces against the drawer fronts. Open the drawers, clamp the faces to the drawers, and screw the faces in place.

Note: *The number of wine tray parts (O–R) depends on how you configure your bar.*

8 Cut the wine tray bottoms (O), edging (P), bottle stops (Q), and dividers (R), and glue the edging to the tray bottoms [**Drawing 5**]. Finish-sand the trays. Radius the front ends of the dividers and round over their top edges. Finish-sand the stops and dividers and glue and clamp them to the tray bottoms.

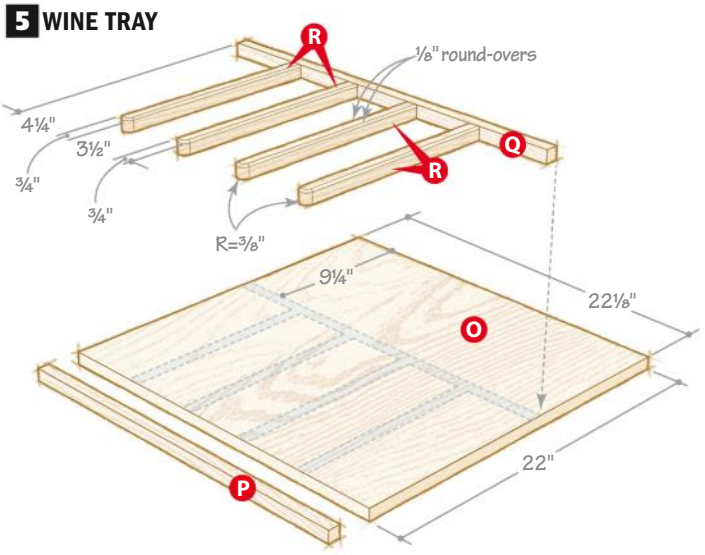
Build the toekicks

Note: *If you want to elevate your refrigerator as we did, build a 21"-deep toekick to match its width plus 1", and add a cabinet-depth platform.*

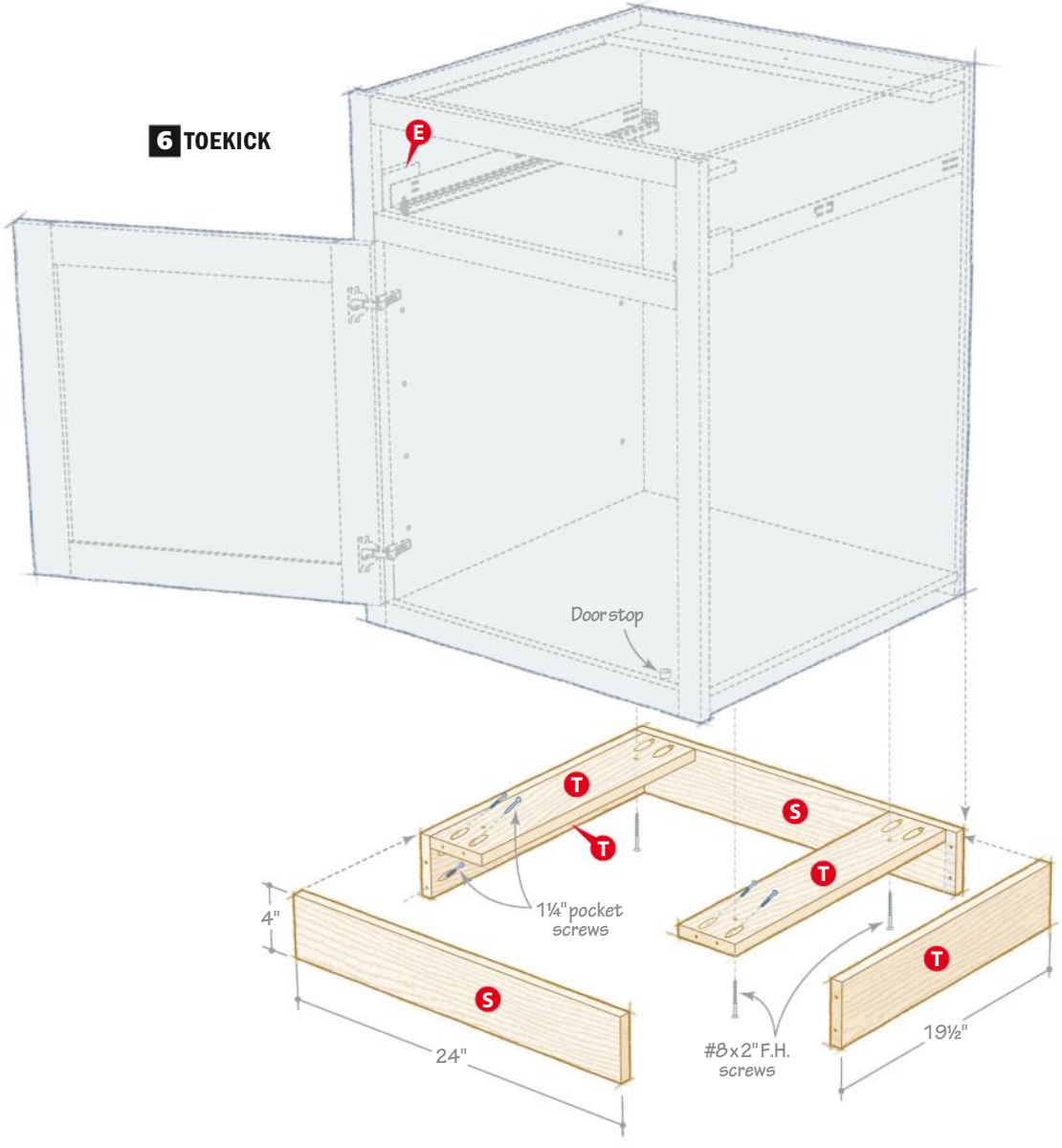
1 Cut the toekick parts (S, T) to size. Drill pocket holes and assemble the toekicks with pocket screws [**Drawing 6**].

2 Position the toekick on the bottom of the cabinet aligned with the face frame at the sides and flush at the back and screw it in place [**Drawing 6**].

5 WINE TRAY



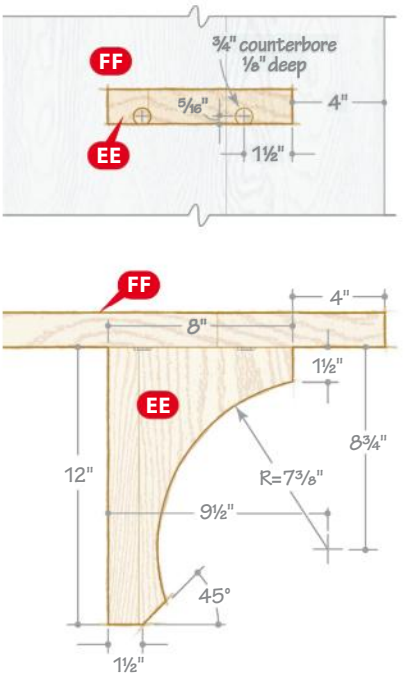
6 TOEKICK



I **Position the wainscot on the cabinet side**, flush at the top and back. Insert spacers (Y) at the top and screw the wainscot in place.

J **Screw the cabinets to the wainscot** with the cabinets clamped flush with the front wainscot ends.

8 CORBEL (Top and side views)



Make wainscot for the sides and front

__Note:__ If one end of your bar is against a wall, make one side wainscot panel and reduce the countertop length by ¾" and the bar-top length by 4".

1 Cut the parts for the side wainscot (U–Y) and the front wainscot (Z–DD). Groove and rabbet the rails and stiles [**Drawing 7, Exploded View**].

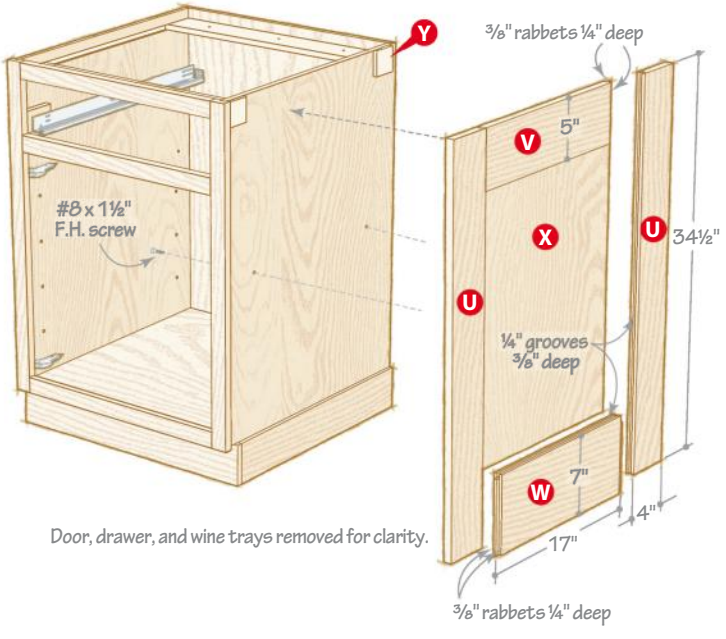
2 Glue and clamp the wainscots. After the glue dries, attach the wainscots to the cabinets [**Drawing 7, Photo I**].

3 Glue up blanks for the corbels (EE), cut and sand them to shape, and drill holes for figure-eight fasteners [**Drawing 8**]. Center the corbels on the front wainscot stiles and screw them in place [**Exploded View**].

4 Fasten the front wainscot to the cabinets [**Photo J**].

5 Glue up a blank for the bartop (FF) and cut it to size. Finish-sand the bartop, ease the sharp edges with a sanding block, and set it aside.

7 SIDE WAINSCOT



Door, drawer, and wine trays removed for clarity.

Laminate a countertop

1 To make the countertop, see the **Skill Builder**, *next page*. Fasten the countertop to the cabinets [**Exploded View**].

2 Screw figure-8 fasteners to the corbels (EE) [**Exploded View**]. Position the bar top (FF) on the corbels [**Drawing 8**]. Using the figure-8 fastener holes as guides, drill pilot holes into the bar top and fasten it to the corbels.

Apply finish and reassemble

1 Disassemble the bar top from the corbels and the countertop and front wainscot from the cabinets. Remove the drawers, door, and wine shelves from the cabinets. Remove all hardware. Inspect all parts and assemblies and finish-sand where needed. Apply stain and a clear topcoat. (We applied Varathane no. 263 Gunstock stain and top coated with General Finishes Enduro-Var satin.)

2 With the finish dry, reassemble the bar in the desired location and reinstall the hardware. Stock it up and toast your latest creation.

***Tip!** It's a good idea to assemble your project as you complete the various parts and before you apply the finish. This way adjustments can be made without ruining the finish.*

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

SKILL BUILDER

Make and laminate a countertop

Whether you are applying plastic laminate to this bar countertop or making anything from a kitchen counter to a simple tabletop, follow these easy steps.

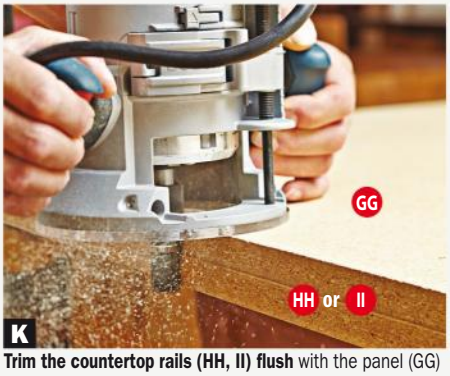
1 Cut the panel (GG) and end rails (HH) to size, and the front/back rails (II) ⅛" overlength. Glue and brad-nail the rails to the panel, letting the edges of the rails protrude evenly beyond all edges of the panel [**Exploded View**]. Flush-trim the rails [**Photo K**].

2 From plastic laminate, cut 2"-wide strips 1" longer than the countertop edges and ends. (We used Formica Graphite Nebula laminate.) Apply water-based contact cement with a short-nap roller to the countertop ends and the end laminate strips. Allow the cement to dry to the touch. Apply the laminate strips to the ends, letting them overhang all around. Firmly press the laminate in place with a roller or rounded-over wood block. Trim the laminate flush [**Photo L**]. Repeat for the front- and rear-edge laminate strips.

3 Cut ⅜×⅜" scrapwood strips several inches longer than the width of the countertop. Make enough to space them about every 12" along the length. Cut the top laminate 1" oversize in width and length. Apply contact cement to the countertop and the laminate and let it dry to the touch. Lay the strips on the countertop and the laminate on the strips. Adjust the laminate so it evenly overhangs the countertop all around. Adhere the laminate [**Photos M, N**].

Tip! *When flush-trimming the plastic laminate, make several passes. Remove contact cement residue from the edge between passes with a putty knife. Clean the bit and bearing with a rag and mineral spirits. Do not immerse the bit in the mineral spirits.*

4 Flush-trim the laminate. Remove the sharp edges with a bastard mill file, holding it at an angle to the top surface, applying light pressure, and drawing it along the edge.



Trim the countertop rails (HH, II) flush with the panel (GG) edges using a top-bearing flush-trim router bit.

Trim the edge strips flush with the countertop using a bottom-bearing flush-trim router bit. Adjust the bit to expose 3/32" of the cutters below the router base.

Starting at one end, withdraw the scrapwood strips one at a time as you press the laminate onto the countertop, smoothing it from side to side with your hand.

Firmly press the laminate onto the countertop using a roller, working over the surface across the width and along the length. Pay special attention to the edges.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Cabinets						
A	backs	½"	22¾"	30½"	MP	2
B	bottoms	½"	22¾"	23"	MP	2
C	sides	½"	23½"	30½"	MP	4
D	stretchers	½"	22¾"	2"	MP	4
E	mounting blocks	⅝"	2"	3"	O	4
F	stiles	¾"	1½"	30½"	O	4
G	rails	¾"	1½"	21"	O	6
Door						
H	stiles	¾"	2¼"	20⅞"	O	2
I	rails	¾"	2¼"	17⅛"	O	2
J	panel	¼"	17⅛"	17⅛"	OP	1
Drawers						
K	sides	⅝"	4"	21"	M	4
L	fronts/backs	⅝"	4"	19⅞"	M	4
M	bottoms	¼"	19⅞"	20¼"	BP	2
N	faces	¾"	4⅞"	20⅞"	O	2
Wine trays						
O	bottoms	¾"	22⅛"	22"	OP	5
P	edging	¾"	¾"	22⅛"	O	5
Q	bottle stops	¾"	¾"	22⅛"	O	5
R	dividers	¾"	¾"	12"	O	20
Toekicks						
S	front/back	¾"	4"	24"	OP	4
T	sides/stretchers	¾"	4"	19½"	OP	8
Side wainscot						
U	stiles	¾"	4"	34½"	O	4
V	upper rails	¾"	5"	17"	O	2
W	lower rails	¾"	7"	17"	O	2
X	panels	¼"	17"	23¼"	OP	2
Y	spacers	⅜"	2"	3"	O	4
Front wainscot						
Z	end stiles	¾"	4"	40½"	O	2
AA	center stile	¾"	4"	29¼"	O	1
BB	upper rail	¾"	5"	61¼"	O	1
CC	lower rail	¾"	7"	61¼"	O	1
DD	panels	¼"	29"	29¼"	OP	2
EE	corbels	1½"	8"	12"	EO	3
FF	bar top	1½"	15"	78"	EO	1
Countertop						
GG	panel	¾"	24¾"	70"	PB	1
HH	end rails	¾"	4"	16⅞"	PB	2
II*	front/back rails	¾"	4"	70"	PB	2

*Parts initially cut oversize. See the instructions.

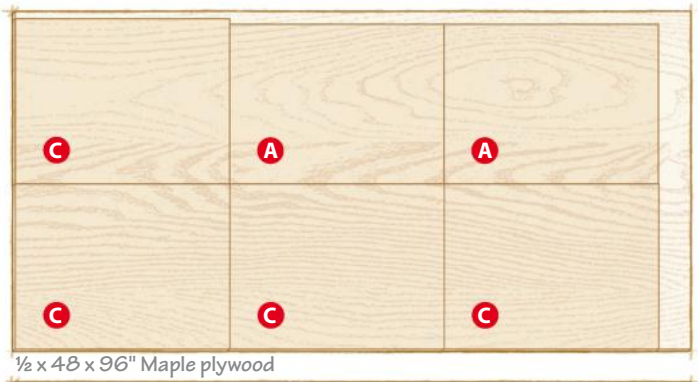
Materials key: MP–maple plywood, prefinished on one side; O–oak; OP–oak plywood; M–soft maple; BP–birch plywood; EO–edge-joined oak; PB–particleboard.

Supplies: 1¼" pocket screws (24), figure-8 fasteners (6), #8×1" flathead screws (14), #8×1¼" flathead screws (8), #8×1½" flathead screws (12), #8×2" flathead screws (28), ¼" shelf pins (20).

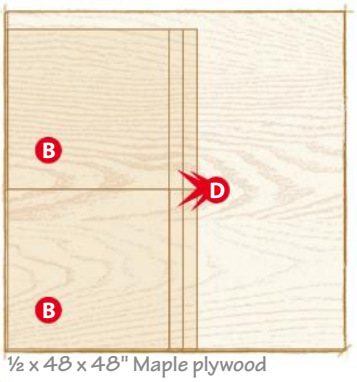
Blade and bits: Dado set; ⅛" round-over, top-bearing and bottom-bearing flush-trim router bits.

Source: Blum 110° clip-top soft-close half-cranked screw-on hinges (2), no. B071B3650, $5.48 ea.; Blum inset face-frame 9mm screw-on clip mounting plates (2), no. B175H5030.21, $3.14 ea.; Hettich Quadro IW21 soft-closing slides, 21" (2 pair), no. HT9134329, $24.66 per pair; Hettich Quadro metal rear brackets (2 pair), screw-on, no. HT9055093, $2.39 per pair; Hettich Quadro front clips for IW21 with spacers for ½" subfront (2 pair), no. HT9140416, $1.76 per pair; Amerock 1 3/16" square knobs, satin nickel, no. BP55271-G10 (3), $4.33 ea.; FastCap inset door stop, no. FCEURO DOOR STOP, $1.58 ea. Woodworker's Hardware, 800-383-0130, wwhardware.com.

Cutting Diagram



½ x 48 x 96" Maple plywood



½ x 48 x 48" Maple plywood

¾ x 9¼ x 96" Maple *Plane or resaw to the thicknesses listed in the Materials List.

¾ x 9¼ x 120" Oak

¾ x 9¼ x 96" Oak

This project requires 7 board feet of 4/4 maple, 33 board feet of 4/4 oak, and 25 board feet of 8/4 oak.

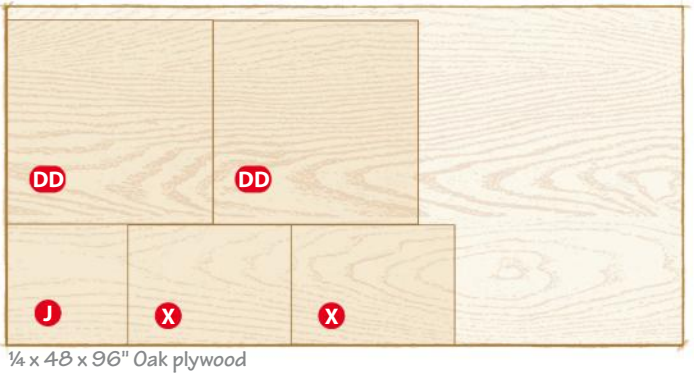
¾ x 7¼ x 96" Oak

¾ x 5½ x 72" Oak (2 needed)

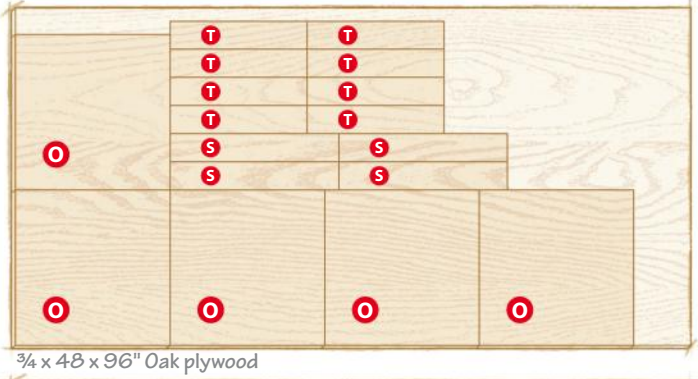
¾ x 9¼ x 96" Oak

1½ x 5½ x 96" Oak (3 needed)

1½ x 3½ x 48" Oak

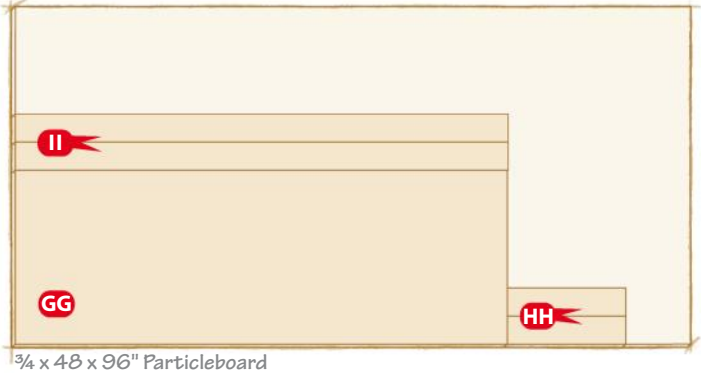


¼ x 48 x 96" Oak plywood



¾ x 48 x 96" Oak plywood

¼ x 24 x 48" Birch plywood



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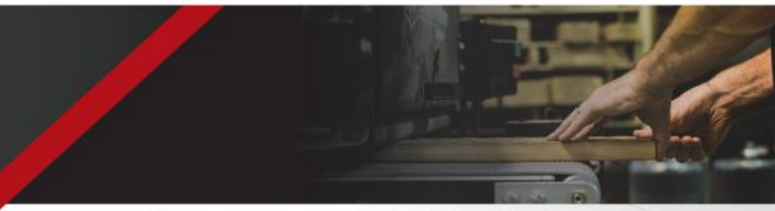

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Bolt Action Pen Kits

Our best-selling pen kits enjoys a huge following in the pen making community. It's beloved for its realistic bolt-action handle that smoothly advances and retracts to securely lock the refill in place. Includes a bolt-action rifle clip and replica 30 caliber cartridge and rose gold tip for added authenticity. You can even reverse the bolt for left handed operation! Requires a pen making mandrel, bushings (Item # PKCP3000BU $5.95) and 3/8" drill bit (Item #PKEXEC-3/8 $3.95). Patent No.: US D682,352 S

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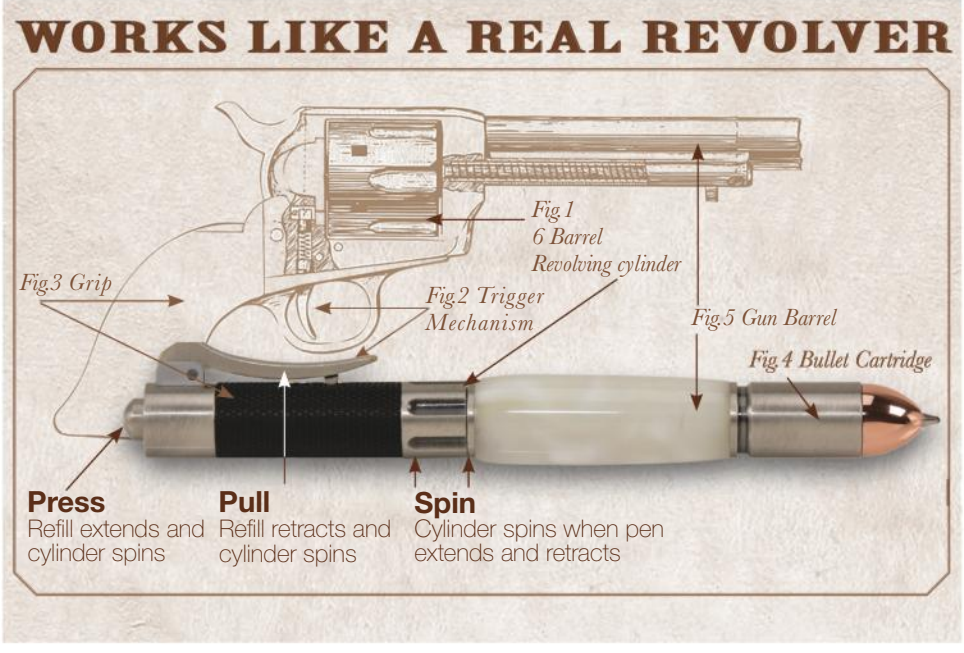
Our FREE 45-minute instructional DVD is packed with all the info you need to start making pens. Order Item # DVD. You'll join thousands of other pen makers who love creating beautiful gifts!

Revolver Pen Kits *NEW!*

These nostalgically stylish pens look and work just like a real revolver. When you press the click mechanism the pen tip extends, the trigger clip moves up and the 6-barrel cylinder rotates to replicate you loading the gun. Then, when you pull the hairpin trigger pen clip the tip retracts while the 6-barrel cylinder quickly spins to replicate you firing the gun. Right above the cylinder you'll find a black metal grip that mimics a revolver handle. And the bullet cartridge pen tip represents your favorite revolver bullet. Requires a pen making mandrel, bushings (Item # PKREVBU $5.95) and 3/8" drill bit (Item # PK10-10 $3.95).
Patent pending.



Bolt Action Pen Kit in Chrome

Bolt action handle smoothly advances and retracts the refill

Revolver Pen Kit in Antique Brass

Revolver Pen Kits *NEW!*

	Item #	1-4	5-9	10-24	25+
Chrome	#PKREVCH	$22.95	$21.95	$20.95	$19.95
Gun Metal	#PKREVGM	$22.95	$21.95	$20.95	$19.95
Antique Brass *(shown above)*	#PKREVAB	$24.95	$23.95	$22.95	$21.95
Antique Pewter	#PKREVAP	$24.95	$23.95	$22.95	$21.95

4 Revolver Pen Kit Starter Set

You get 1 Pen Kit in Chrome, 1 in Gun Metal, 1 in Antique Brass and 1 in Antique Pewter. Plus, you get the bushings and drill bit.

#PKREVSS **SAVE $25** **Only $79.95**

**Kits in packs may vary subject to availability*

SAVE 24%

Chrome

Gun Metal

Antique Pewter

Bolt Action Pen Kits *BEST SELLER!*

	Item #	1-4	5-24	25-49	50+
Chrome *(shown above)*	#PKCP8010	$12.95	$12.05	$11.15	$10.25
Gun Metal	#PKCP8020	$12.95	$12.05	$11.15	$10.25
24kt Gold	#PKCP8000	$14.95	$13.95	$12.95	$11.95
Antique Brass	#PKCP8040	$14.95	$13.95	$12.95	$11.95

3 Bolt Action Pen Kit Starter Set

You get one of each pen in Chrome, Gun Metal and 24kt Gold plus the 3/8" drill bit and 2pc Bushing Set

#PKCPBAPAK SAVE $8 **Only $42.75**

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SAVE 16%

Gun Metal

24kt Gold

Deer Hunter Bolt Action Pen Kits

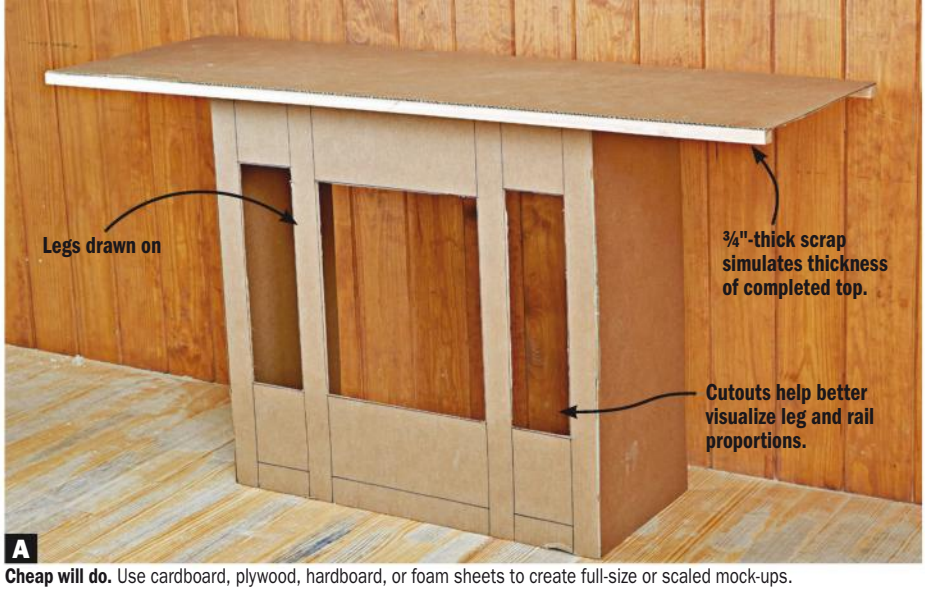
	Item #	1-4	5-24	25-49	50+
Antique Brass	#PKCP8DHAB	$16.95	$15.95	$14.95	$13.95
Antique Pewter	#PKCP8DHAP	$16.95	$15.95	$14.95	$13.95

Antique Brass

Antique Pewter

Take Your Projects from Good to Great!

What separates a "nice" project from a "great" one can be simply several details better executed. Learn to recognize those details, then improve the skills required to create them, and watch the quality of your projects soar. To help you down that path, we've gathered the collective wisdom of the *WOOD*® staff. We all wish we'd been told (or had paid attention to) these lessons when we started woodworking.



Cheap will do. Use cardboard, plywood, hardboard, or foam sheets to create full-size or scaled mock-ups.

Set up your tools carefully, then make test cuts in scrap to verify accuracy before cutting project parts.

Before the build

Make mock-ups. These help you visualize a project's proportions and how it fits into a space. Build quickly using lightweight materials held together with tape, hot glue, staples, brads, or pocket screws, getting only as detailed as you need [Photo A]. A box matching a project's outside dimensions may be enough to determine if it fits well in its intended spot. Attach or draw drawer fronts, legs, or moldings to better visualize them.

Sometimes you only need a mock-up of part of a project, such as a joint or a molding profile, to assess its scale or appearance. These may require making full-size samples in scrap material. As a bonus, this familiarizes you with the technique for making them before constructing the project.

▶Find free articles and videos to help you tune many of your tools. woodmagazine.com/tune

Take time to tune your tools and jigs. A misaligned fence, cutter, or table introduces slight errors when milling parts or cutting joinery—those errors show up as gaps, out-of-square surfaces, or worse during assembly.

Buy the best tool you can afford. Whether it's a combination square or a tablesaw, better design, higher-grade materials, and tighter tolerances cost more. However, top price doesn't always buy the best tool. Most of us work within a budget, so research for quality first. Then, if necessary, save up for the purchase—even if that means delaying it. As the saying goes, cry once when you buy it, or cry every time you use it.

During the build

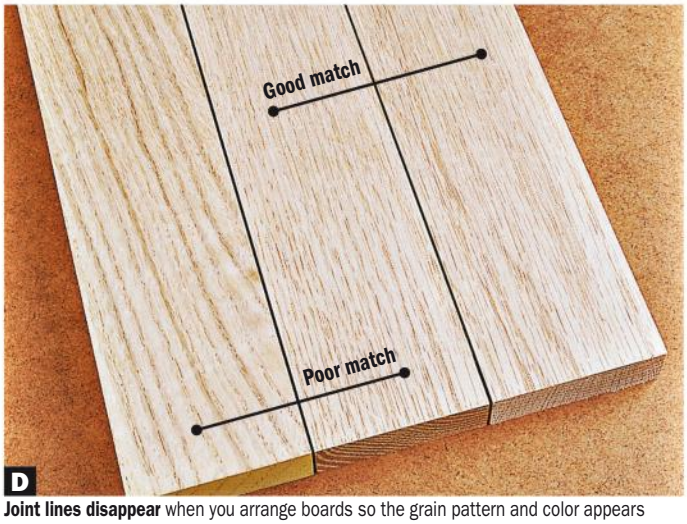
Pay attention to the grain. Cutting boards for the most efficient yield, or to match a cutting diagram, rarely produces parts with the most eye-appeal. Instead, choose straight grain for narrow parts, and save cathedral grain to use on larger panels, if it looks appropriate, *opposite page*. If the grain doesn't parallel the edges of a board, rip at the bandsaw to correct that [Photo C]. Cut plywood panels to center grain patterns in a frame.

Select boards with similar color for panels and subassemblies, such as doors or drawer fronts. When gluing up panels, choose and arrange boards so the grain flows across the joint lines [Photo D].

▶Watch a video on selecting grain patterns in plywood. woodmagazine.com/woodgrainselection

▶Learn more about selecting grain. woodmagazine.com/selectgrain woodmagazine.com/grainreigns

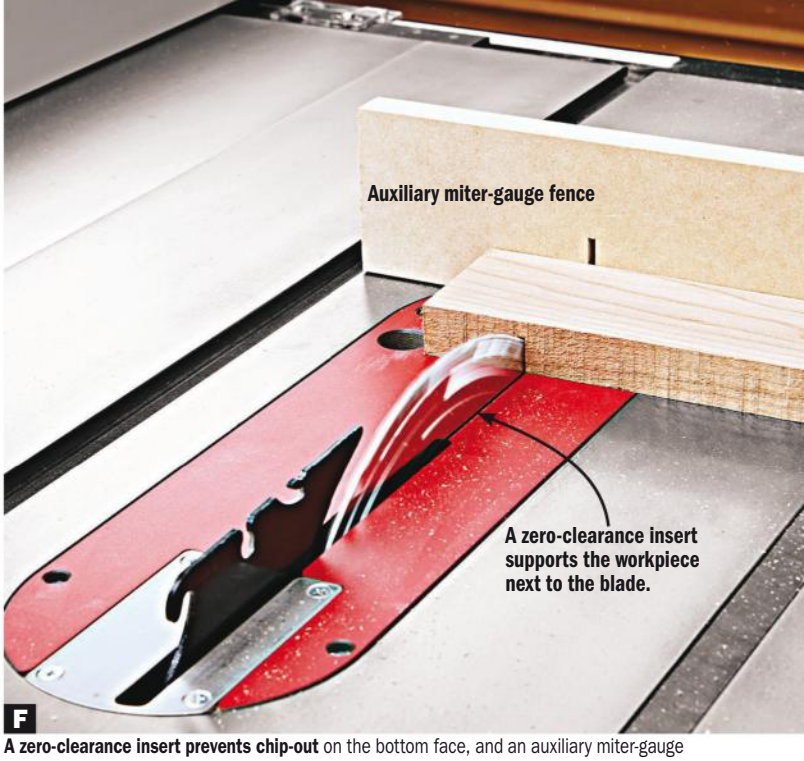
Lay out a line parallel to the grain, then bandsaw as close to the line as possible. Joint the edge before ripping the piece to width at the tablesaw.



Joint lines disappear when you arrange boards so the grain pattern and color appears continuous. The seam between the two boards on the left will be obvious. The line between the two on the right will be nearly invisible.

E

Determine exact part dimensions by marking them directly from the project. For example, when sizing a divider, place it in one of the dadoes of a dry-fit carcase. A marking knife at the opposite dado establishes a fine, precise line.



F

A zero-clearance insert prevents chip-out on the bottom face, and an auxiliary miter-gauge fence backs up the trailing edge of the workpiece.

Start square to stay square. Check the squareness and flatness of cut surfaces and assemblies as you go. Make corrections as needed, or the error will multiply as you add or try to fit other parts. Sometimes this means trimming parts to slightly smaller dimensions, which leads to…

The project, not a cut list, dictates part sizes. As you build, small errors inevitably creep in. Cut a set of legs 1/128" under the intended width, sand away another 1/128" from each and the intended width and depth of a project shrink by 1/32". That can affect the fit of drawers and inset doors. Cut dadoes for a shelf 1/32" too deep, and the shelf length must increase by 1/16" to prevent a gap. Compensate by measuring the project as you go to determine the size of parts that must fit between or within other parts [**Photo E**].

▶Get more marking and layout tips. woodmagazine.com/markingtips

Mark precise lines. Rather than working with a pencil, score narrower lines with a marking knife [**Photo E**]. Register a chisel tip or handsaw blade in the knife cut to make precise cuts.

▶Learn more techniques to prevent chip-out. woodmagazine.com/chipout

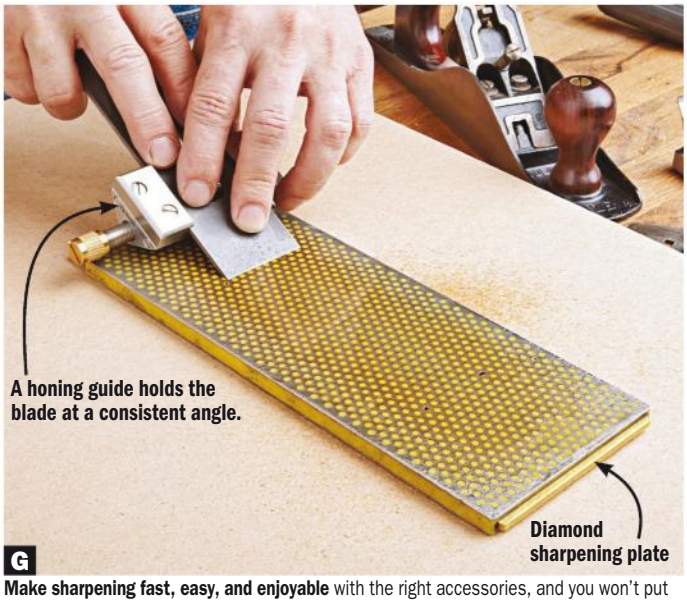
Skip out on chip-out. When cutters exit a workpiece, the force tears away unsupported wood fibers, causing chip-out. Keep cuts clean by backing up the workpiece with surfaces that tightly surround those fibers [**Photo F**].

▶Learn four methods for sharpening. woodmagazine.com/sharpeningshowdown

Take time to sharpen. Well-honed cutters reduce chip-out, leaving cleaner edges because they sever the wood, rather than crush and tear it. Keep plane blades and chisels honed [**Photo G**], and have a backup blade for your tablesaw to eliminate downtime while having your primary blade sharpened.

Embrace hand tools. Chisels, planes, card scrapers, and handsaws have lofty reputations as tools reserved for expert craftsmen who understand their mysterious vagaries. Nonsense. If you don't have them already, outfit your shop with a set of bench chisels, a block plane, a No. 5 jack plane, a card scraper, and a Japanese pull saw [**Photos H–K**]. Learn to tune the planes, and sharpen all but the saw. (Replace its disposable blade rather than sharpen it.) All provide superfine control

▶Learn to set up and use these hand tools. woodmagazine.com/goodtogreat



G

Make sharpening fast, easy, and enjoyable with the right accessories, and you won't put it off. With a set of sharpening stones or plates and a honing guide, you can touch up an edge in less than two minutes.

H

Use chisels to chamfer ends, clean up mortises, and square up rounded ends left by router bits when cutting stopped rabbets or dadoes.

I

Planes create chamfers faster than setting up a router bit, remove razor-thin shavings to fine-tune the fit of a workpiece, and remove tooling marks to speed or even eliminate finish-sanding.

of a workpiece's dimensions and, when well-tuned, prove a pleasure to use.

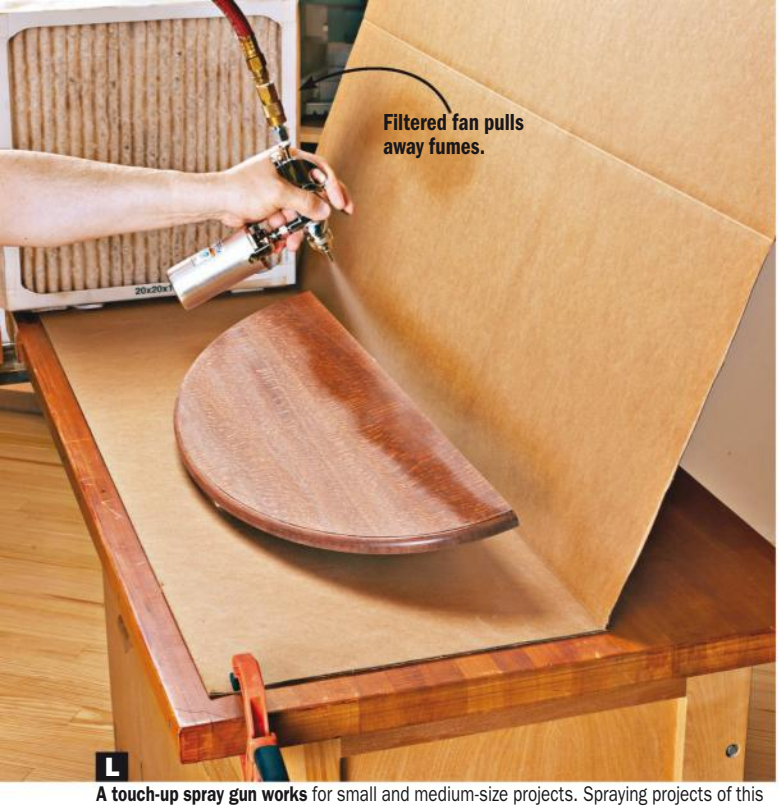
Be patient. Don't rush construction; it only increases chances of mistakes and mishaps. Remember, you or the recipient will enjoy this project for years to come. Don't be reminded every time you look at it that an extra hour or day in the shop would have made it better. Avoid establishing deadlines to complete projects; instead enjoy the process as time allows. When you reach an impasse, take a break. A walk or a good night's sleep often provides a fresh perspective or solution.

J

Card scrapers smooth joint lines on panels and remove tooling marks. A small burr along the edge of a properly sharpened scraper removes fine, curly shavings.

K

Japanese saws cut on the pull stroke and provide excellent control. Use one for cutting small parts and joinery, and making interior cuts a power saw can't.



A touch-up spray gun works for small and medium-size projects. Spraying projects of this scale doesn't require a dedicated spray booth.

Position a light behind and just above the worksurface. This angle creates shadows that highlight flaws, stray brush bristles, dust nibs, and over- or under-covered areas.

After the build

Allow time for finishing. With a project assembled, it's tempting to get a finish on fast so you can call it done. But the last thing you do on a project is the first thing people notice about it. So apply each coat evenly, allow time for each coat to dry fully, and buff as needed between coats to smooth out nibs and brushstrokes.

▶ "Rubbing out" creates a finish that feels as good as it looks. woodmagazine.com/rubout

Master one or two "go-to" finishes. But don't limit yourself to them. Try numerous finishes and techniques to find what you like. We recommend a wipe-on oil/varnish blend (Watco is one brand) for projects that need warmth and light protection from abrasion. For a more durable surface, go with a wipe-on polyurethane.

▶ Get into spraying with scaled-down equipment. woodmagazine.com/smallsprayers

Spray it, don't lay it. Spraying speeds finishing, and when done properly, provides even coats. Start with aerosol cans for small projects, and invest in a spray gun and related items later [**Photo L**].

Finish in the right light. Regardless of how you apply finish, a raking light allows you to see problem areas where nibs, bubbles, or brush streaks remain [**Photo M**].

Clean crevices and corners. Finish, especially gel stains, can build up in these areas. Remove drips or blobs with the tip of a brush or the creased edge of a paper towel [**Photo N**].

Apply these tips to your work and see it begin to generate more "ooohs" and "ahhhs" than ever.

Produced by **Craig Ruegsegger**

Keep details crisp by closely inspecting molding profiles, inside corners, and edges as you apply finish. As you move a brush or rag over these areas, the corners can force more finish from the applicator, causing runs or drips.

Mil-spec CH-47 Chinook Helicopter

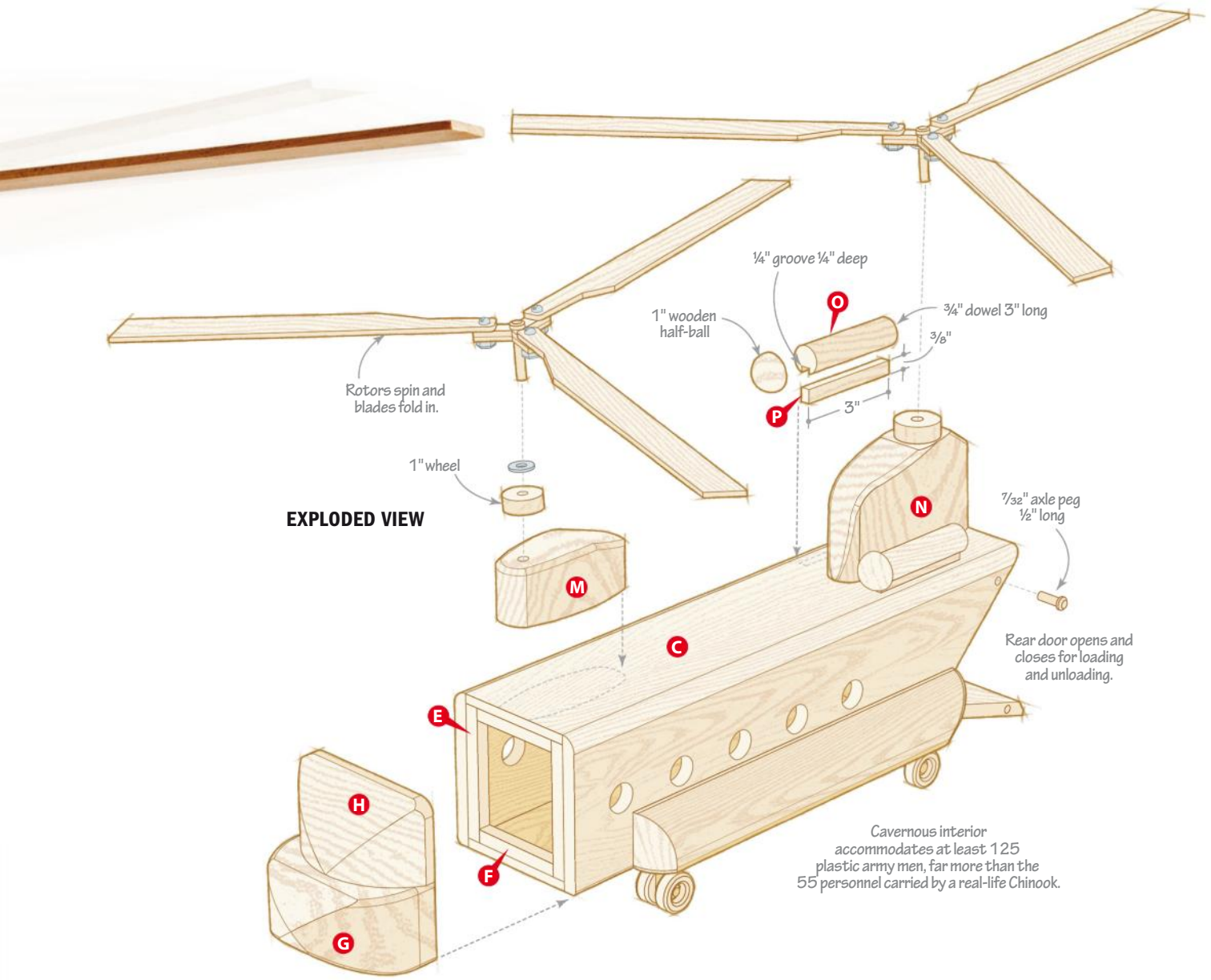
Although it requires imagination (and some mouth-made motor noises) to get this aircraft off the ground, it shares many moving parts with its real-world counterpart. The rotors spin and fold in for easy storage. A drop-down rear door provides access to a spacious cargo bay. And rolling landing gear enables tabletop maneuvers. To speed your build along, we've gathered all the specialty parts you need in a one-stop-shopping kit. See **Source** on *page 49*.

Since the first Chinooks were delivered to the military in the mid-1960s, this workhorse has served as a heavy hauler, moving troops and equipment, with oversize loads slung beneath its belly. The CH-47 Chinook serves civilian purposes as well, operating as cargo and service aircraft for oil companies, logging operations, and forest firefighters.

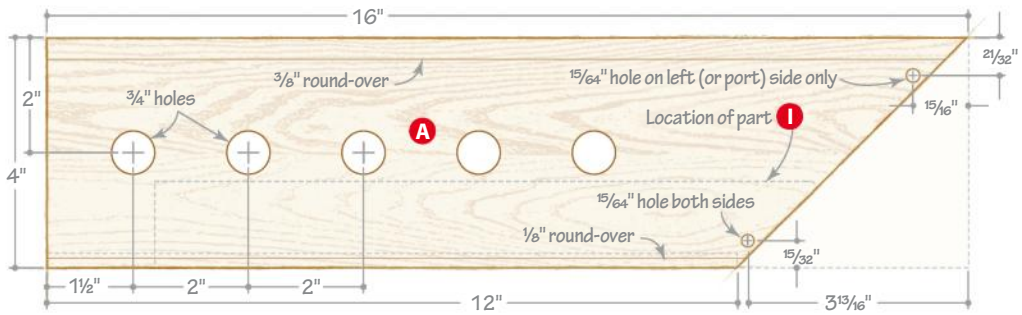
DIMENSIONS
6" W × 18½" D × 9 1/16" H

Approximate materials cost:
$30

Nearly 20" rotor diameter



1 FUSELAGE SIDE

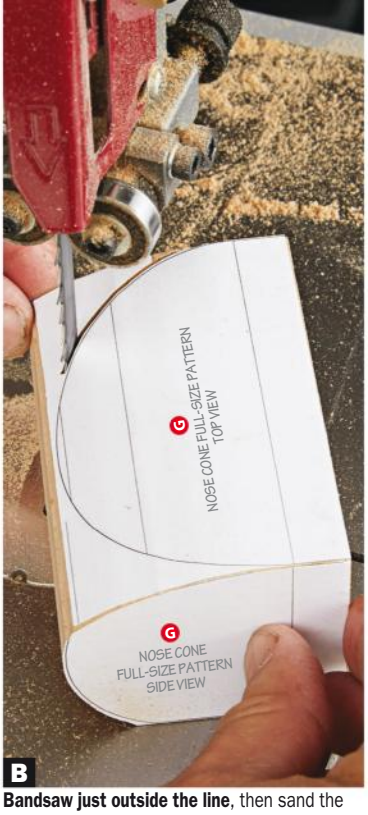


Fabricate the fuselage

1 Cut the sides (A) to size [**Materials List**], and stick them together with double-faced tape. Cut them to shape and drill the holes [**Drawing 1**]. Note that the 15/64" hole at the top corner is drilled in one side only.

A

Cut spacers to position the top (C) flush with the edges of the sides (A). Clamp the assembly together and check for square.



B

Bandsaw just outside the line, then sand the blanks smooth.

C

Use a ⅜" Forstner bit to rough out the flat-bottomed mortises that later accept the struts (J, K). Chisel the edges of the slots straight.

2 Cut the bottom (B) and top (C) to size. Glue them between the sides [**Photo A**].

3 After the glue dries, sand the end of the top (C) to match the angle of the sides. Round over the edges [**Drawing 1**], and finish-sand the assembly.

4 Cut the door (D) to size. Round over one end and chamfer the other and drill the holes for the axle pegs [**Drawing 2a**]. Place a drop of glue in each hole, position the door between the sides, and insert axle pegs. Wipe away any squeeze-out so the door will pivot freely. After the glue dries, cut and sand the pegs flush with the sides. Then drill the top hole in the door using the hole in the fuselage as a guide for the drill bit.

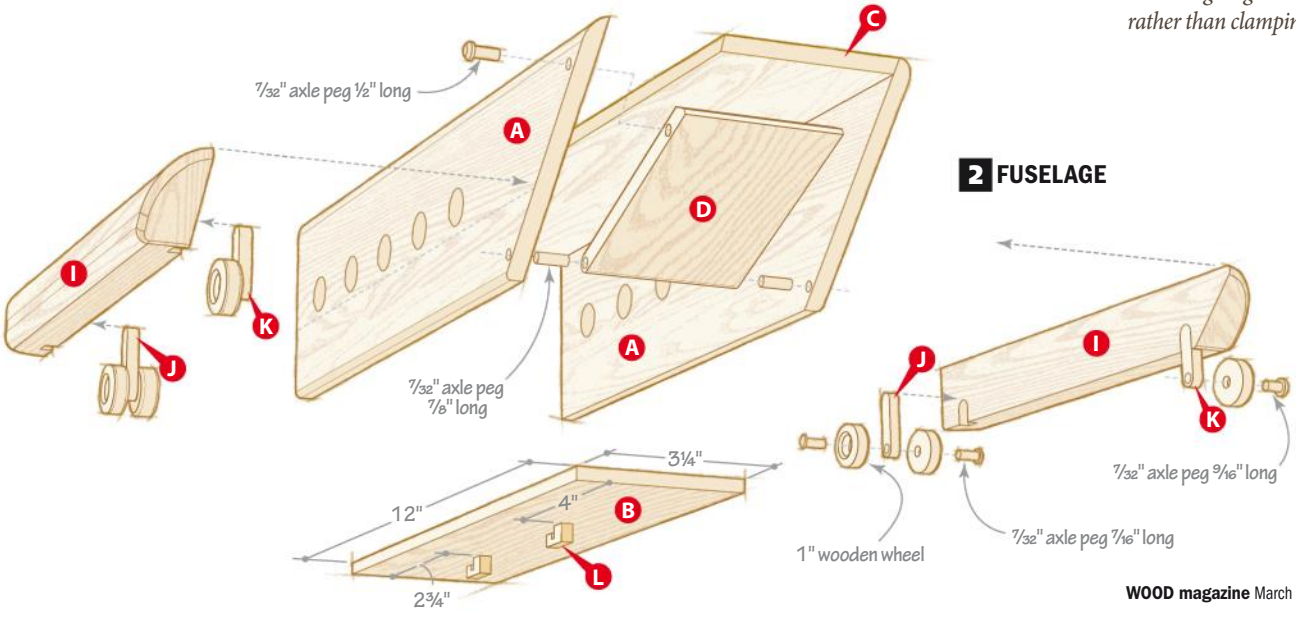
Tip! *A blast of compressed air will force squeeze-out from between the door and sides.*

5 Cut the nose mounts (E, F) to fit in the fuselage [**Exploded View**]. Glue them flush with the front end of the fuselage.

6 Cut the nose cone (G) and cockpit (H) to size. Spray-adhere copies of the **Side-view Full-size Patterns** to each blank, and bandsaw the profiles. Apply the **Top-view Patterns** and cut those profiles [**Photo B**].

7 Glue the nose cone and cockpit together, flush at the back and sides. Then, glue this assembly to the fuselage, flush all around.

Note: *Because of the odd shapes of the pieces, you may need to hold the parts in place until the glue grabs rather than clamping.*



No 1" round-over bit? No problem. Simply cut bevels outside the layout line at 20°, 30°, and 45° to remove the bulk of the waste. Finish shaping the curve with a block plane and sandpaper.

Clamp a scrap to the tank to keep it flat on the table as you cut the ends to shape.

Fuel around with the tanks

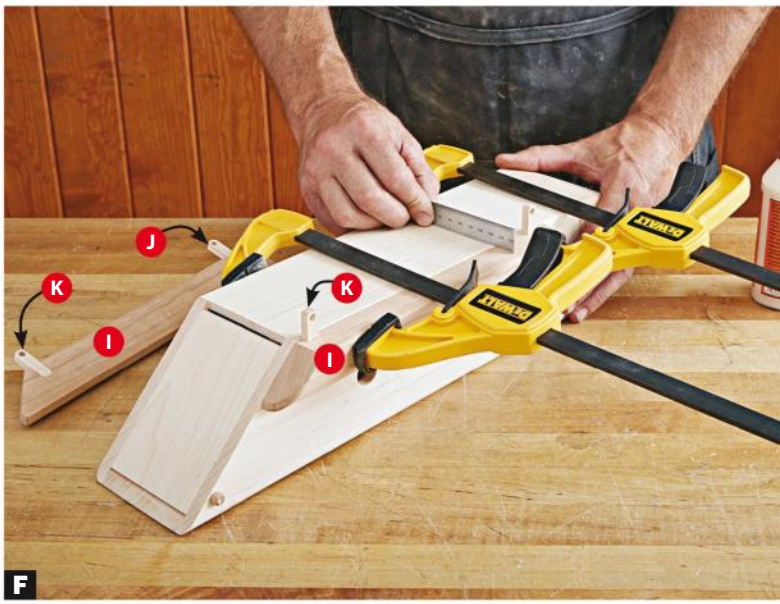
1 Cut the fuel tanks (I) to size. Lay out the radius on the ends and drill the mortises for the struts (J, K) [**Fuel Tank Full-size Patterns**, **Photo C**].

2 Rout the 1" round-over along the top edge of each fuel tank (I), or use the tablesaw [**Photo D**].

3 Apply copies of the **Fuel Tank Full-size Patterns** to the tanks and shape the tanks [**Photo E**].

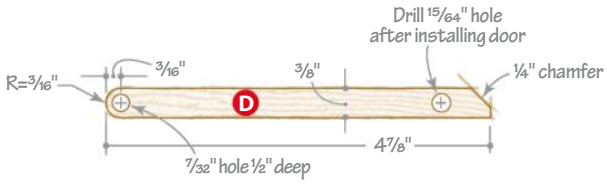
4 Cut a ¼×⅜×8" blank for the front and rear struts (J, K). Lay out the lengths for each, drill the holes, then cut and sand them to shape [**Drawing 2b**]. Glue the struts in place in the fuel tanks (I), then glue the tanks to the fuselage [**Photo F**].

5 Working on an oversize blank, bandsaw the hooks (L) and cut them to size [**Drawing 2c**]. Glue the hooks, centered, to the bottom (B) [**Drawing 2**].

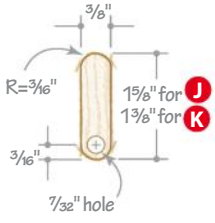


Align the fuel tanks with the bottom and rear of the fuselage.

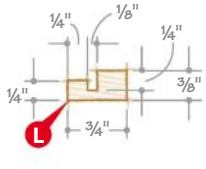
2a DOOR EDGE VIEW



2b LANDING GEAR STRUT

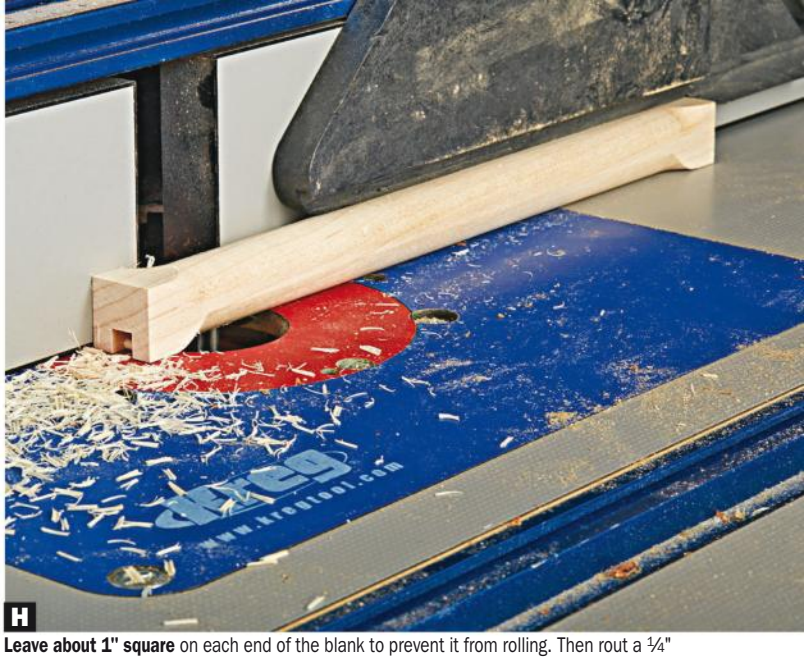


2c HOOK



G

Use a wedge to lift one end of a motor blank until the hole outline on the pattern aligns with a square. Then drill the hole.



H

Leave about 1" square on each end of the blank to prevent it from rolling. Then rout a ¼" centered groove the length of the blank to accept the mounts (P).

Shape the motors and rotors

1 Cut blanks to size for the motors (M, N). Spray-adhere the side patterns to the respective blanks. Drill the hole in each [**Photo G**].

2 Bandsaw along the side patterns. Then apply the **Motor Top-view Patterns** and bandsaw these profiles. Sand the motors smooth and round over the top edges. Glue the rear motor (N) to the top (C) flush at the rear. Overlap the front motor (M) 3/16" onto the cockpit (H) and glue it down. Glue a 1" wheel [**Source**] to each motor, using an axle peg to align the holes. Remove the peg.

3 To make the turbines (O), rout ⅜" roundovers on a ¾×¾×9" blank [**Photo H**]. Cut the turbines to length, and glue a 1" half-ball [**Source**] to one end of each [**Exploded View**].

4 Cut the turbine mounts (P) to size and glue them into the slots in the turbines. Glue the turbine assemblies centered between the rear motor and the edge of the top, with the front ends flush with the front of the motor.

5 Cut the six rotors to size. Adhere them together with double-faced tape to make two stacks of three. Apply a copy of the **Rotor Full-size Pattern** to each stack, drill the hole, and cut and sand the rotors to shape.

6 Cut four ⅛×2×2" maple blanks and glue them together in pairs with the grain running perpendicular to each other. Apply a copy of the **Rotor Hub Full-size Pattern** to each, drill the hole, and cut them to shape.

Finish and assemble

1 Apply a finish to all parts. We used satin aerosol lacquer.

2 Attach the rotors to the hubs (R) [**Drawing 3**]. Put a drop of glue in the hole in each motor and attach the rotor assembly with a washer between the hub and wheel.

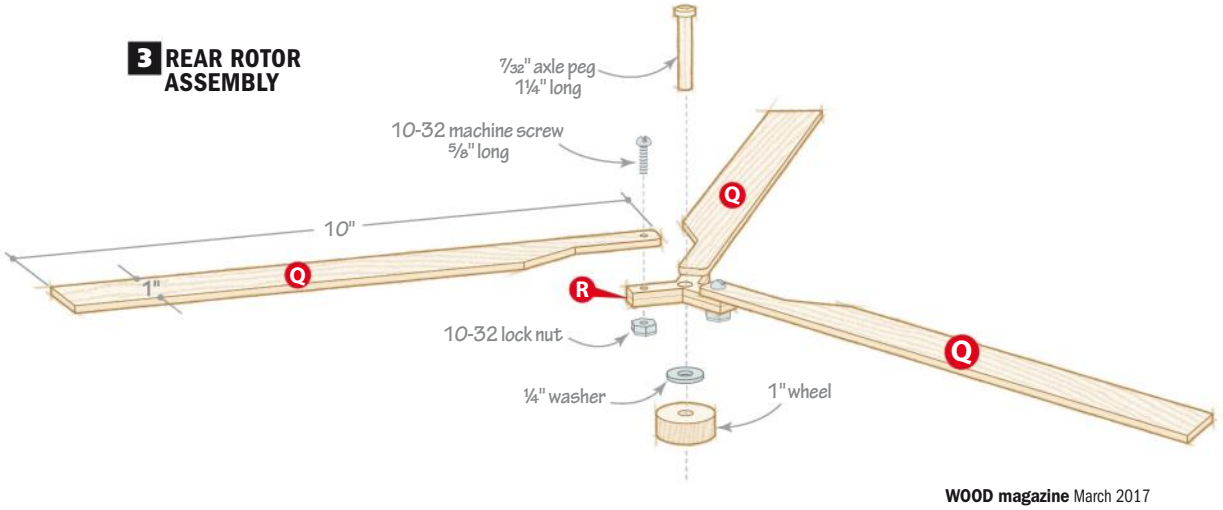
3 Cut pegs to length to attach the wheels to the struts. Note that the front wheels have a peg on each side [**Drawing 1**]. Your Chinook is ready for service.

Tip! *Drip mineral spirits along the edges of the rotors to soften the tape adhesive before separating them.*

▶ Making cross-grain laminations strengthens a potentially fragile part.

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

3 REAR ROTOR ASSEMBLY



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The 42" wingspan of the AC-130 supports four spinning propellers. Drop down the rear door to load cargo inside. Issue 236 (Nov. 2015)

The M1A1 Abrams tank is ready to roll and provide support for your green plastic army men. Plus it fits inside the AC-130. Issue 239 (May 2016)

Patrol the waves of your living room floor with this stately warship, or anchor it atop the fireplace mantel. Issue 243 (Nov. 2016)

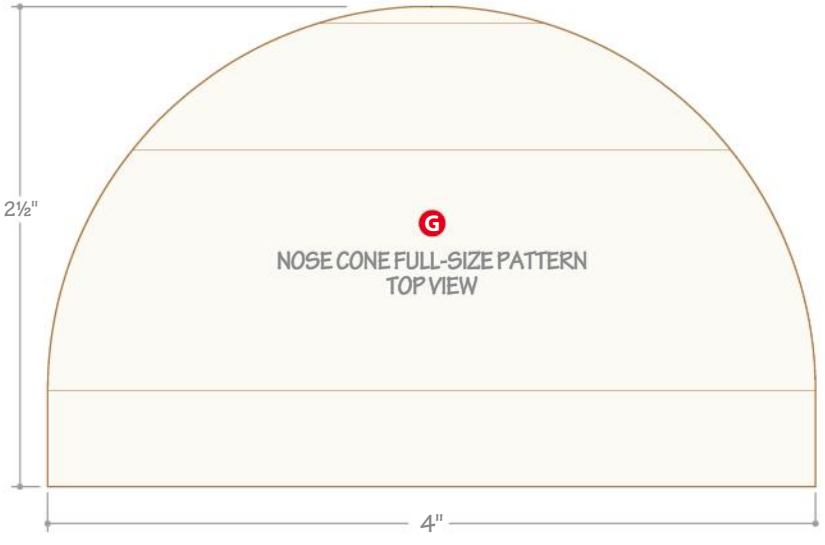
Order step-by-step plans and hardware kits.
woodmagazine.com/mil-spec

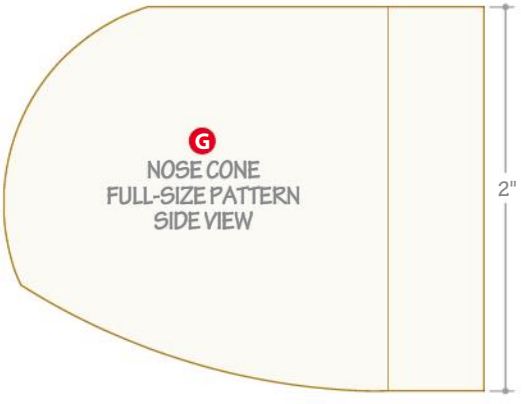
Materials List

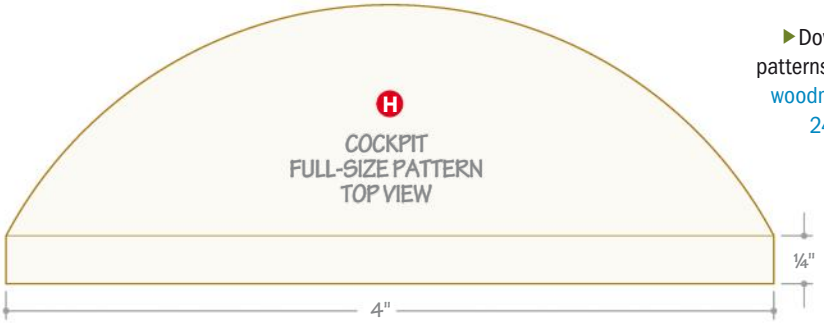
Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	⅜"	4"	16"	M	2
B	bottom	¼"	3¼"	12"	M	1
C	top	¼"	3¼"	16"	M	1
D	door	⅜"	3 3/16"	4⅞"	M	1
E	vertical nose mounts	⅜"	⅜"	3½"	M	2
F	horizontal nose mounts	⅜"	⅜"	2½"	M	2
G	nose cone	2"	2½"	4"	C	1
H	cockpit	2"	1 7/16"	4"	C	1
I	fuel tanks	1"	1½"	11½"	C	2
J*	front struts	¼"	⅜"	1⅝"	M	2
K*	rear struts	¼"	⅜"	1⅜"	M	2
L	hooks	¼"	⅜"	¾"	M	2
M	front motor	1½"	1½"	3⅝"	C	1
N	rear motor	1½"	3⅛"	5"	C	1
O*	turbines	¾"-dia.		3"	M	2
P	turbine mounts	¼"	⅜"	3"	M	2
Q	rotors	⅛"	1"	10"	M	6
R*	rotor hubs	¼"	1⅝"	1⅞"	LM	2

*Parts initially cut oversize. See the instructions.

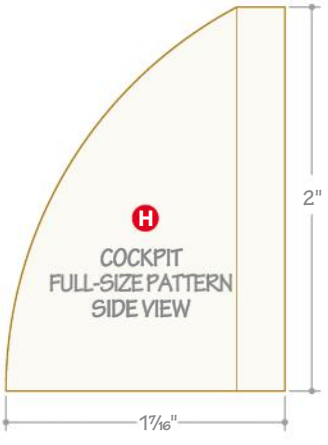
Materials key: M-maple, C-cherry, LM-laminated maple.
Blade and bits: ⅜" Forstner bit; ¼" straight, ⅛", 3/16", 3/8", 1" round-over router bits.
Source: Each kit includes the hardware and specialty parts to build one helicopter. You provide the lumber. 10-32x⅝" machine screws (6), 10-32 lock nuts (6), ¼" washers (2), 1" half-balls (2), 1" wheels with tread (6), 1" smooth wheels (2), 7/32" axle pegs (11), kit no. RS-01140, $7.95, 888-636-4478, woodmagazine.com/chinookkit.

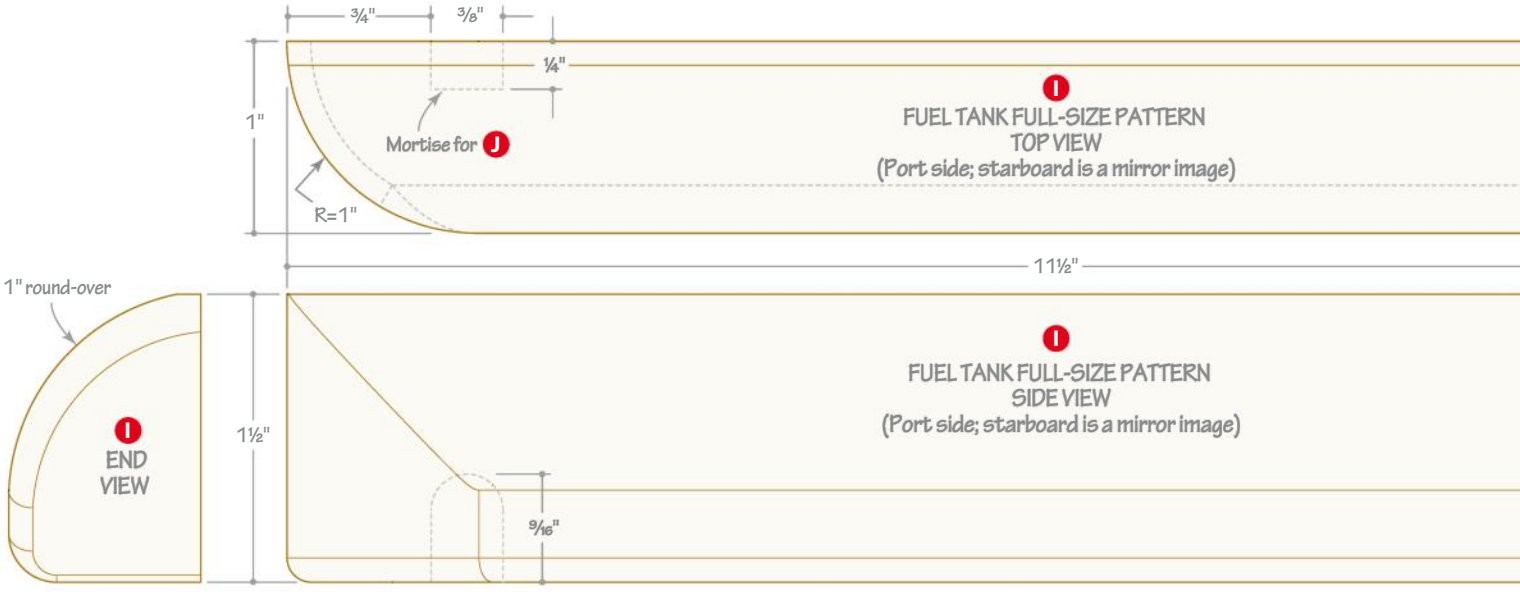


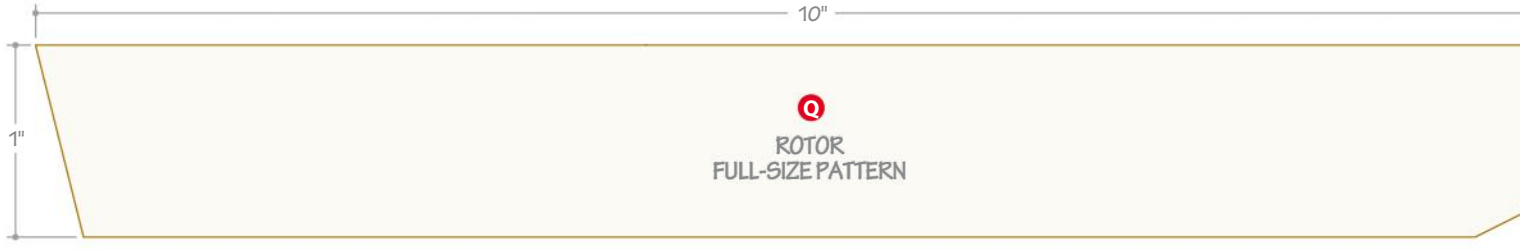




▶Download all the patterns for this project.
woodmagazine.com/245patterns







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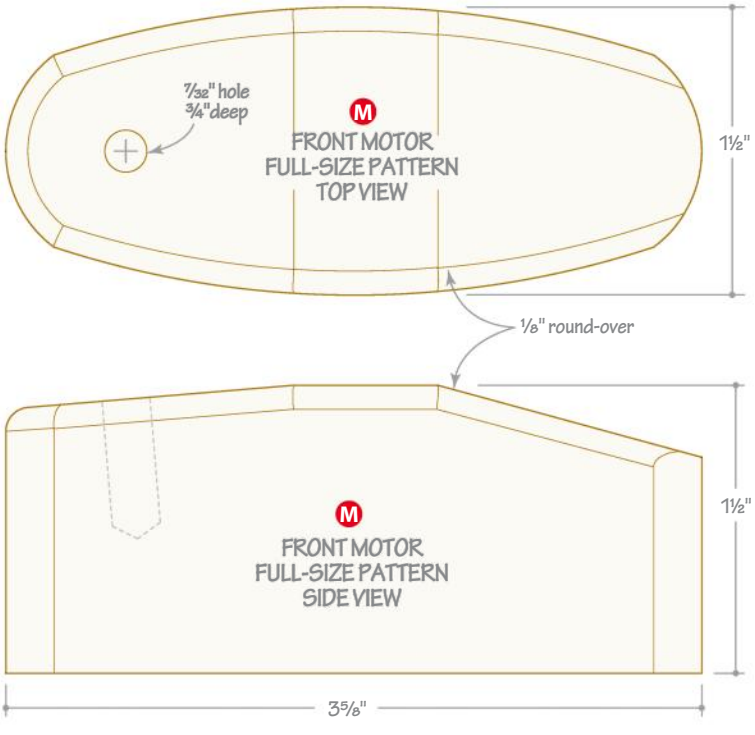
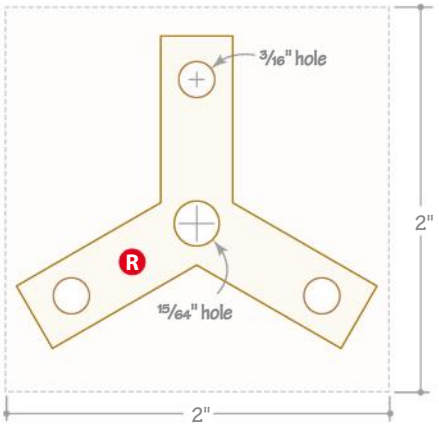
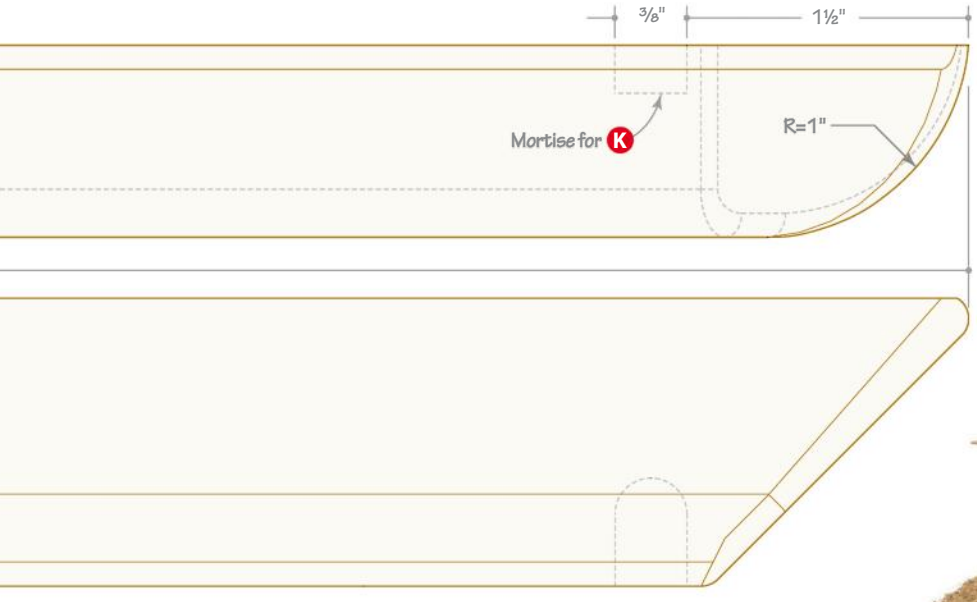
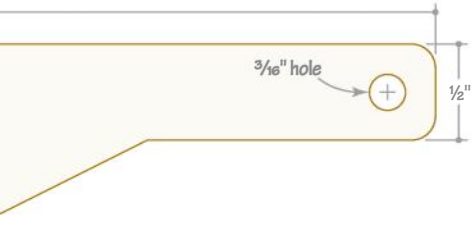
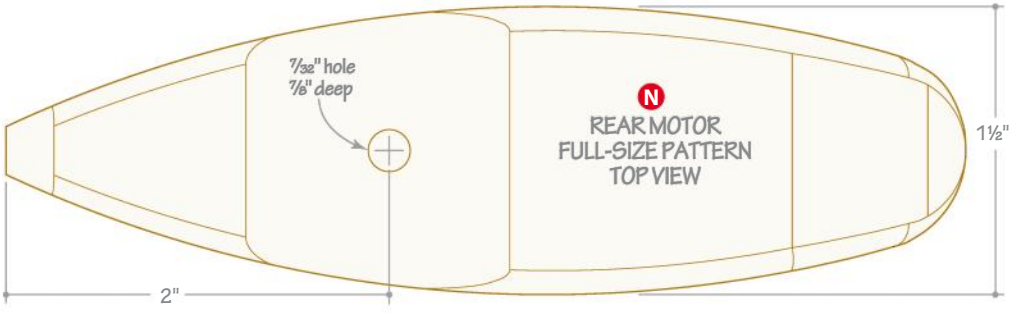


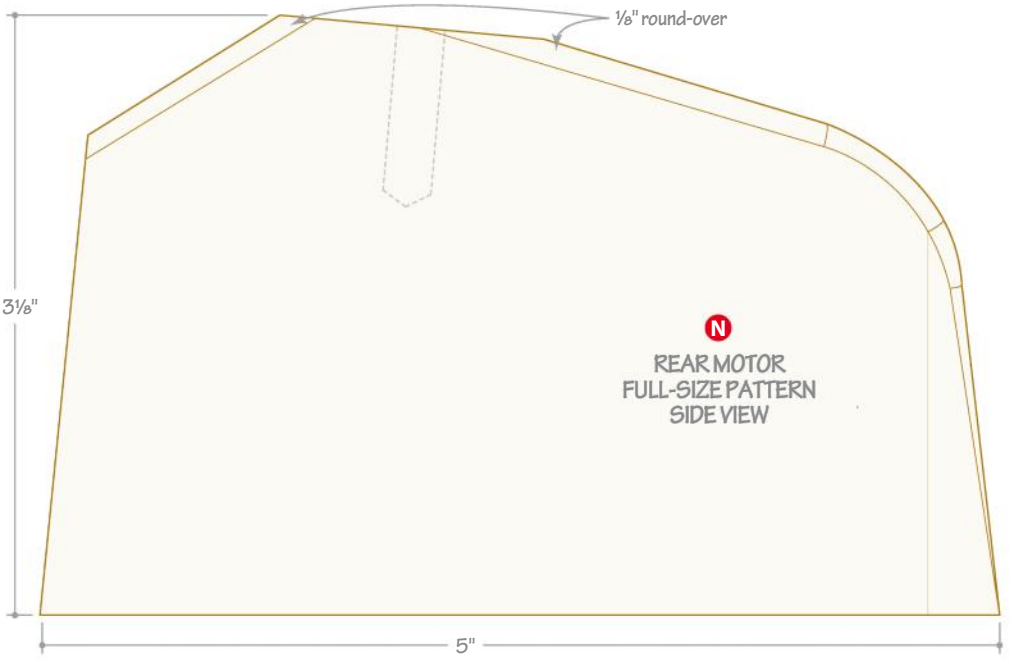


ROTOR HUB
FULL-SIZE PATTERN


3/8"
1½"
Mortise for K
R=1"

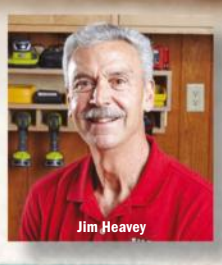

3/16" hole
½"


7/32" hole
7/8" deep
N
REAR MOTOR
FULL-SIZE PATTERN
TOP VIEW
1½"
2"


1/8" round-over
3⅛"
N
REAR MOTOR
FULL-SIZE PATTERN
SIDE VIEW
5"

Bandsaw Resawing

By Jim Heavey


Jim Heavey

The first time I saw a piece of furniture with book-matched door panels was at a museum exhibit of 17th- and 18th-century woodworking. After looking at those nearly identical panels with mirrored grain, I was hooked. At the time, my small basement shop had an old Craftsman bandsaw. Its "one size fits all" blade provided usable radiused cuts, but was far from ready for the resawing work that I now had planned for it. And frankly, the saw needed more than just a new blade to resaw accurately and consistently.

▶Resawing: Cutting lumber along its grain, parallel to the face.

I learned a lot of lessons back then about how to make any bandsaw, and its owner, a can't-miss resawing team. The first step is giving your bandsaw a good tune-up to set the table perpendicular to the blade, get peak performance from the guides, and ensure the blade tracks true.

▶Review basic bandsaw setup. woodmagazine.com/2sawtuneup

With your saw well-tuned, turn to the blade. Resawing wide boards requires a blade that cuts evenly throughout the stock's thickness while evacuating large amounts of sawdust. The wider the blade, the straighter the cut, so use the widest blade your bandsaw can handle. Most saws accept at least a ½"-wide blade, and many even wider. Typically, a wide 3-tooth-per-inch (tpi) blade provides the perfect blend of aggressive yet smooth cut and sawdust evacuation that resawing requires.

▶There are many types of blades and tooth styles to consider. Find the best one for the job. woodmagazine.com/bsblades

Finally, consider the fence on your saw. The workpiece should be no more than twice the height of the fence. For example, a 4"-high fence will accommodate an 8"-wide board. Use an auxiliary shop-made fence when more height is needed.

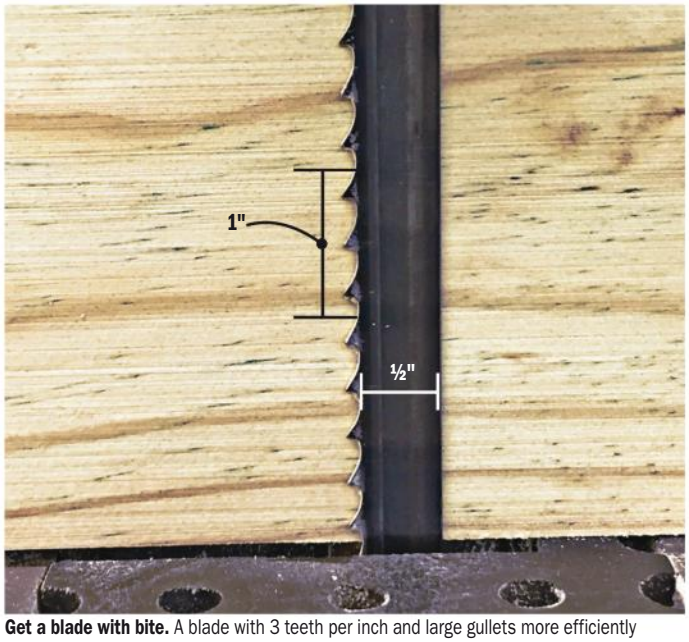
Why resaw?

The simple answer is to get more from your stock. For example, rather than planing a 1"-thick board to ⅜", resawing can net two boards from the same piece. As an additional benefit, each of these boards will have nearly identical grain patterns, resulting in book-matched faces, *right*. Slicing that same 1"-thick board into ⅛"-thick veneers makes an expensive wood species go even further.

It's not always easy to predict the book-match. All wood grains have the potential for great figure, and choosing stock with interesting grain patterns most often yields the best results. Look what was inside the lowly 2×4 scrap I used to test my bandsaw setup!

Ready, set and now, go!

Begin by squaring up your stock and a piece of similarly sized scrap. This will ensure that the stock sits flat on the table and plumb to the fence. Using the scrap piece, test the saw setup. Position your fence for the desired



Get a blade with bite. A blade with 3 teeth per inch and large gullets more efficiently removes sawdust that can cause the blade to bind and deflect.

Keep the stock firmly against the fence and the tabletop. A pushstick keeps needed pressure against the fence, and your hands away from the blade as it exits the cut.

Stand a square ¼" from the blade (you may have to raise the blade guard to accommodate the square), and press the center of the blade. Moderate pressure should deflect the blade to touch the square.

A blade too far back on the wheel, such as this one, tends to make the cut drift toward the fence. A blade that runs too close to the front edge of the wheel does the opposite.

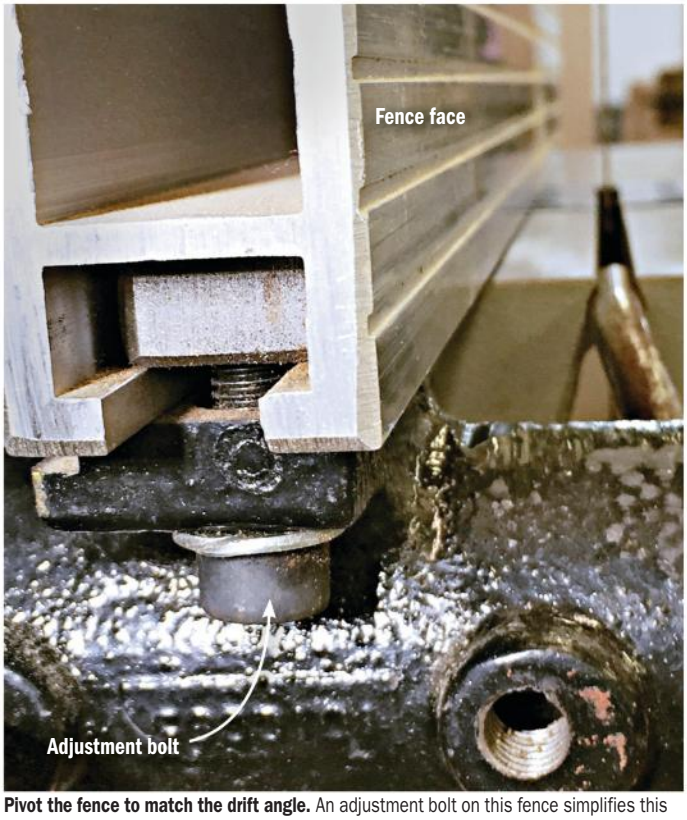
thickness and feed the stock slowly into the blade. The saw motor should run smoothly without bogging. Finish the cut by using a pushstick to move the stock past the blade. Now, check the cut.

If the cut piece is thicker at the top or bottom, check that the table is 90° to the blade, and adjust if necessary.

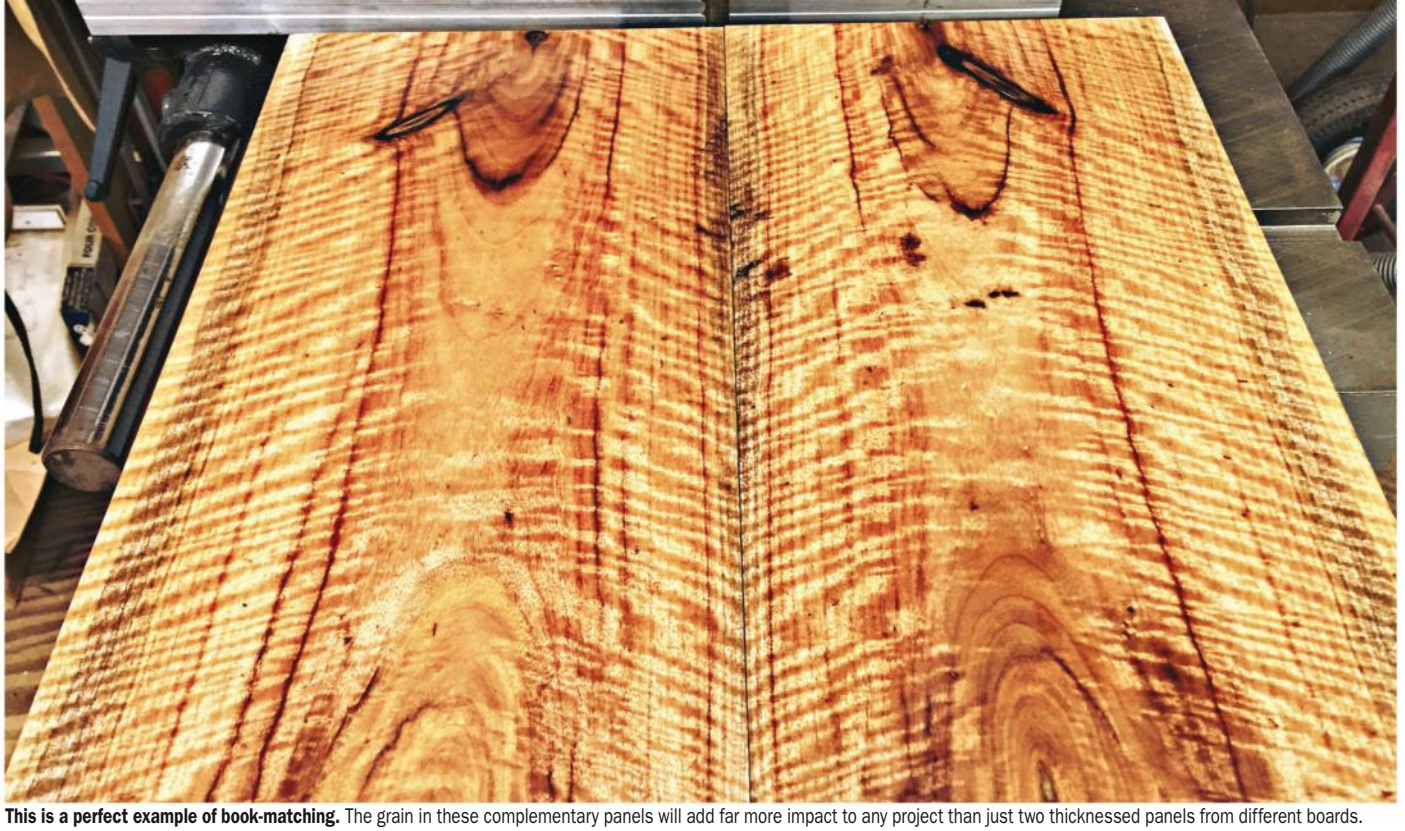
If there is a bow or belly in the cut, the problem could be insufficient blade tension. Many bandsaws' built-in tension gauges are less than accurate. A properly tensioned blade should deflect no more than ¼" when pressed in the middle, *above*. A too-rapid feed speed, using a narrow blade with too many teeth, or a dull blade can also cause this bow in the cut.

If the workpiece ends up thicker at one end than the other, the problem is drift, meaning the blade drifts out of parallel to the fence. If a sharp blade, well-set guides, and proper feed speed don't fix the problem, adjusting the tilt of the upper wheel so the blade runs on the center (crown) of the wheels, *above right*, may bring relief. If not, adjust the fence to compensate for the drift. Here's how.

Square up a piece of stock similar in thickness and density to your project wood and scribe a pencil line parallel to an edge. Without the fence in place, freehand cut the stock following that pencil line. Before you reach the end of the cut, turn off the saw and, without moving the piece, mark a pencil line along its edge on the bandsaw table. Setting the fence parallel to that line, *below*, effectively counteracts the effect of the drift. Whenever I change blades, I run through the checks again and make any needed adjustments to the saw setup.



Pivot the fence to match the drift angle. An adjustment bolt on this fence simplifies this task. Aftermarket magnetic fences, such as the Carter Magnafence (carterproducts.com), also make temporary adjustments easy.



This is a perfect example of book-matching. The grain in these complementary panels will add far more impact to any project than just two thicknessed panels from different boards.

Now for the magic

Once the setup tests are complete, it's time to turn your attention to the project pieces. Rummaging through my wood storage bin I found a piece of stock with an interesting grain pattern that I thought would look great as ¼"-thick book-matched panels on a pair of jewelry-cabinet doors.

I set the fence 5/16" from the blade (¼" plus 1/16" for subsequent sanding) and began the cut. My feed speed was based on the density of the stock (this was sweet gum or liquid amber) and the width of about 7". A quick check of the first piece indicated that the saw setup was on target, so I cut the second piece. The resulting complementary faces, *above,* illustrate just how beautiful those resawn boards can be. These fresh-cut pieces needed to acclimate to the shop's humidity, so they were stickered for a day or two to minimize the chance of warping, *below.* Following that, I jointed and planed them to the final ¼" thickness.

If I had decided to use this stock to make my own veneers for a project, the steps would be only slightly different. I would set the fence to produce ⅛"-thick slices, and thickness-plane or sand the blank between each successive cut. This technique provides one flat and smooth side for gluing on each of the veneers. And you thought that your bandsaw was just for cutting curves.

▶ Use this sled to resaw small logs into usable lumber. woodmagazine.com/resawsled

Stickering allows rebalancing the moisture content so stock stays flat. The stickers (scraps of plywood in this case) should be evenly spaced and a weight placed atop the stack to reduce warping.

Finish-sand the "show" side after gluing the veneers onto a substrate. MDF or multi-ply plywood make excellent substrates because they are relatively unaffected by expansion and contraction.

All-seasons Bench

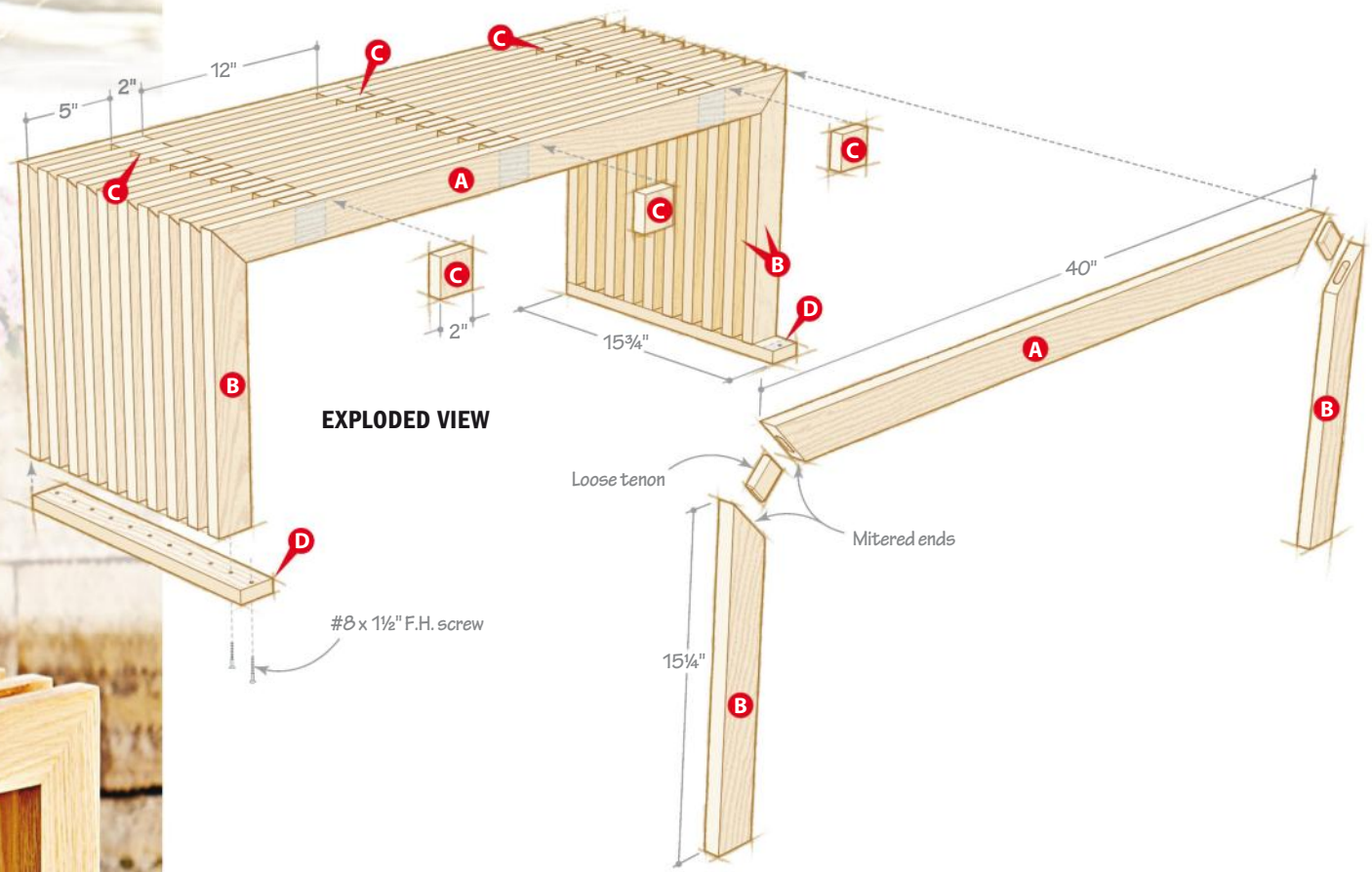
As easy to make as it is on the eyes

This contemporary bench goes anywhere inside *or* outside of your home. Build it from from nearly any wood, apply a clear finish, and set it in an entry way or at the foot of a bed. Or, make it from an outdoor-hardy wood—such as the white oak we used here—then apply a UV-blocking finish or stain, and set it on a deck or patio. It has only four different parts, and easily goes together in just a weekend, so no matter your skills or time constraints, this seat can't be beat!

DIMENSIONS
40" W × 15¾" D × 16" H

Approximate materials cost:
$75
using 4/4 white oak

Learn how to make simple mortise-and-floating-tenon joints.



First, build the rail/legs assemblies

Though simple to construct, this bench does require that you make a lot of identical parts, some with precisely mitered ends. So prepare your stock in a consistent fashion, use stopblocks, and take time to set up on-the-money miter cuts.

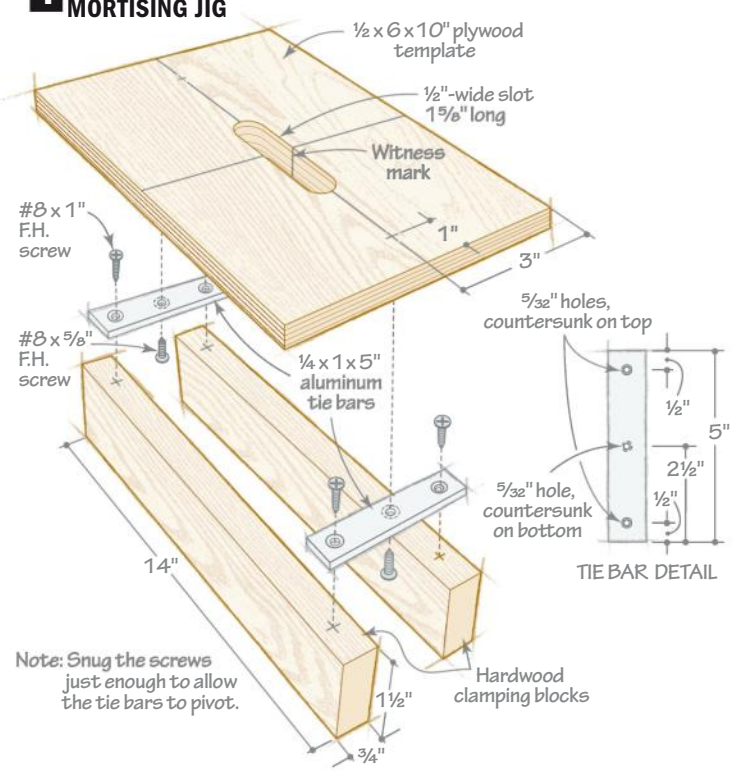
1 Cut the rails (A) and legs (B) ½" longer than listed [**Materials List**]. Miter them to final length [**Exploded View**].

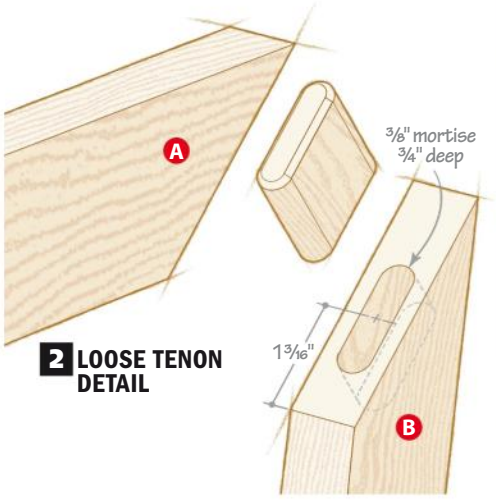
2 Outfit a plunge router with a ½" O.D. guide bushing and a ⅜" upcut spiral router bit. Build a mortising jig [**Drawing 1**]. Check that your guide bushing easily slides within the jig's slot without slop.

3 Mark a mortise centerline on each mitered end [**Drawing 2**]. Then cut a mortise at each mark [**Photo A**].

4 To make the loose tenons, cut three ⅜×1⅜×12" strips of a dense hardwood. (We used hard maple.) Check the thickness for a snug fit in the mortises. Rout 3/16" round-overs on all edges, then crosscut the strips to make 1⅜"-long tenons. Note that the tenons are narrower than the length of the mortises to allow for adjustment during assembly.

1 SELF-CENTERING MORTISING JIG





2 LOOSE TENON DETAIL

Cut the mortises. Clamp each seat rail (A) and leg (B) in a vise with its mitered surface positioned horizontally. Align the mortise centerline with the witness mark on the jig and plunge the router to make the cut.

Tip! *Sand slight chamfers on the ends of snug-fitting tenons to help them slide into their mortises.*

Tip! *If you intend to place the bench outdoors, or another damp location, use a waterproof glue and stainless steel screws.*

5 Glue and clamp 11 rail/legs (A/B) assemblies. Make sure the heels of each miter joint align; otherwise, the bottoms of the legs will not be flush when you attach the feet (D) later. Don't be concerned by slightly misaligned miter toes—you can sand those flush later. Check each joint for square.

6 Sand the faces of each assembly to 150 grit (220 grit if you will be applying stain later). Be careful not to round edges—the faces must be flat for the upcoming steps.

Put it all together and apply a protective finish

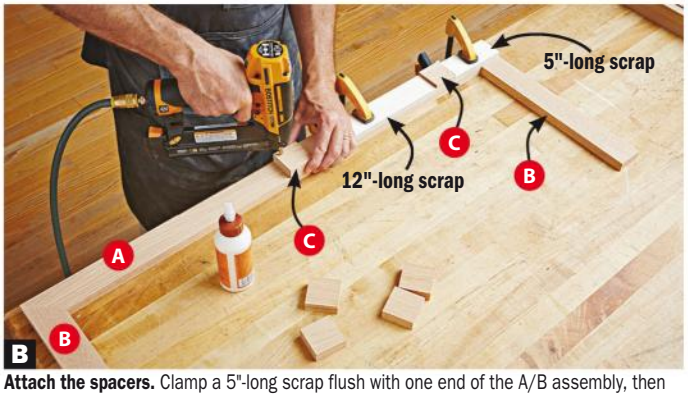
1 Cut the spacers (C). From 2"-wide scrap cut pieces 5" long and 12" long. Use the scrap pieces to attach spacers to all but one rail/leg assembly (A/B) [**Photo B**]. Place all of the spacers with their grain oriented parallel with the seat rail.

2 Retrieve the A/B assembly without spacers and glue it to two A–C assemblies [**Photo C**]. While that dries, glue and clamp two groups of four A–C assemblies.

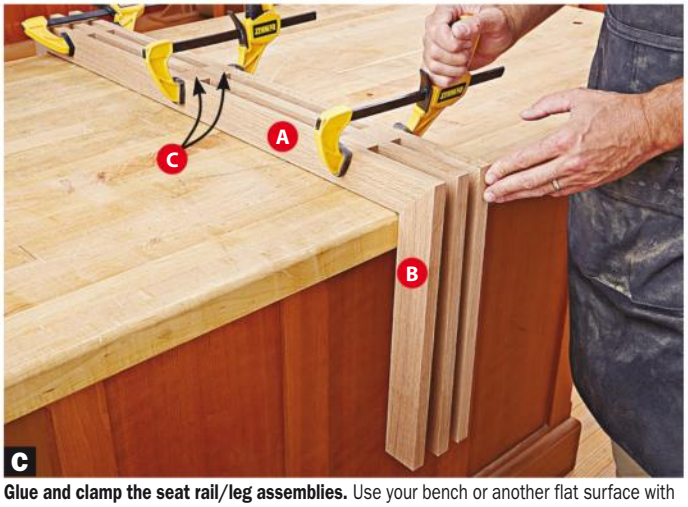
3 Glue and clamp together the three groups of rail/legs assemblies [**Exploded View**].

4 Cut the feet (D) to a length matching the width of the seat top. Screw the feet to the outside legs first, aligning them flush. Then use a ¾"-thick scrap piece to evenly space the other legs as you attach each one to the feet.

5 Finish-sand the completed bench and apply a finish appropriate to where the bench will be located. We applied two coats of penetrating oil.



Attach the spacers. Clamp a 5"-long scrap flush with one end of the A/B assembly, then glue and tack in place a spacer (C). Next, use the 12"-long scrap to position the middle spacer. Move the 5" scrap to the opposite end to position the third spacer.



Glue and clamp the seat rail/leg assemblies. Use your bench or another flat surface with a square edge to align the assemblies square and flush at their ends.

Produced by **Bill Krier** with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	rails	¾"	2"	40"	O	11
B*	legs	¾"	2"	15¼"	O	22
C	spacers	¾"	2"	2"	O	30
D	feet	¾"	2"	15¾"	O	2

*Parts initially cut oversize. See the instructions.

Materials key: O–oak.
Supplies: #8×1½" flathead screws (22), 1¼" brad nails.
Bits: 3/16" round-over and ⅜" upcut spiral router bits.

Cutting Diagram

This project requires 18 bd. ft. of 4/4 oak.

¾ x 9¼ x 96" Oak (2 needed)

¾ x 7¼ x 96" Oak

Waterfall Wonder

Create miter joints on natural-edge slabs for the look of a continuous-grain dropoff.

Redwood slab with bloodwood bow ties

Furniture made from slabs of wood with natural edges still intact has a soulful, sculptural quality, thanks largely to the handiwork of Mother Nature. And creating projects with waterfall joints—a miter joint with the continuous-grain appearance of water going over a falls—only adds to the beauty.

But cutting tight-fitting, precise miters on stock with no straight reference edges can be tricky. Thankfully, this technique helps you achieve that waterfall look, using tools found in most shops. (This also works with more typical straight-edged lumber too unwieldy for a tablesaw.)

Flatten and stabilize the slab

Your natural-edge slab will likely have rough-sawn faces and bark-covered edges. In order to create perfect-fitting miters, though, both faces must be flat and parallel. You can achieve this by running the slab through a wide planer or drum sander, but if that's not an option, use a router and shop-made jig. This requires patience as you make repeated shallow passes across the width and along the length of the slab, but it's effective. When finished, sand the slab smooth with 60- or 80-grit abrasive.

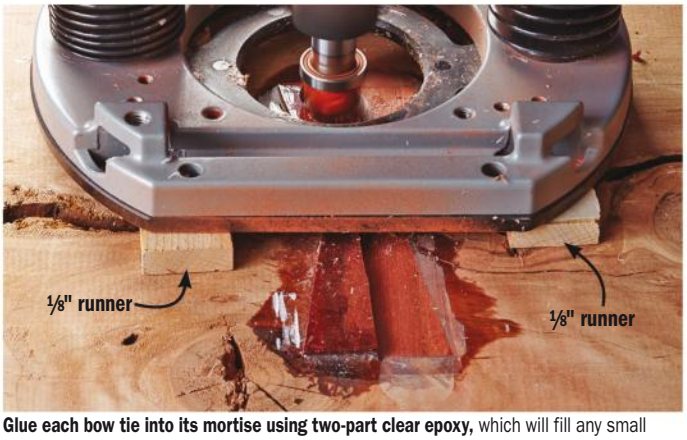
▶Learn more about flattening and working with natural-edge slabs. woodmagazine.com/naturaledge

Next, evaluate any splits, knots, bark inclusions, voids, or other defects in the slab. Filling or repairing them ensures long-term stability, but keeping everything as natural as possible usually looks best. Splits can open up more as the slab adjusts to a new environment's humidity, so stabilize these with bow-tie keys, as shown *below*. Before adding these to your slab, though, determine the location of the miter joint and mark it. You don't want to later cut the miter through a bow tie you painstakingly installed.

To highlight the bow-tie keys, use a contrasting wood species. Make them ½" thick and visually pleasing in length and width. Graduated sizes add even more flair. Adhere the bow ties to the slab with double-faced tape, and trace around them with a marking knife. Identify each bow tie and matching mortise so you can pair them up later.

Take the plunge. Remove the bow ties and tape, and trace each knife line with a sharp pencil to increase its visibility for the next step. Using a plunge router and ¼" upcut spiral bit, rout the mortise for each bow tie in incremental depths, keeping about 1/16" inside the marked outline. Rout to a depth slightly less than the thickness of your bow ties: in this case, 7/16".

Use a chisel—as wide as will fit—to pare away the remaining waste, seating the chisel in the knife-scored outline as you go and cutting perpendicular to the slab surface as you work around the perimeter. Use a small square to check your progress: If the walls are not perpendicular, the bow tie will not seat in the bottom. Check each bow tie's fit as you go, but avoid inserting it too deep to remove.



Glue each bow tie into its mortise using two-part clear epoxy, which will fill any small voids. Allow 24 hours for the epoxy to cure, and then trim each bow tie flush to the slab surface. We used a plunge router with a flat-bottom dado clean-out bit, and elevated the router base by taping on a pair of ⅛"-thick runners so the router could pass over the bow tie. Sand smooth when finished.

Prep the slab's edges

The natural edges grab the spotlight (and deservedly so), so treat them like the stars of the show. Although it's tempting to leave the bark on, don't. It eventually will fall off, in pieces, so get rid of it now. If it doesn't peel off easily, chip or slice it away with rounded chisels (sharp corners will gouge the wood), putty knives, and wire brushes. You might find hidden surprises beneath the bark, such as small burrs, ripply edges, or insect tunnels; leave these intact, if practical, because they add character.

With the bark removed, treat the edges to suit your taste. If you prefer a slightly bumpy texture, leave the stringy cambium fibers and bristly points. For a smoother edge, sand away the roughness with abrasive flap-wheels of sequential grit.

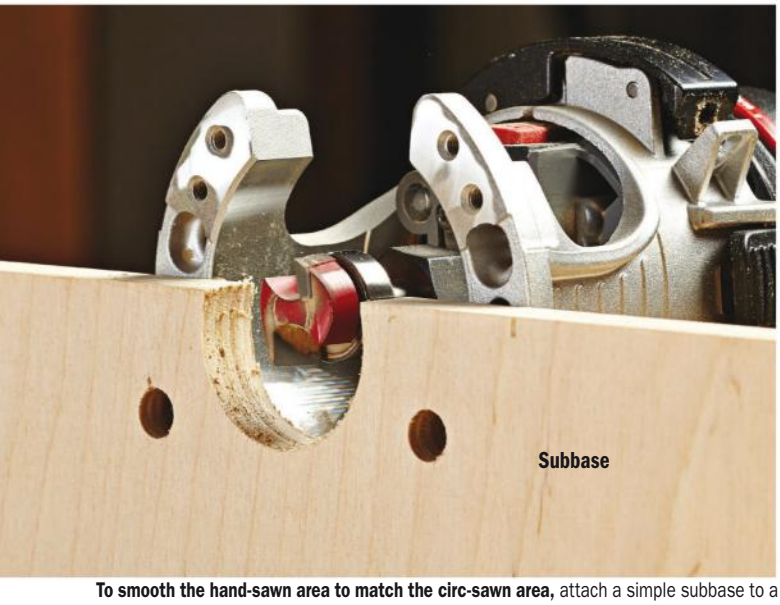
Miter the waterfall joint

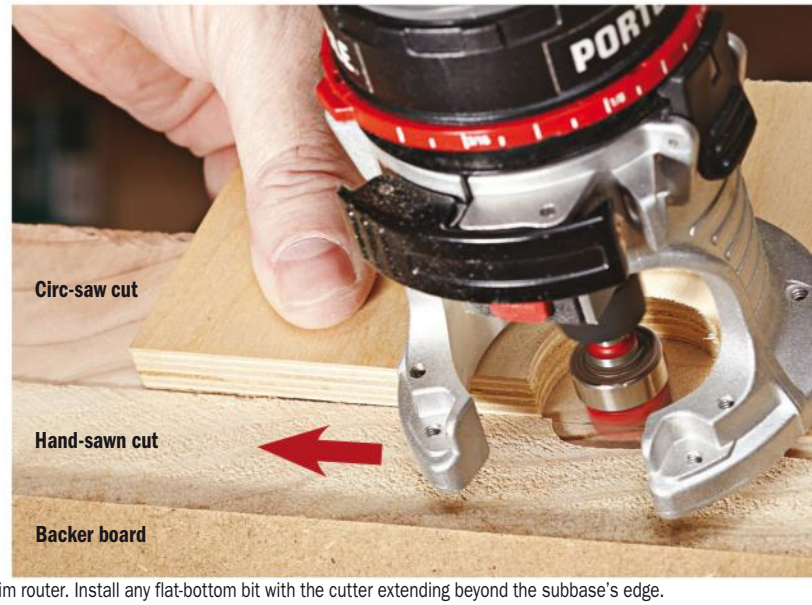
Because you won't be able to use a tablesaw, radial-arm saw, or sliding mitersaw to cut the miters, we recommend using a portable circular saw equipped with a 60-tooth blade and a simple straightedge jig, as shown at *right*. Make the jig from ¼" hardboard or plywood about 10" longer than your slab's width. The jig should be about 10" wide, with a ¾"-tall centered fence attached. Using this setup, and following the photos on *this page*, cut mating miters for each joint.

Set the circ saw for a 90° full-depth cut, and trim one edge of the jig to provide zero-clearance support. Position that edge on the cutline, clamping it as close to perpendicular to the slab's edges as you can by eyeballing it. Then cut across the slab.

If your saw cannot cut through the slab's full thickness, finish the cut with a handsaw.

With the slab now in two pieces, tilt the saw blade to 45° and trim the other edge of the jig for zero-clearance support. Reposition the jig on the slab's top face with the mitered edge aligned with the tip of the just-cut end of the slab, clamp it in place, and make a miter cut. Finish with a handsaw, if needed. Repeat for the other slab section.





To smooth the hand-sawn area to match the circ-sawn area, attach a simple subbase to a trim router. Install any flat-bottom bit with the cutter extending beyond the subbase's edge. Adjust the bit depth so it just grazes the circ-saw cut face. Then, with the subbase resting on the smooth circ-sawn surface, rout back and forth to smooth and flatten the handsawn portion of the miter. A backer board protects the heel of the miter from chip-out as you rout the final pass. Repeat for the miter on the other slab section.

▶ Learn tips for using a plunge router. woodmagazine.com/plungerouter

Call for reinforcements

Regardless of whether you're making a table, desk, or bench, it's crucial to strengthen the miter joint beyond just glue. Do this by concealing a loose tenon or two in the joint, as shown *below*. This also helps align the joint. For extra support, add a piece of angle iron (or similar steel bracket) to the bottom face.

Our slab was too short to make waterfall-joint legs on both ends, so we opted instead for one black-painted welded-steel leg [**Sources**]. Screws through slotted holes in this leg bracket allow for seasonal wood movement.

After assembling your project, finish-sand the faces to 220 grit. Be careful to not oversand along the miter joint and compromise the waterfall effect. (If your miter has a slight gap, gently rub a smooth screwdriver shank or burnishing tool over the joint to close it up.) Complete the project with a finish that highlights the natural-edge slab. We used two coats of an oil-varnish mix to bring out the figure in this redwood.

Produced by **Bob Hunter**

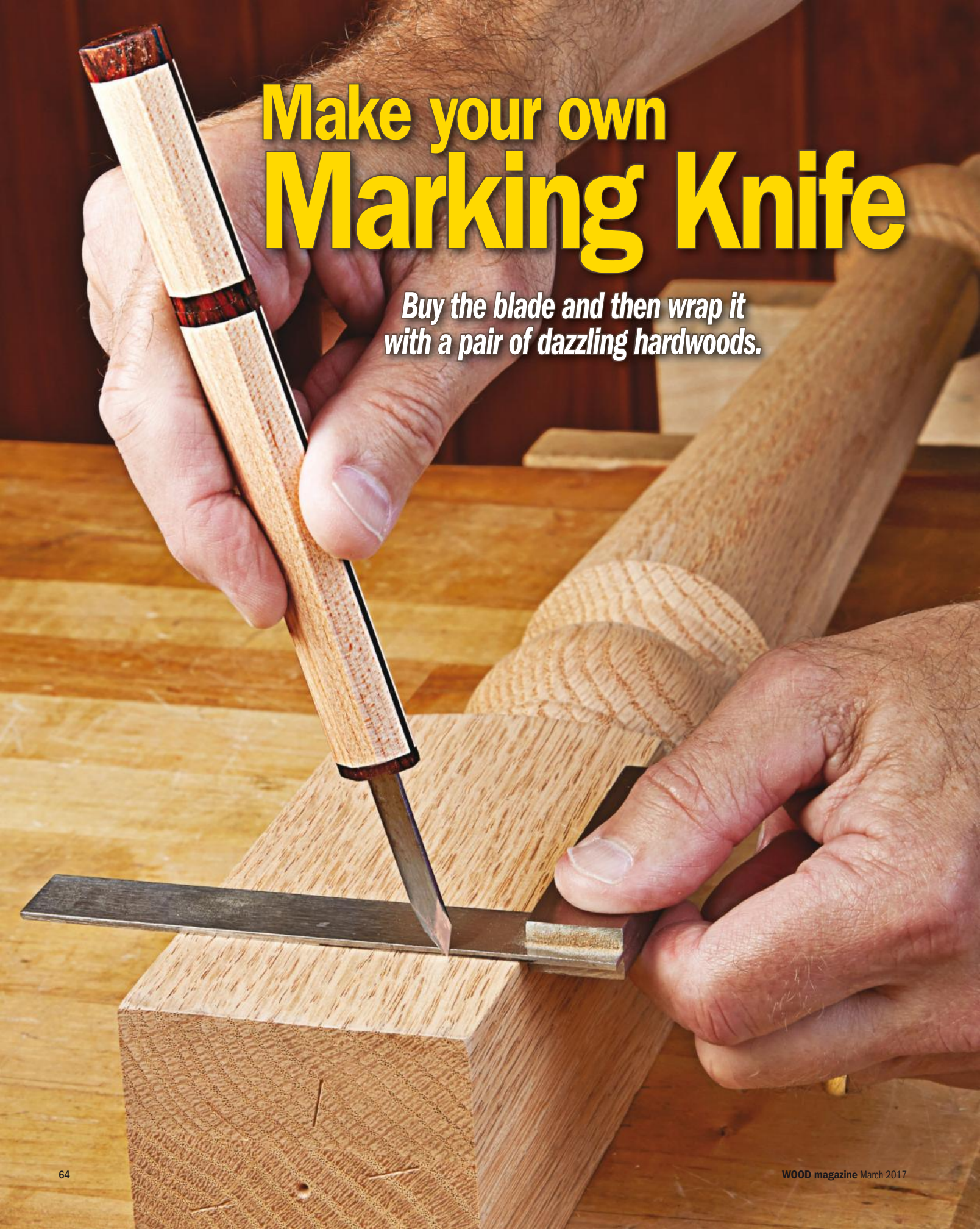
Sources

Natural-edge slab: Jewell Hardwoods, Clackamas, Oregon, 503-785-3935, jewellhardwoods.com.
Welded-steel leg: Factor Fabrication, Des Moines, Iowa, 515-635-1942, factorfabrication.com.

Using a plunge router and ½" upcut spiral bit, set your router's edge guide to roughly center the bit along the miter, and then rout a stopped mortise in ¼"-deep increments. We routed 1¼"-deep mortises. Repeat for the other slab segment.

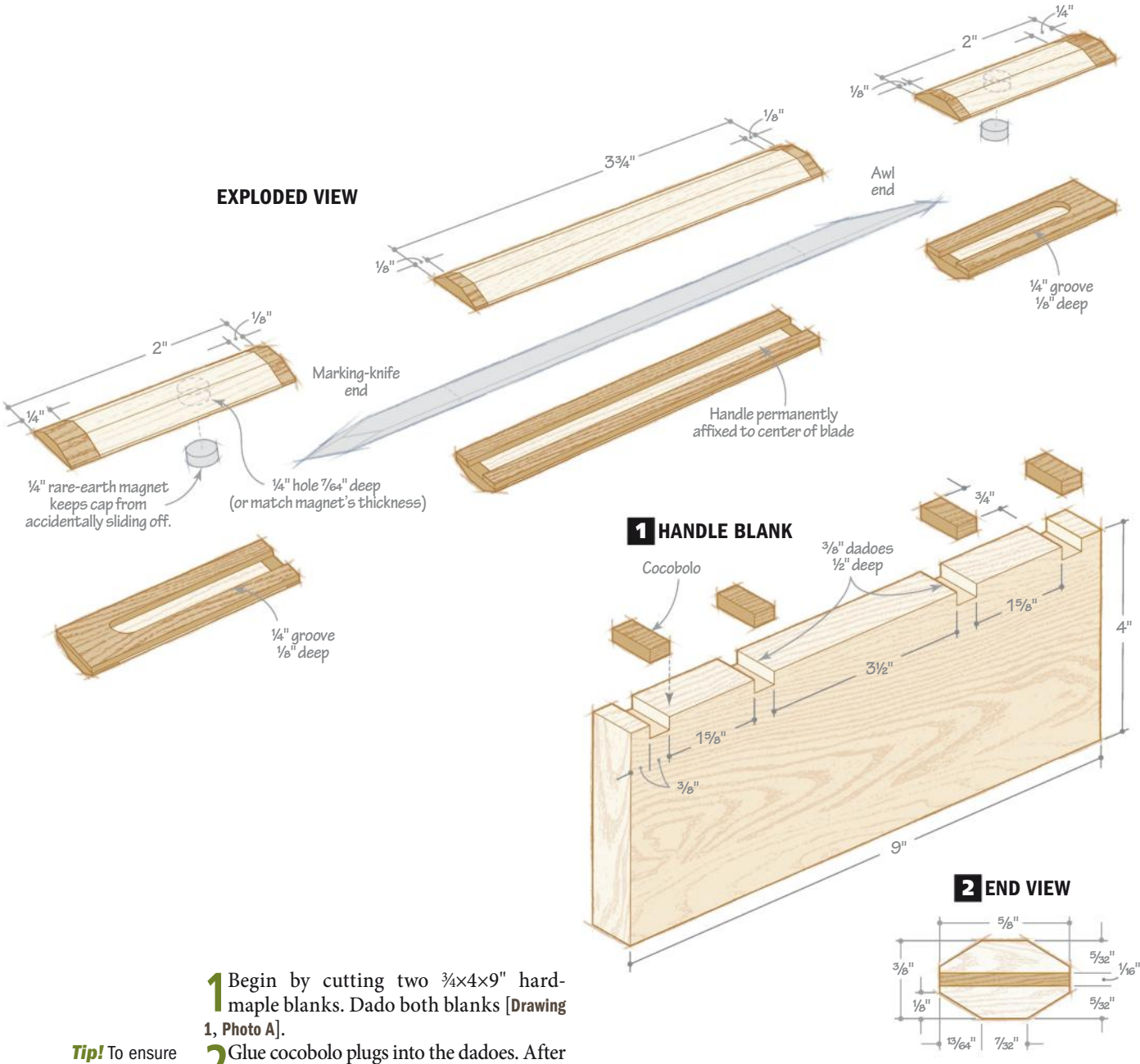
Make loose tenons from ½"-thick stock, with the grain aligned with the slabs' grain. This allows the tenon to expand and shrink with the slab even after being glued in place, preventing splitting. We used two tenons with a ¼" gap between them, rather than one long tenon, to allow more room for movement.

To hide the steel support, recess it into the slabs' bottom faces. Cut the support to length, and, with the two slabs dry-assembled, lay out the mortise locations. Use a plunge router and straightedge guide to mortise each piece. Attach the support with screws that fit loosely in the support's holes (to allow for expansion and contraction); widen the holes if needed. When satisfied with the fit of the miter, disassemble all parts, add glue, reassemble, clamp, and reattach the support with screws.



Make your own Marking Knife

Buy the blade and then wrap it with a pair of dazzling hardwoods.



Tip! To ensure maximum adhesion when gluing oily exotic wood species, such as cocobolo, wipe them with a clean rag and acetone before applying glue.

1 Begin by cutting two ¾×4×9" hard-maple blanks. Dado both blanks [**Drawing 1, Photo A**].

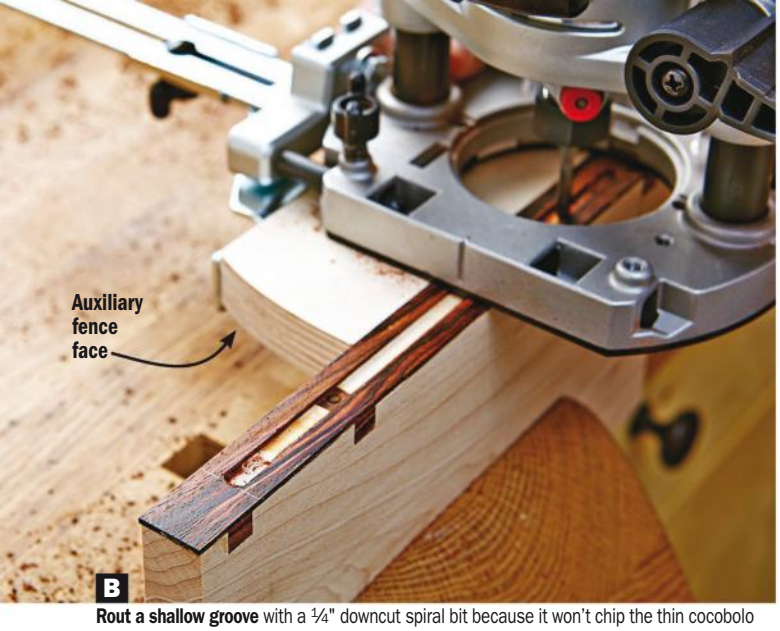
2 Glue cocobolo plugs into the dadoes. After the glue dries, trim and sand them flush. Glue a 1/16×¾×9" cocobolo strip to the plugged edge of one blank, and trim flush when dry. Rout a 7¼"-long centered groove along the cocobolo edge [**Exploded View, Photo B**].

3 Retrieve the other blank and plunge-rout holes for the rare-earth magnets [**Exploded View, Photo C**] so the magnets are flush with the edge when inserted. Using two-part epoxy, adhere the magnets.

4 Glue the two blanks together—without the blade inside [**Photo D**]. Avoid filling the blade cavity with glue.

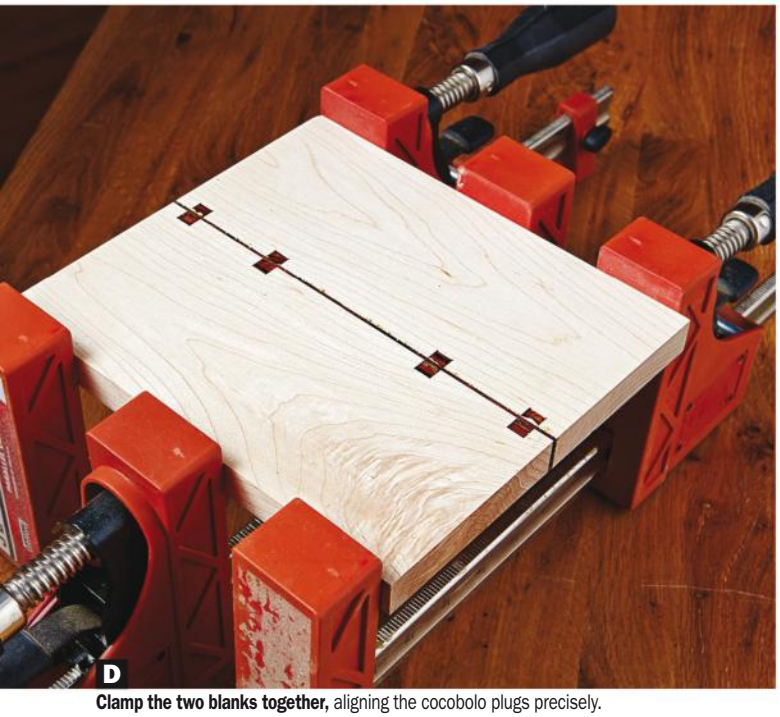
5 Rip a ⅜"-thick blank from the glue-up with the cocobolo strip centered [**Drawing 2**]. Rip the blank to ⅝" wide, removing equal amounts from each edge (to keep the magnets centered). Crosscut ½" from each end to expose cocobolo ends.

Cut the notches in both blanks, using the rip fence as a stop. After cutting the first notch, rotate the boards to cut the same for the other end. Repeat for the middle notches.



Rout a shallow groove with a ¼" downcut spiral bit because it won't chip the thin cocobolo strip. Rout a whisker deeper than the thickness of the blade. (An auxiliary plywood face attached to the router's edge guide improves stability.)

Using the same downcut spiral bit, plunge a hole centered ¾" from the inner edge of the inside cocobolo plug. Repeat for the other end.



Clamp the two blanks together, aligning the cocobolo plugs precisely.

Secure the handle assembly in a vise or clamp, and use a block plane to remove material up to your layout lines. Don't plane too deep—doing so could expose the magnets.

▶The hardened-steel Hock knife blank requires substantial grinding to shape it. That creates a lot of heat, so quench it frequently with cold water during the process.

6 Lay out the chamfers for the edges [**Drawing 2**], and hand-plane to shape [**Photo E**]. Sand smooth to ease the crisp edges; you want a comfortable feel.

7 Apply a finish of your choice. We rubbed on three coats of furniture wax, buffing after each coat with 0000 steel wool. Crosscut the blank across the center of the two inner cocobolo plugs, creating the caps.

8 Grind the square end of the blade to an angle, and then grind a rounded awl tip [**Exploded View**]. When finished—and the blade is cool and dry—epoxy it into the handle, centering it so both caps fit over the blade ends. Wipe away any epoxy squeeze-out, and allow to cure for 24 hours. Then let the precision marking begin!

Produced by **Bob Hunter** with **Joshua Steele** and **John Olson**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Supplies: Two-part quick-set epoxy.
Blade and bit: Dado set; ¼" downcut spiral router bit.
Sources: 1/16×¼×7" marking knife blade, no. MK025, $30, Hock Tools, 888-282-5233, hocktools.com.
¼"-diameter rare-earth magnets, no. 99K31.01, 48¢ each, Lee Valley, 800-871-8158, leevalley.com.

▶Make more hand tools for your shop. woodstore.net/handtools

SHOP TEST: HVLP Sprayers

Take finishing to the next level with a top-performing system.

Brushing or wiping finish or spraying from a rattle can yields great results on most small projects. But when you're tackling large furniture projects or cabinetry, spraying finish with a high-volume, low-pressure (HVLP) spray system gets the job done easier and with less overspray than a compressed-air sprayer.

An HVLP unit consists of an air-generating turbine, an air-supply hose, and a gun that mixes finish with the air—simple in theory, yet complex in implementation. (See "**Get to know an HVLP system**" *next page.*) Luckily, manufacturers of these systems have managed the tricky part, so you just need to spend time spraying finish on practice workpieces (plywood works well) until you get a good feel for it. Soon you'll have the confidence to spray all of your projects.

To find out which HVLP system to buy, we tested six three-stage models head-to-head, and also threw in a few two- and four-stage units for perspective. A three-stage system best balances the oomph it takes to spray most finishes with an affordable price.

Note: *An HVLP turbine is rated by the number of fans it uses to pressurize the air; a three-stage unit has three fans, and so on. Typically, the more stages, the more heavy-bodied the finishes it can spray without thinning.*

Get to know an HVLP system

Think of an HVLP turbine as a reverse vacuum pump: It sucks air through filters, then condenses and blows it through a hose to the gun. In order to be classified as HVLP, its air pressure cannot exceed 10 psi.

■ Because a turbine motor spins at about 20,000 rpm, it generates heat, which unavoidably warms the pressurized air. Although this warmed air all but eliminates moisture in the line, it also can cause finishes to flash-dry too quickly. To offset this, most turbines have separate filtered intakes for spraying air and motor-cooling air.

■ Spray guns come in two styles: *Bleeder* guns pass air constantly, even when you stop the flow of finish. *Nonbleeder* guns, our favorite, cut off both air and finish flow when you release the trigger. (We tested all the systems with nonbleeder guns.)

■ You can get both gun styles with either gravity-fed cups (mounted on top of the gun) or pressurized cups (beneath the gun). Pressure in the latter cup forces finish into the gun's airstream via the fluid tube, where it gets sprayed through the nozzle. Both work equally well when spraying, but we prefer the flat-bottom pressure cups for their smaller footprint and ease of filling with finish. And these cups prove easier to set down when not spraying, although you might have to disconnect the hose on some models.

It all starts with the air

The turbine is the heart of an HVLP system. All the models we tested run on 110 volts, so you can plug one in just about anywhere. That's convenient, but turbines do generate two main complaints: noise and hot air.

In our tests, some turbines ran quieter than others. The Fuji Q4 Platinum, despite having four fans, proved quietest in the group. (Spraying from 10' away produced 72 decibels of noise, about the same noise level as a drill press.) The others ranged from an acceptable 76 decibels (Graco FinishPro 7.0, quietest of the three-stage units) to an annoying 84 (Earlex Spray Station 5500). Confined spaces make the noise seem louder, but a long hose that puts distance between you and the turbine can make the noise more tolerable.

As for the warm air, most of the tested models keep their cool by using two separate air intakes: One supplies the air for spraying, and the other cools the motor. Single-intake turbines (Earlex Spray Station, Graco, and Fuji Q4 Platinum) use the same air to cool the motor and spray finish. Dual-intake units eventually shoot warm air, too, so turn off the turbine when you're not spraying, such as when repositioning a project. (You also can prevent flashoff—finish drying too quickly to properly blend overlapping areas on large projects—by pumping more finish through the gun, but you'll need to move the gun quicker to avoid runs and drips on your project.)

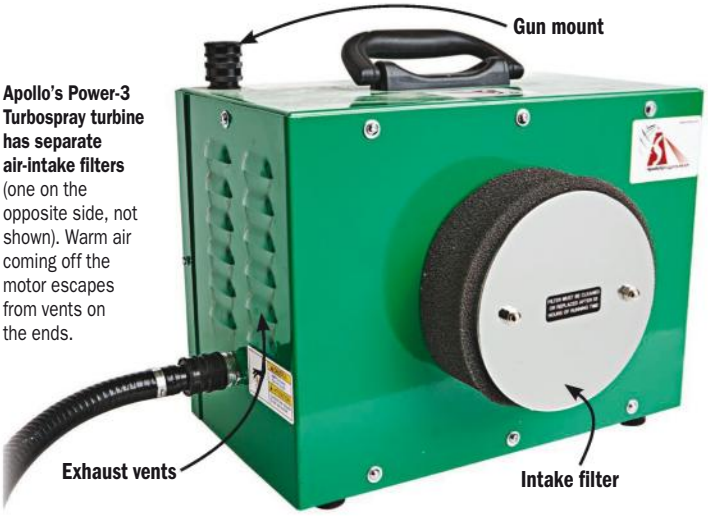
▶ Purchase a digital article archive to learn more about finishing, including HVLP spraying. woodmagazine.com/finishdvd

Turbine notes:

▶ All the turbines provide a place to hold the spray gun upright when not in use—to avoid spilling finish—but it's best to disconnect the hose from the gun first. That's required with the Apollo and Fuji units, because their guns store on their air-intake couplers.

▶ The Graco and Titan Capspray 75 units include storage compartments for wrenches or extra spray-nozzle sets. That's handy, given the small size of some of those parts.

▶ Over time, all filters need to be cleaned or replaced to maintain proper airflow. Filters on the Earlex Spray Station and the Graco proved difficult to access and remove.



Apollo's Power-3 Turbospray turbine has separate air-intake filters (one on the opposite side, not shown). Warm air coming off the motor escapes from vents on the ends.

Apollo Eco-3 Turbospray, $650
888-900-4857, hvlp.com

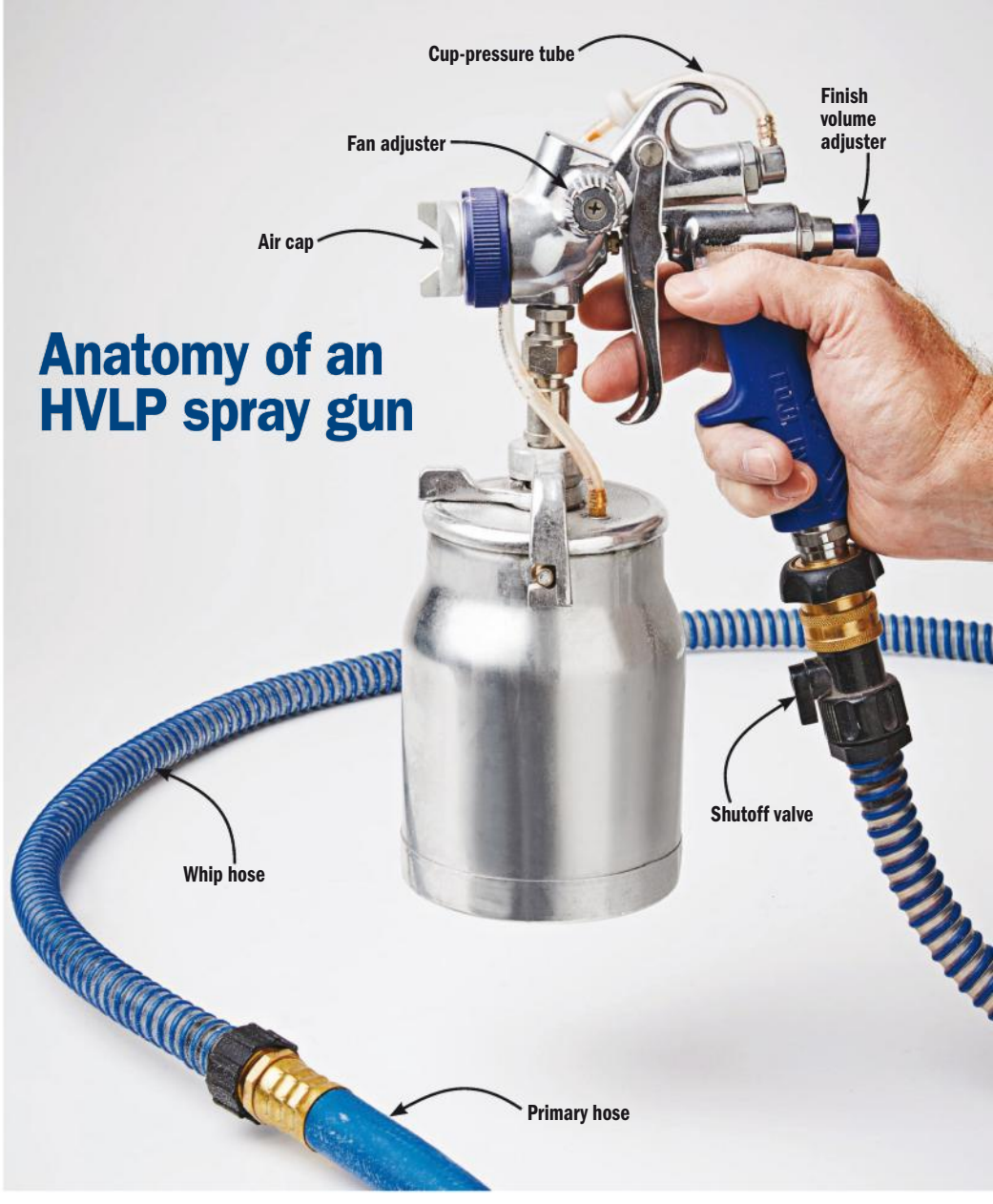
Apollo Eco-4 Turbospray, $750

Have gun, will spray

Here's where things get more complicated, because all spray adjustments—including atomization and spray pattern—happen at the gun. Atomization involves injecting finish into the airstream and converting it into tiny droplets that, when applied onto a project surface, blend together nicely for a smooth, even coat. That atomized mixture of air and finish exits the gun at a rate and in a pattern that you adjust for the best finish.

The first adjustment pairs your finish of choice with the appropriate nozzle. We tested each gun with the nozzle set (nozzle, needle, and air cap) that comes with the system. That's a 1.3mm-diameter nozzle for all but the Apollo Power-3, which comes with a 1.0mm nozzle, and the Earlex Spray Station's 2.0mm nozzle. (You can buy optional nozzle sets for each system, as shown in the chart on *page 73*.) Each system comes with a chart that pairs the viscosity of a finish with a particular nozzle set, or tells how much to thin a finish so it will work with the factory-supplied nozzle. All systems except Apollo and Graco include a viscosity cup for determining the flowability of a finish, but you can buy these as accessories.

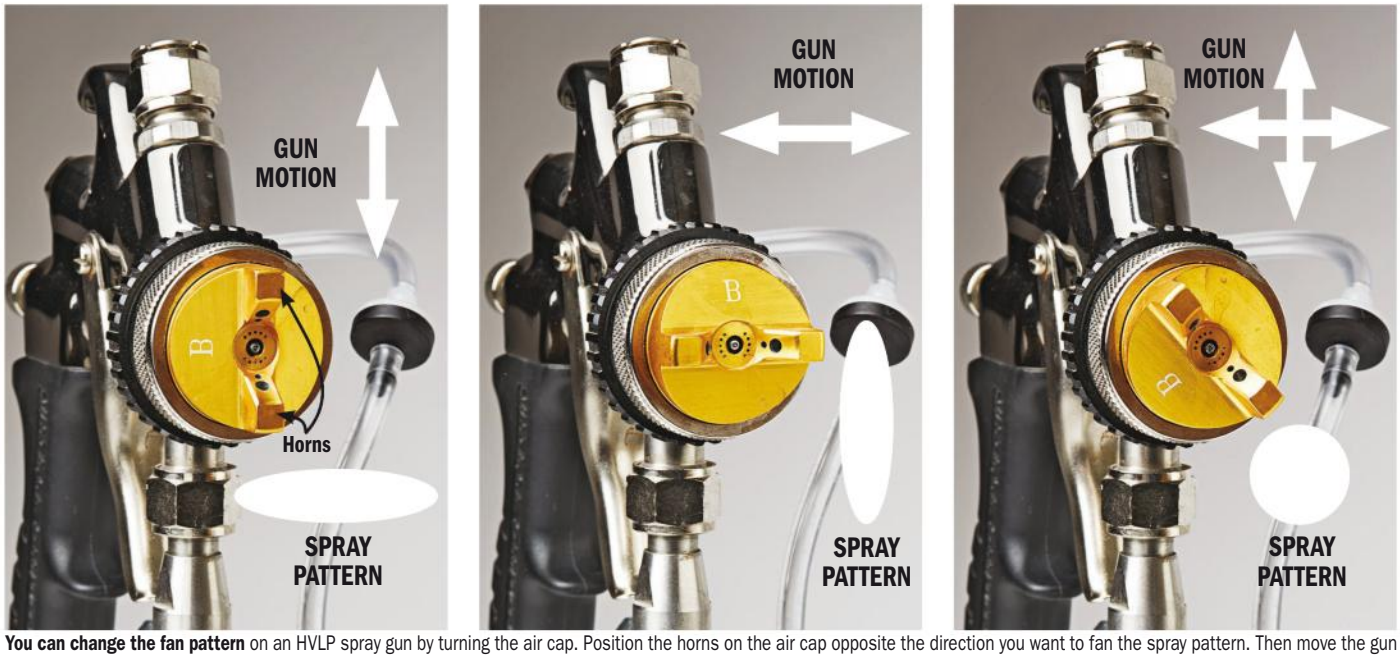
Tip! *When spraying latex paint, add a flow enhancer, such as Floetrol, for best results.*



2017 WOOD Magazine TOP TOOL HVLP Sprayer

Apollo Power-3 Turbospray, $900

Earlex Spray Station 5500, $300
888-783-2612, earlex.com



You can change the fan pattern on an HVLP spray gun by turning the air cap. Position the horns on the air cap opposite the direction you want to fan the spray pattern. Then move the gun in the same direction the horns point.

With the finish and nozzle matched, you next adjust the mixture of finish and air. You control finish flow by turning a knob (shown *above*) that limits how far the needle retracts from the nozzle when you pull the trigger. Next, adjust the airflow by turning a knob or ring on the gun: Fully open creates a wide fan pattern; close it down for a smaller circular shape. Experiment with these adjustments until you like the results. Rotating the air cap also adjusts the spray pattern, as shown *above*.

Finally, to apply the best coating without runs or drips, you adapt the speed of the gun's movement (side to side or up and down). This comes naturally through practice and repetition.

We prefer the guns supplied with the Apollo Power-3 and both Fuji systems. Adjustments are easy, they have perfectly tensioned trigger pulls, they're balanced well, and they felt good in our hands. The Apollo Eco systems also come with nice guns. By contrast, Titan's gun, with finicky adjustments and a too-stiff trigger, detracted from its quality turbine.

Graco's gun has an intuitive finish adjuster: The higher the number, the more finish flows into the airstream.

We sprayed lacquer, water-based polyurethane, and latex paint with each system, using the factory-supplied nozzle sets. The Apollo, Fuji, and Earlex SprayPort units sprayed unthinned lacquer and poly with excellent results. Paint, though, was a different challenge, with some sprayers having to

2017 WOOD Magazine TOP VALUE HVLP Sprayer

2017 WOOD Magazine TOP TOOL HVLP Sprayer

Earlex SprayPort 6003-P, $550

Fuji Mini-Mite 3 T-Series, $625
800-650-0930, fujispray.com

Note: *Latex paints vary in viscosity—the better the quality, the thicker the paint—so be prepared to thin as needed to match your sprayer's nozzle.*

work noticeably harder to get the job done using the supplied nozzles. Others sprayed it easily, straight from the can. Our advice: If you plan to spray paint regularly, get a nozzle set specifically recommended for paint.

Spray gun notes:

▶With most guns, you turn off the turbine and pull the trigger to relieve pressure inside the cup—but that also squirts finish! The Apollo guns have valves to release pressure with no splatter, the only tested models with this feature.

▶We like Fuji's splash guard, shown *right*. But the guns have lots of small internal parts, requiring great care when cleaning.

▶We were disappointed with the Earlex SprayPort gun's limited fan-width range and backlash in the adjuster; nonetheless, it sprayed well enough overall.

▶With no airflow adjustment, you control the flow rate on the Graco and Earlex Spray Station guns by adjusting viscosity, finish volume, and nozzle only.

▶Apollo's Power-3 gun comes in a case with storage for extra nozzle sets.

The Fuji T-70 spray gun has a plastic splash guard on the underside of the cup lid to prevent finish from getting into the nooks and crannies of the cast lid, making cleaning easier.

The missing link: the hose

A good hose must be firm enough to resist crushing should you step on it, but supple and nimble enough to allow maximum maneuverability with the gun. To achieve these seemingly opposite goals, our favorite systems employ a two-part hose: a durable one connected to the turbine and a short, pliable "whip hose" at the gun end. The Earlex SprayPort's hose is large in diameter (about 1¼"), but very flexible and lightweight. By contrast, we found the Graco and Titan hoses too bulky and awkward.

All models except the Earlex Spray Station come with at least a 20' hose. That's important because the farther you locate the turbine from your spray area, the less clogging overspray gets sucked into the filters (and noise pumped into your ears).

Hose notes:

▶The hoses on all three Apollo units lack a supportive boot at the turbine end, resulting in a slight kink as the hose sags after warming up. To combat this, position these turbines on the floor, rather than a bench, during use.

▶The hose on the Earlex Spray Station, despite being lightweight, proved stiff and inflexible, compromising gun movement.

▶Both Fuji hoses have a shutoff valve at the gun end, letting you stop airflow without turning off the turbine, or reduce airflow if you're getting too much overspray. Also, we found that the quick-connect fitting at the gun end of these hoses disconnected easily through incidental contact during use.

Fuji Q4 Platinum, $1,050

Graco FinishPro 7.0, $950
844-241-9497, graco.com

HVLP Systems: Spray finishing for any shop

MODEL	PERFORMANCE RATINGS (1)										TURBINE		SPRAY GUN				HOSE		NOISE LEVEL, DECIBELS (10' FROM TURBINE)	VISCOSITY CUP INCLUDED? (YES, NO)	WARRANTY, YEARS (3)	COUNTRY OF ASSEMBLY (4)	SELLING PRICE (5)
	PRIMARY			EASE OF USE			SECONDARY																
	EASE OF ADJUSTING AIRFLOW	EASE OF ADJUSTING FAN WIDTH	QUALITY OF GUN CONSTRUCTION	LACQUER	WATER-BASED POLYURETHANE	LATEX PAINT	AIR FILTRATION	HOSE QUALITY/EASE OF USE	SPRAY GUN/HOSE ERGONOMICS	EASE OF CLEANING SPRAY GUN	NUMBER OF STAGES	AIR FILTERING (2)	MODEL	INCLUDED NOZZLE/NEEDLE SIZE, MM	OPTIONAL NOZZLE/NEEDLE SIZES, MM	STRAINER/FILTER ON SIPHON TUBE? (YES, NO)	LENGTH, FEET	WHIP HOSE? (YES, NO)				
EARLEX SPRAY STATION 5500	A-	N/A	B-	C	C	B	B	C	B-	A	2	C	L0150	2.0	1.0, 1.5, 2.5	N	13'	N	84	Y	1	P	$300
APOLLO ECO-3 TURBOSPRAY	A	A	A	A-	A-	A-	A	B+	A	A	3	D	E7000	1.3	1.0, 1.8	N	20'	N	79	N	2	U	$650
APOLLO POWER-3 TURBOSPRAY	A	A	A	A	A	A-	A	A-	A	A	3	D	A7500QT	1.0	.8, 1.3, 1.5, 1.8, 2.0, 2.5	Y	24'	Y	79	N	2*	U	$900
EARLEX SPRAYPORT 6003-P	A	B-	A	A-	A-	B+	A	B+	B+	A	3	D	PRO 8	1.3	.8, 1.0, 1.5, 1.8, 2.0, 2.5	Y	25'	N	79	Y	2	U	$550
FUJI MINI-MITE 3 T-SERIES	A	A	A	A	A	B+	A	A	A	A	3	D	T-SERIES	1.3	.8, 1.0, 1.5, 1.8, 2.0, 2.5	Y	31'	Y	78	Y	2	C	$625
GRACO FINISHPRO 7.0	A	N/A	B	B	B	A	B+	C-	B-	C+	3	C	EDGE	1.3	.8, 1.8, 2.2, 2.5, 2.8	Y	30'	N	76	N	1	U	$950
TITAN CAPSPRAY 75	A	D	B-	B	B	A	A	C	C	C	3	D	MAXUM II	1.3	.8, 1.8, 2.2, 2.4, 2.6	N	25'	N	77	Y	4	U	$900
APOLLO ECO-4 TURBOSPRAY	A	A	A	A	A	A-	A	B+	A	A	4	D	E7000	1.3	1.0, 1.8	N	20'	N	81	N	2	U	$750
FUJI Q4 PLATINUM	A	A	A	A	A	A	A	A	A	A	4	S	T-SERIES	1.3	.8, 1.0, 1.5, 1.8, 2.0, 2.5	Y	31'	Y	72	Y	2	C	$1,050

1. A Excellent
   B Good
   C Fair
   D Poor
   N/A No adjustment on this model

2. (C) Combination filter: single filter for spray and cooling air
   (D) Dual filters: separate filters for spray and cooling air

3. (*) 3 years upon online registration

4. (C) Canada
   (P) Poland
   (U) United States

5. Prices current at time of article production and do not include shipping, where applicable.

Titan Capspray 75, $900
800-526-5362, titantool.com

What to pay to spray

When keeping a strictly apples-to-apples comparison among three-stage HVLP systems, two models rose above the field: the Apollo Power-3 Turbospray ($900) and the Fuji Mini-Mite 3 T-Series ($625). They share Top Tool honors. Both systems performed superbly in nearly every test, and either would make a great finishing partner in your shop. The Mini-Mite also wins our Top Value award for being a top performer for the second-lowest price among three-stage models.

But if you should need the added power of a four-stage system—especially for paint—spend a little extra and get the Fuji Q4 Platinum system ($1,050). (Although we did not test Fuji's Q3 Platinum system [$900], Fuji's Mark Rosin said it's exactly the same as the Mini-Mite 3, but with the quiet performance of the Q4 turbine.)

Produced by **Bob Hunter** with **John Olson** and **Kevin Boyle**

Pipe Dreams

Tired of constantly dragging dust-collection hose from one machine to another? As you plan a hard-piped dust-collection system for your shop, consider these options.

▶Learn more about designing a dust-collection system. woodmagazine.com/dcfacts

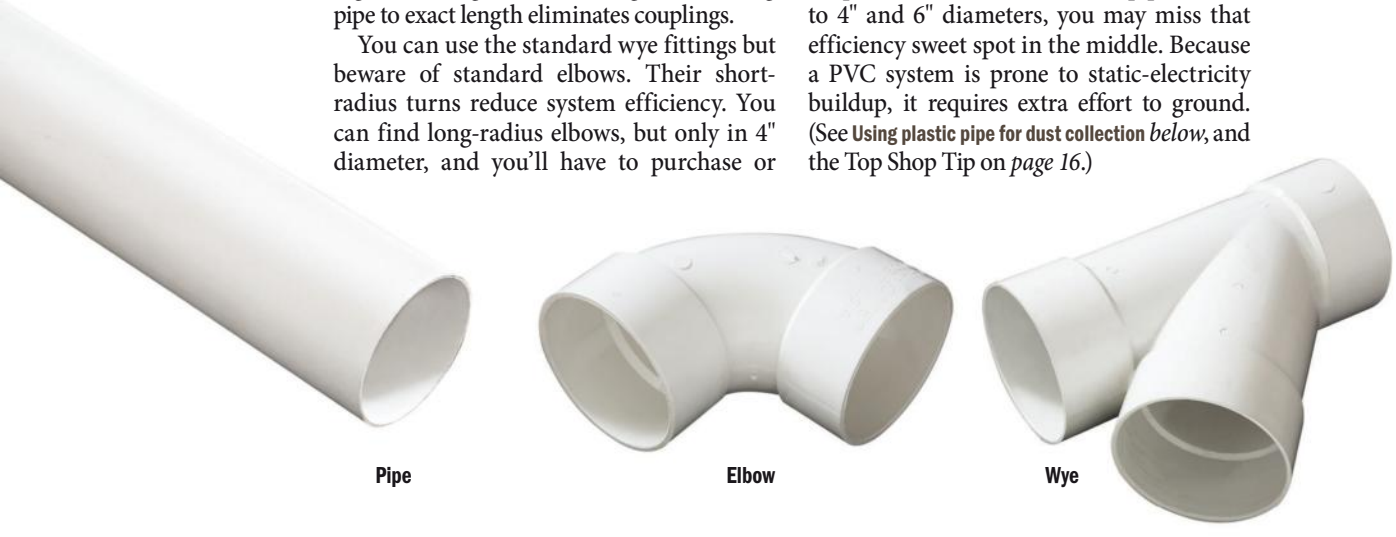
Thin-wall PVC pipe and fittings

Cost $$$$

Lightweight, easy to cut, and available at home centers, thin-wall PVC presents the low-cost option. An airtight system can be assembled dry (no glue) using self-tapping screws, allowing for reconfiguration. Cutting stock 10'-long pipe to exact length eliminates couplings.

You can use the standard wye fittings but beware of standard elbows. Their short-radius turns reduce system efficiency. You can find long-radius elbows, but only in 4" diameter, and you'll have to purchase or improvise adapters to join them to the pipe. You'll also need adapters [*page 55,* **Sources**] to attach flexible hose.

Many dust collectors suitable for small shops have 5" inlets. With PVC pipe limited to 4" and 6" diameters, you may miss that efficiency sweet spot in the middle. Because a PVC system is prone to static-electricity buildup, it requires extra effort to ground. (See **Using plastic pipe for dust collection** *below*, and the Top Shop Tip on *page 16*.)



Pipe

Elbow

Wye

Using plastic pipe for dust collection

The possibility of a dust explosion and fire caused by static-electricity buildup and discharge in PVC dust-collection piping generates much controversy. Authoritative sources find the possibility of such an event highly unlikely, particularly in a home-shop environment. For detailed information, check out a well-researched article on this subject at woodmagazine.com/PVCgrounding.

Snap-lock pipe and fittings

Cost $$$$

Snap-lock reigns as the low-cost option for an all-metal system. With diameters of 3", 4", 5", and 6" available, you can match the size to your requirements. For best results, cut the 60" lengths of pipe with metal snips before snapping them together.

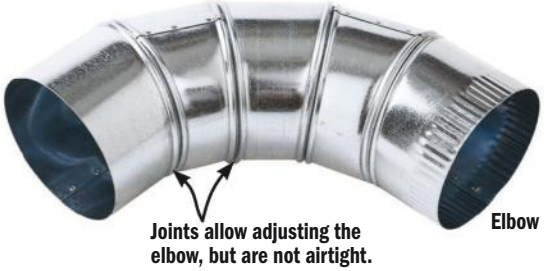
Home centers carry this type of pipe and fittings for HVAC applications. Use the wye fittings but avoid the tees and elbows. They have short-radius turns that reduce system efficiency. You can work around the short radius of adjustable elbows by joining two, but fittings and pipe are leaky. All joints and seams must be sealed with tape or caulk after installation.

Airtight fittings designed to optimize airflow are available by mail order. Unassembled lengths of pipe nest together, reducing packaging and shipping costs.

The thin 26-gauge pipe is prone to denting, also limiting it to a system with a blower of less than 5 hp. In a more powerful system, closing all blast gates with

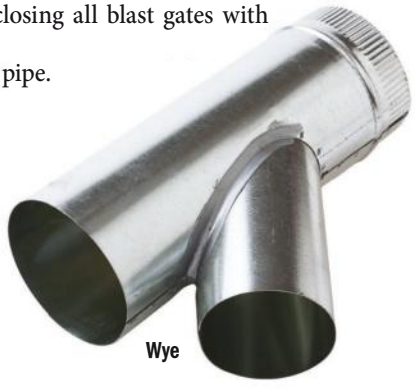
lapse the pipe.

Unassembled pipe



Joints allow adjusting the elbow, but are not airtight.

Elbow



Wye

Tabs snap together

What's the cost?

We priced three basic components for each option based on 5" pipe and fittings (except where noted) suitable for main runs in a small shop.

System	Pipe (5' length)	90° elbow	45° wye	Three-item total
Thin-wall PVC*	$6/$18	$5/$11	$6/$17	$17/$46
Snap-lock	$17	$16	$39	$72
Spiral duct	$25	$30	$65	$120
Quick-Clamp	$38**	$57**	$101**	$196

*Prices shown for 4"/6" diameters.

**Includes the cost of one Quick-Connect clamp.

Spiral pipe and fittings
Cost $$$$

If you are into heavy metal, spiral pipe satisfies. Available in 4", 5", and 6" diameters, pipe and fittings are airtight with fittings designed to optimize airflow. The rigid 58" lengths of pipe need fewer hangers on long runs. Significantly stronger than snap-lock pipe, it resists denting and is suitable for systems with 5 hp or larger blowers.

Unless you find an HVAC supplier willing to sell it to you, spiral pipe can be hard to find locally. Because like-diameter pipe does not nest, packaging and shipping are more expensive than for snap-lock pipe.

Cleanly cutting pipe proves a challenge, with few options other than hacksawing. Any way you cut it, the intersection of the cut and the spiral winding leaves a long, sharp point. You must seal all joints in the system after assembly, covering the sharp points with several layers of tape.


Pipe


Elbow


Wye

Quick-Clamp pipe and fittings
Cost: $$$$

Quick-Clamp sets the gold standard for both performance and cost. It comes in diameters of 3", 4", 5", and 6" (even larger for commercial and industrial use) with fittings designed for optimum airflow.

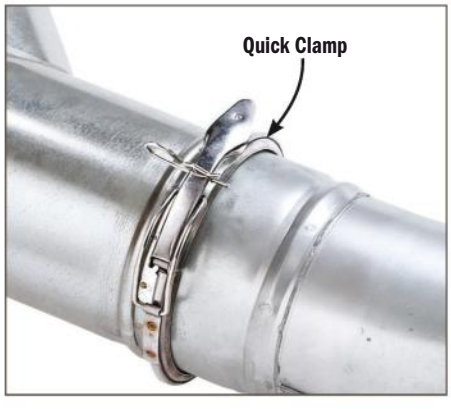
Gasketed Quick Clamps connect pipe and fittings to make airtight joints. Although a Quick Clamp at every joint adds to the cost of the system, they make it easy to reconfigure piping to accommodate changes in equipment or shop layout.

Pipe and fittings are rigid, resist denting, and are suitable for systems with 5 hp or larger blowers. Two 60" lengths of pipe joined with a Quick Clamp approach the strength of an unbroken 120" length, so you'll need fewer hangers for long runs. Special telescoping pipe nipples allow customizing pipe length from 12" to 67". Quick Clamp pipe suffers the same shipping disadvantages as spiral pipe.


Wye


Pipe


Elbow



Get connected

Every dust-collection system relies on airtight connections that efficiently facilitate air movement. These products make connections easy.

Flexible hose

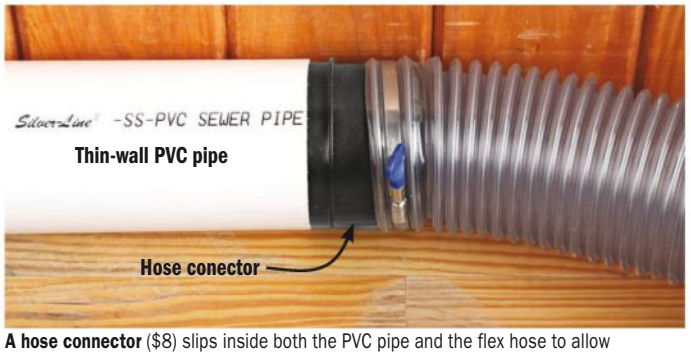
Use flex hose to connect rigid piping to the dust port on tools and machines. The ribs impede airflow more than smooth-wall rigid pipe, reducing the efficiency of the system, so keep hose lengths as short as possible without sacrificing convenience.

Clear PVC reinforced with plastic spline is a good low-cost option.
$20/10'

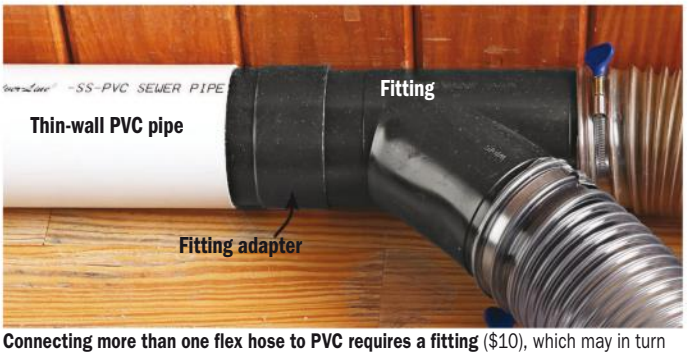
Clear PVC reinforced with metal wire is crush resistant, and the wire can be used for grounding.
$30/10'

Anti-static hose prevents static-electric shocks, and requires no additional effort to ground.
$45/10'

Adapters



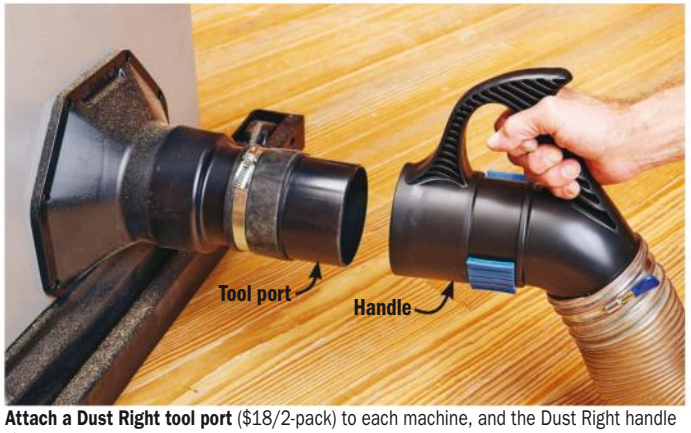
A hose connector ($8) slips inside both the PVC pipe and the flex hose to allow connecting the two.



Connecting more than one flex hose to PVC requires a fitting ($10), which may in turn require an adapter to fit the PVC.

Machine couplers

These connectors make it easy to service more than one machine with a single flexible hose.



Attach a Dust Right tool port ($18/2-pack) to each machine, and the Dust Right handle ($15) to the hose. Push on and pull off to quickly move the hose from machine to machine. Tool ports attach to 2½" and 4" dust ports.

FazLok quick disconnects ($12 each) lock together with a twist of the hose, ensuring a secure connection. The clear plastic lets you spot chip clogs. These fit 4" hose and machine ports.

Sources

Grizzly Industrial
800-523-4777, grizzly.com
Quick-Clamp system components
4" plastic fittings and adapters
Flexible hose

Oneida Air Systems
855-377-3212, oneida-air.com
Quick-Clamp system components
Spiral pipe and fittings
Snap-lock pipe and fittings
Flexible hose

Penn State Industries
800-377-7297, pennstateind.com
FazLok quick disconnect fittings
Snap-lock pipe and fittings
Spiral pipe and fittings
Flexible hose

Rockler
800-279-4441, rockler.com
Dust Right products
Anti-static hose
Spiral pipe and fittings
Adapter fittings

Compact cleaners

Whether cleaning your benchtop, garage, or car, a small electric shop vacuum (2–6 gallon capacity) gets the job done without the maneuvering and emptying hassles of a large vac. Granted, their small-diameter hoses don't connect to 2½" dust ports on benchtop machinery, but these portable vacs provide sufficient suction for general clean-up, dry or wet. We tested nearly a dozen small vacs, and recommend these four.

Craftsman 16825, $99

- Tank size: 5 gallons
- Hose length: 12' (22'6" with included extension hose)
- Hose diameter: 1¾" OD, 1⅝" ID

800-349-4358, craftsman.com

Available at Sears

This versatile vacuum mounts on a wall with the included bracket, and you can reach up to 22'6" using both hoses. The angled nozzle's remote-control switch allows you to turn the vac on and off without traipsing back to the unit each time. The vac also removes easily from the bracket for hand-carry use.

Craftsman 12004, $49

- Tank size: 6 gallons
- Hose length: 8'
- Hose diameter: 1¾" OD, 1⅝" ID

800-349-4358, craftsman.com

Available at Sears

Built in the traditional tub-style form, this vac rolls around smoothly and lifts easily due to its light weight (12 pounds). Plus, you get two extension wands and two nozzles.

Ridgid WD3050, $60

- Tank size: 3 gallons
- Hose length: 32" (8' fully extended)
- Hose diameter: 1¾" OD, 1⅝" ID

866-539-1710, ridgid.com

Available at Home Depot

The longer accordion-like hose on this compact, hand-carried unit handles nicely and retracts for easy storage (hooked into the nozzle holder).

Shop-Vac 930-25-11, $30

- Tank size: 2½ gallons
- Hose length: 50"
- Hose diameter: 1¼" OD, 1⅛" ID

570-326-0502, shopvac.com

Available at Lowe's

It's a bare-bones, low-cost vacuum, but it works great for picking up dust and small debris. The short, small-diameter hose creates some limitations, though.

continued on page 80

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QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

WOW SUPER COUPON
12" RATCHET BAR CLAMP/SPREADER
PITTSBURGH

ITEM 46807/68975
69221/62123/63017
69222 shown

SAVE 85%

$2.99 ~~$3.99~~ comp at $20.76

14657373

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ANY SINGLE ITEM

Limit 1 coupon per customer per day. Save 20% on any 1 item purchased. "Cannot be used with other discount, coupon or any of the following items or brands: Inside Track Club membership, Extended Service Plan, gift card, open box item, 3 day Parking Lot Sale item, automotive lifts, compressors, floor jacks, saw mills, storage cabinets, chests or carts, trailers, trenchers, welders, Admiral, Badland, Bauer, Bremen, CoverPro, Creekstone, Daytona, Diablo, Doyle, Drummond, Earthquake, Franklin, Hercules, Holt, Jupiter, Lynxx, Maddox, Portland, Predator, Quinn, StormCat, Tailgator, Union, Viking, Vulcan. Not valid on prior purchases. Non-transferable. Original coupon must be presented. Valid through 5/10/17.

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$4.97 VALUE

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14663189

SUPER COUPON
CENTRAL MACHINERY
4" x 36" BELT/ 6" DISC SANDER
ITEM 62502
97181 shown

SAVE $87

Customer Rating

$59.99 ~~$79.99~~ comp at $147.55

14675490

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WOW SUPER COUPON
US GENERAL
26", 16 DRAWER ROLLER CABINET
ITEM 61609/67831 shown
- 1060 lb. capacity
- 14,600 cu. in. of storage

SAVE $633

Customer Rating

$319.99 ~~$369.99~~ comp at $952.99

14664547

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SUPER COUPON
16" VARIABLE SPEED SCROLL SAW
CENTRAL MACHINERY
ITEM 62519/63283/93012 shown

SAVE $49

Customer Rating

$69.99 ~~$99.99~~ comp at $119

14652145

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WOW SUPER COUPON
CENTRALPNEUMATIC
2.5 HP, 21 GALLON 125 PSI VERTICAL AIR COMPRESSOR
ITEM 69091/67847 shown
61454/61693/62803

Customer Rating

SAVE $347

$149.99 ~~$179.99~~ comp at $497

14675295

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SUPER COUPON
4" BISCUIT PLATE JOINER
CHICAGO ELECTRIC POWER TOOLS
ITEM 68987

$44.99 ~~$64.99~~ comp at $179

SAVE $134

Customer Rating

14692836

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WOW SUPER COUPON
SAVE 78%

NEW

29 PIECE TITANIUM NITRIDE COATED HIGH SPEED STEEL DRILL BIT SET

Customer Rating

ITEM 62281
61637 shown

$12.99 ~~$19.99~~ comp at $59.97

14662851

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SUPER COUPON
RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE
ITEM 93897 shown
69265/62344
CENTRAL PNEUMATIC

Customer Rating

SAVE $129

$59.99 ~~$89.99~~ comp at $189

14696594

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SUPER COUPON
UNIVERSAL TOOL STAND
ITEM 69805

Customer Rating

CENTRAL MACHINERY

SAVE 63%

$29.99 ~~$39.99~~ comp at $81.39

• 500 lb. capacity

14681475

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SUPER COUPON
WE CARRY A FULL LINE OF FASTENERS

18 GAUGE 2-IN-1 NAILER/STAPLER
CENTRALPNEUMATIC

Customer Rating

SAVE $93

ITEM 63156
68019 shown

$15.99 ~~$22.99~~ comp at $109

14679388

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SUPER COUPON
10" SLIDING COMPOUND MITER SAW
CHICAGO ELECTRIC POWER TOOLS
ITEM 61971/61972
98199 shown

SAVE $114

Customer Rating

$84.99 ~~$119.99~~ comp at $199

14680784

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SUPER COUPON
CENTRAL MACHINERY
10", 12 SPEED BENCHTOP DRILL PRESS
ITEM 63471/60237 shown

SAVE $112

Customer Rating

$109.99 ~~$139.99~~ comp at $222.75

14660019

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SUPER COUPON
RAPID PUMP® 3 TON LOW PROFILE HEAVY DUTY STEEL FLOOR JACK
PITTSBURGH

• Weighs 73 lbs.

ITEM 61282 shown
61253/62326

Customer Rating

SAVE $185

$84.99 ~~$99.99~~ comp at $269.99

14659728

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SUPER COUPON
SAVE $129

CENTRAL MACHINERY
2.5 HP 12" THICKNESS PLANER
ITEM 95082

Customer Rating

$239.99 ~~$299.99~~ comp at $369

14669366

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A drill press that thinks for itself (and you)

18" DVR drill press (no. 58000), $1,500

Few drill presses cost as much as Teknatool's Nova Voyager, but none offers a fraction of its functionality. Its direct-drive motor senses feedback from the drilling task (that's the digital variable resistance—DVR) to maintain speed and torque even when drilling with large bits in dense materials. I was able to program and store several common drilling operations and then retrieve and perform them flawlessly. I especially like the electronic depth stop, which was dead-on for each of the 100 holes I drilled in the same setup. (It also has an old-fashioned mechanical depth stop.) An optional feature starts and stops the motor simply by turning the quill-feed handle, which let me keep my hand on the workpiece rather than reach for the switch. I was able to easily make speed adjustments, coarse and fine, on the digital screen; it even recommends speeds if you input the type of bit and stock you're using.

—Tested by Bob Saunders

Teknatool
800-274-6848
teknatool.com

Sharpen fast with a diamond flash

300/1,000-grit 8" diamond stone, $90

Diamond sharpening stones work great for shaping and honing tools because they cut fast and last a long time. These M-Power diamond stones (yes, they're called stones even though they're actually diamond-covered steel plates) cut faster than most comparable diamond products, so you finish quicker. And you get two grits on one stone—a real value. The 300-grit side helps you shape a blunt or damaged tool edge, and the 1,000-grit side works great for a first honing. You'll still need another finer stone (4,000-grit waterstone or ceramic) to get an ideal cutting edge.

—Tested by John Olson, Design Editor

M-Power Tools
m-powertools.com

continued on page 82

Forrest Blades

For building cabinets and fine furniture, nothing beats Forrest saw blades.

NEW Website! More Blades!

Craftsmen appreciate the way our blades deliver smooth, quiet cuts without splintering, scratching, or tearouts. They know our unique grade C-4 micrograin carbide, proprietary manufacturing process, and hand straightening produce exceptional results. In fact, independent tests rate us #1 for rip cuts and crosscuts.

"From the first cut on, I realized that this blade was a bargain at any price! Nothing else I have cuts comparably."
Calvin Brodie, Spanaway, WA

Forrest Quality Shows

Woodworker II—Best rated, all-purpose blade for rips and crosscuts.

Chop Master—Perfect for tight, perfectly cut miter joints without splinters.

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- **Tows behind** your ATV or Riding Mower to remove ruts, potholes, and washboard.
- **Grading depth adjusts easily** from your towing vehicle. Models with wireless remote control available.
- **Saves you money** by loosening and redistributing existing drive-way material.

ALSO GREAT FOR HORSE RINGS, BALL FIELDS, AND PARKING AREAS!

DRpowergrader.com

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The **DR® STUMP GRINDER** uses carbide-tipped cutting teeth (taking 360 "bites" per second) to reduce any stump to a pile of woodchips. Grinds stumps below ground level so they are gone forever!

- **Quickly eliminate any stump** without digging, burning, or chemicals.
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DRstumpgrinder.com

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DR® POWERWAGON!

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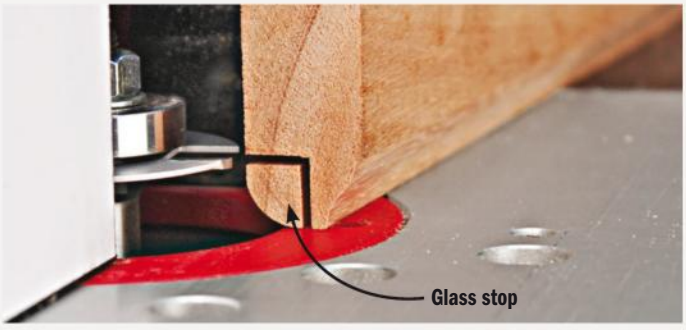
PROFESSIONAL POWER DR DONE RIGHT

Jig trio provides cabinetmaking shortcuts

Drawer-slide jig, no. KHI-SLIDE, $25; Concealed-hinge jig, no. KHI-HINGE, $30; Cabinet-hardware jig, no. KHI-PULL, $25

Kreg Tool has three new jigs for building cabinets and similar case-furniture projects. The drawer-slide jig (which replaces two of Kreg's previous jigs) helps align and install slides on face-frame and frameless (shown *top right*) cabinets, as well as on the drawers. Use the adjustable concealed-hinge jig (*above*) to align and drill holes for cup hinges, using the included 35mm bit. Finally, the cabinet-hardware jig (*right*) helps position and drill holes for mounting knobs and pulls on drawers and doors (bits not included).

800-447-8638, kregtool.com



Bit sets specialize in glass cabinet doors

3-piece glass-door router bit set, six profiles, $139.90

These Infinity router-bit sets create custom cabinet doors with glass panels. The cope-and-stick bits rout the edge and end profiles for rail-and-stile doors, and a slot-cutting bit cuts away the rounded-over glass stop from the inside face. Infinity offers six profiles: standard, ogee, bevel and radius, chamfer, Shaker, and Art Deco.

877-872-2487, infinitytools.com

How to Be Cut Off From Civilization

When it's you against nature, there's only one tool you need: the stainless steel River Canyon Bowie Knife—now ***ONLY $49!***

You are a man of the wilderness. The only plan you have is to walk up that mountain until you feel like stopping. You tell your friends that it's nothing personal, but this weekend belongs to you.

You've come prepared with your ***River Canyon Bowie Knife*** sheathed at your side. This hand-forged, unique knife comes shaving sharp with a perfectly fitted hand-tooled sheath. The broad stainless steel blade shines in harmony with the stunning striped horn, wood and bone handle. When you feel the heft of the knife in your hand, you know that you're ready for whatever nature throws at you.

This knife boasts a full tang blade, meaning the blade doesn't stop at the handle, it runs the full length of the knife. According to *Gear Patrol,* a full tang blade is key, saying "*A full tang lends structural strength to the knife, allowing for better leverage ...think one long steel beam versus two.*"

With our limited edition ***River Canyon Bowie Knife*** you're getting the best in 21st-century construction with a classic look inspired by legendary American pioneers. What you won't get is the trumped up price tag. We know a thing or two about the hunt— like how to seek out and capture an outstanding, collector's-quality knife that won't cut into your bank account.

BONUS! Call today and you'll also receive this genuine leather sheath!

This quintessential American knife can be yours to use out in the field or to display as the art piece it truly is. But don't wait. A knife of this caliber typically cost hundreds. Priced at an amazing **$49**, we can't guarantee this knife will stick around for long. So call today!

Your satisfaction is 100% guaranteed. Feel the knife in your hands, wear it on your hip, inspect the craftsmanship. If you don't feel like we cut you a fair deal, send it back within 60 days for a complete refund of the sale price. But we believe that once you wrap your fingers around the ***River Canyon's*** handle, you'll be ready to carve your own niche into the wild frontier.

What customers are saying about Stauer knives...

★★★★★

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Not shown actual size.

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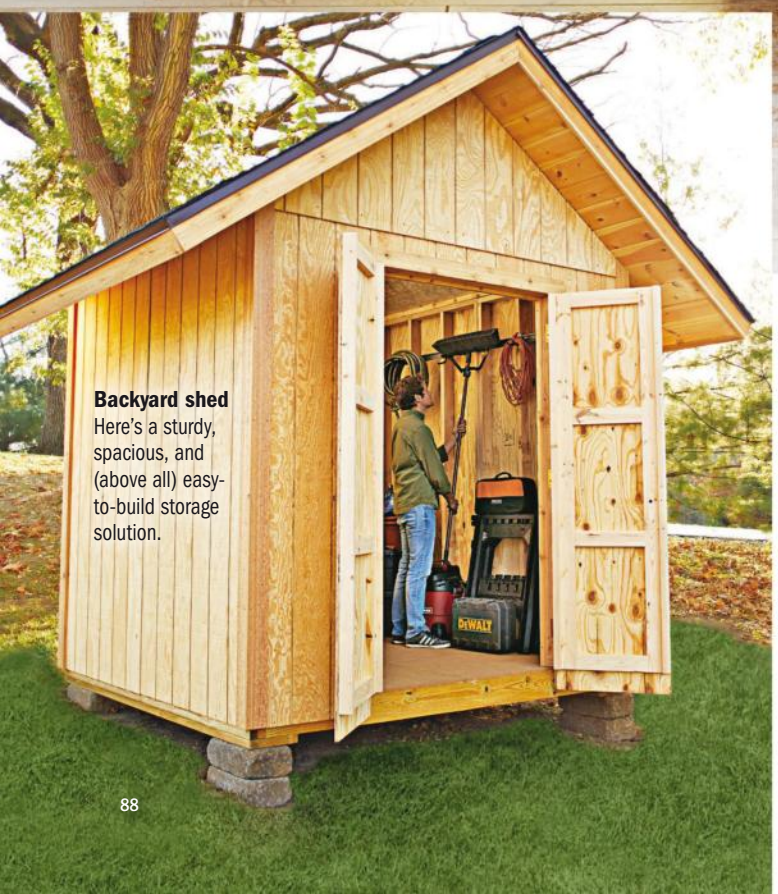
A GLIMPSE INSIDE THE MAY ISSUE
(ON SALE MARCH 7)

Yarn bowl
Learn to turn "green" while crafting this no-snarl dispenser for your favorite knitter.

Shaker tables
Build this beautiful matched set—the end table *above* and coffee table *at right*—from a single set of plans.

Serving tray
Weave a solid-wood web to fashion the bottom of this lovely server. It's easier than you think!



Backyard shed
Here's a sturdy, spacious, and (above all) easy-to-build storage solution.

Benchtop planers
Our shop tests reveal the model you'll rely on through thick and thin.

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