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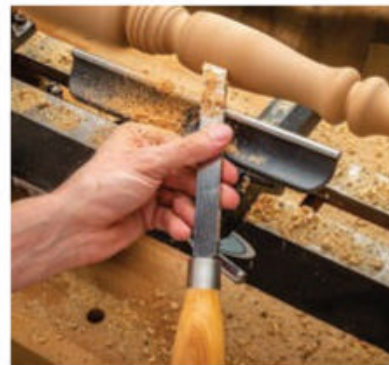


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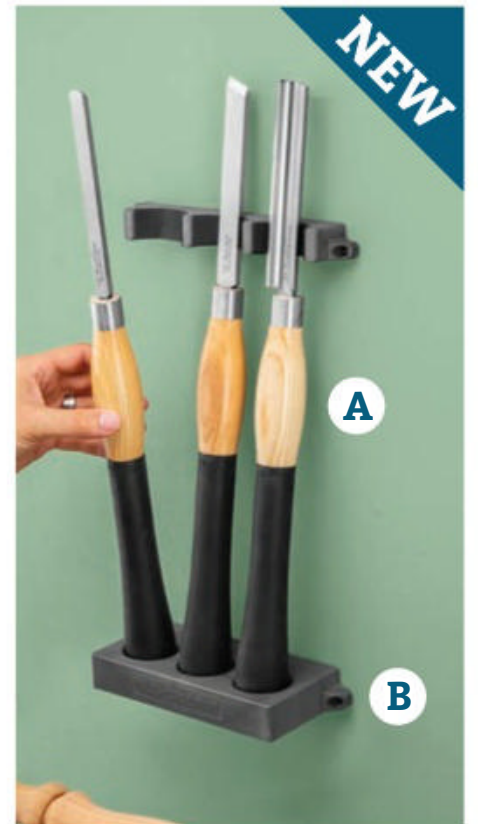


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WOODWORKER'S JOURNAL

CONTENTS

AUGUST 2022

VOLUME 46, NUMBER 4

PROJECTS



Hybrid Workbench

By Chris Marshall

MDF and ash combine to form this affordable, workaday shop fixture.

Page 30

Dog Stairs

By Colleen Carey

Fun to build, this project will provide your canine companion a helpful step up in the world.

Page 40



Plant Stand

By Nick Brady

This Danish Modern inspired walnut accent is sturdy enough for the heaviest of plants.

Page 44



Drill Bit Organizer

By Rob Johnstone

Give your bits and other drill press accessories a portable home base with magnetic appeal!

Page 26

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DEPARTMENTS



Page 18

8 From Our Readers/Stumpers

Fixing water stains and wrangling grabby pattern bits; guessers put the squeeze on April mystery tool.

16 Tricks of the Trade

Readers share ideas for laying out curves with washers and an easier way to round them all up.

18 Shop Talk

Puzzle-maker recalls his path to the craft. Full Circle Woodworking School teaches hand-tool joinery.

22 Woodturning

Learn how to turn pins for a kid-sized bowling game, based on Ernie Conover's antique set.



Page 20

50 Skill Builder

Miter joints elegantly hide end grain for picture frames and more, if you master those angles!

52 Power Tool Fundamentals

Our publisher surveys routers and router tables — woodworking's most versatile workhorses.

58 What's In Store

Clever new gizmos for tuning table saws, clamping hoses, lifting sheet goods and rocking out in the shop.

60 Tool Preview

File, hone and burnish cabinet scrapers easier than ever before with Rockler's all-in-one solution.



Page 52

62 Hardworking Hardware

Rockler's heavy-duty cross dowel connectors join legs to frames with knock-down convenience. Here's how to install them easily.

66 Finishing Corner

Home concoctions for tack cloths, plus options for doing without. Tips for dismantling glue joints.

International Woodworking Fair is Back!



Like nearly every other industry during the COVID-19 pandemic, big woodworking trade shows simply got shut down. Over the last year or so, a few have started to come back, although from my observations, they were smaller and had fewer companies displaying. As with any trade show, there were some interesting things to see, but the shows of late have been shadows of their former selves.

But this August, the International Woodworking Fair (IWF) will be returning to Atlanta, Georgia, and it is my guess that it will be a robust event with lots of people and cool new tools. I've always found the IWF to be inspiring, with the spirit of a lively open marketplace. That said, trade shows have changed in the over 20 years I have been attending them. Formerly they were places where deals were struck for the coming sales season and new tools were unveiled with pomp and ceremony.

These days, it is more about cementing personal connections within the industry. Old friends touch bases and new friendships are developed. Even so, there are new tools launched and inventors present their ideas, hoping to be the next big thing. I clearly remember when SawStop technology was revealed at the IWF. There were so many people wanting to see that hot dog trip the saw that you could not even get close to the demonstration!

Will there be an innovation launched this year that rivals SawStop's ingenuity? Only time will tell, but if there is, we will cover it. Check out our next issue for all the details. And consider attending the IWF yourself. It runs from Tuesday, Aug. 23 through Friday, Aug. 26. Visit www.iwfatlanta.com to learn more and register.

—Rob Johnstone



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FROM OUR READERS

When Projects Catch Your Eye



INSPIRATION IS WHERE YOU FIND IT

It has happened to me so many times. I might be walking through an antiques store, reading a magazine, flipping through one of my wife's catalogs or even visiting a friend's house and there it is — something made of wood that catches my eye, and I can't turn away. Oftentimes I decide that I am going to make "one of those." I once saw an old-fashioned dough bowl in an antiques shop; it's a piece of treenware where bread

dough was placed to rise. I just had to make one (well a few, actually). Another time at a friend's house, I saw an elegant Scandinavian-designed coat and hat rack with steam-bent wooden "hooks." It was soon a project of mine.

I'm guessing this has happened to you as well. You see a cabinet, wooden toy, table or bookcase, and the item inspires you to head off to your shop to build it.

One of my challenges in this regard is remembering the piece that inspired me. I will often take a photo on my smart phone with the strong intention of coming back to it, and then I just forget to actually do that. (I am guessing you are not surprised by this.)

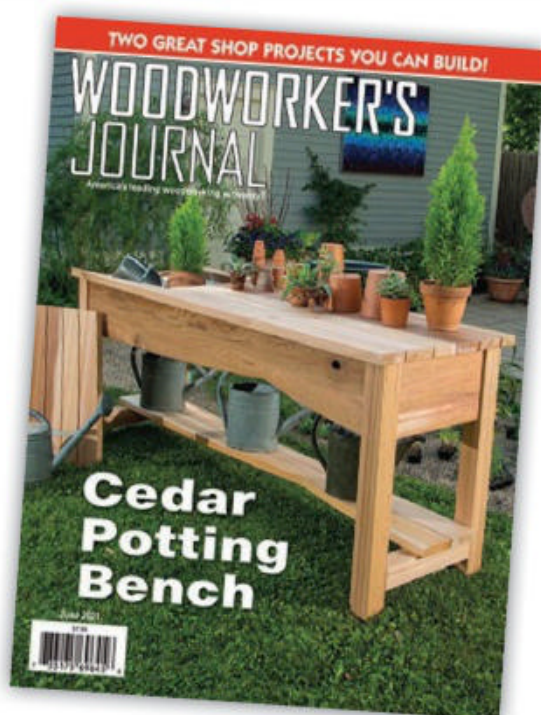
That exact situation happened to me a few years ago. I was in a shop and spotted an old-fashioned, small-scale bowling set. It was so cool. I took photos, held a pin in my hand for scale and started dreaming of Christmas to come and how happy my grandchildren would be to get their set. Then I completely forgot. But to my good fortune (and that of my grandkids), Ernie Conover's wife spied a similar set in his neck of the woods, and he turned them into our "Woodturning" department's focus. Now I not only have all the dimensions I need, but it will be in print ... I can't forget that!

— Rob Johnstone

LETTERS

Potting Bench Praise

Thank you for publishing Kim McNeelan's "Cedar Potting Bench" that appeared on the cover of the June 2021 issue. The moment I saw the bench, I thought I needed to build one for my daughter who is an avid gardener. The design is both simple and elegant. It's very pleasing to the eye while at the same time offers high functionality. When I showed the article to my daughter and asked if she'd like a version of it, she immediately accepted the offer. I completed the bench in time for our spring planting here



in Michigan this year, and hopefully she'll have it for many springs to come. Through your craftsmanship and design skills, you have brought

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Safety First Learning how to operate power and hand tools is essential for developing safe woodworking practices. For purposes of clarity, necessary guards have been removed from equipment shown in our magazine. We in no way recommend using this equipment without safety guards and urge readers to strictly follow manufacturers' instructions and safety precautions.

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August 2022 Woodworker's Journal

joy to our family. Thank you for the article and for allowing others to benefit from your knowledge.

Mike Kestner
Via the Internet

D4R Pro Riser Plan?

In the “More on the Web” video for your “Cherry Wine Cabinet” article [February 2021], Chris Marshall has his Leigh D4R Pro Dovetail Jig attached to some sort of riser and clamped to his workbench. Are there plans for this riser? I have the D4R Pro and would like to make the riser for mine.

Brian Collier
Via the Internet

Chris Marshall Responds:

I’m a pretty tall guy, so that riser helps me use the D4R Pro at a more comfortable working height. There’s no plan for it, either in our archives or from Leigh. But here’s a photo of it that should help. The riser is 12" tall with a couple of stretchers screwed to the back of it. This way, I can hang the jig on my shop wall over a board with two turnbuckles attached to it. The turnbuckles restrain the stretchers to lock the riser and jig in place.

Advice Needed for Pattern-routing Problems

Recently when I was trying to rout a pattern for the legs on a table, the bits grabbed my stock in a scary way. The wood was 1¼" thick. I band-sawed close to the line and taped a pattern to the

bottom of my stock because I didn’t have a bit tall enough to put the pattern on top. I tried several bits, but they all blew out the stock along the wood grain this way. Here’s a photo of the problem (bottom right). What was I doing wrong? I was feeding against the grain, so I slowed down the bit as much as possible. Any suggestions would be greatly appreciated. I’m a little wary of my router table due to a mishap last summer.

Barney Heller
North Wales, Pennsylvania

Rob Johnstone Responds:

I totally get how startling it is when a router bit grabs hold of wood and splits the grain. My guess is that the section of the leg you are routing is essentially end grain. It may not be at the end of the board, but the curve in the shape of the leg means the router bit’s cutter is striking wood in line with the grain.

There are a few ways to fix this. First is to band-saw very close to the shape of the piece, within 1/16" in the danger zones. Second, pattern bits with spiral flutes will be less likely to grab the grain than straight cutters.

Third, and this is a trifle tricky: Use what we call a “climb cut” on the small section of the piece that is causing you the trouble. That means carefully moving the wood *with* the rotation of the bit (not against it) and keeping your fingers well clear of the cutters. It’s a technique of last resort, but most of us do it from time to time.

Continues on page 11 ...



READER PROJECTS



Five Monogrammed Keepsake Boxes

Recently I made five of these boxes for my young nieces and nephew. I took design cues from different styles and created my own plans. I added the initial of their first names to personalize each box. My wood choices were maple, white oak and mahogany.

Joseph Gervasio
Via the Internet



Plant Stand Pleases!

I made this plant stand from the “Breakfront Plant Stand” plans in the February 2022 issue. I had to make some changes in the construction, due to the fact that I’m legally blind and find some things are difficult for me. I did the joinery with pocket screws instead of tenons and rabbeted the upper and lower side pieces to accept the slats. I appreciate the detail in the plans and enjoyed every minute of its construction. We’re using it to display some of my other work while we try to find the plants we want. I’m turning 90 this year and try to get in my shop every day that I can. Thanks for your excellent magazine.

James Sahli
Othello, Washington

Kitchen Cabinet Face-lift

I’m a self-taught woodworker, using many of the tools I inherited when my father passed. One of my bigger recent projects was updating our kitchen with 28 new doors and 12 new drawers for the cabinets — a situation where the plywood boxes were just fine but the doors and drawer fronts were dated. I have used my woodworking skills in work trips with our church and for Rotary Club, both in the U.S. and abroad. I continue to learn, enjoy the articles and videos that your magazine provides and look to YouTube for ideas, instruction and inspiration.

Don Gwinn
Via the Internet



Serving Tray Success

I loved the look of your “Simple Serving Tray” [December 2021] and thought I’d give it a go. I used walnut and padauk, same as yours. I turned the padauk buttons on my lathe. I added a couple different “design features” to hide some mistakes. I chamfered the bottom edge and finished the project with Danish oil. I think it turned out pretty well. Thanks for the inspiration!

Billy Gilman
Woodridge, Illinois

How About a Tool Drawing for Readers?

Some of the tools used to build projects featured in *Woodworker's Journal* are things most of us will never own. The handheld Shaper Origin CNC is one, and so is the Leigh FMT Pro Mortise and Tenon Jig that appeared in the February 2022 issue (right photo). The Shaper Origin is much cheaper than other CNC machines but still a couple of thousand dollars. This Leigh FMT Pro jig sells for more than \$1,200. I understand that tool manufacturers sponsor these things as advertising money well-spent, and I'm happy they trust you folks to showcase them. How about stipulating that you'll use them in your articles if they will also donate one to be given away to someone in a random drawing of your subscribers? Worth an ask ... Thanks for an inspiring magazine!

Hyrum Weller
West Jordan, Utah

Removing Black Water Stains from Windows

I have windows in my home with natural wood trimwork that has water stains. The stains are brown to black in color. Is there a way to remove the stains so I can varnish? I have subscribed to *Woodworkers Journal* for years and like your advice on all the questions. The April 2022 issue's "Finishing Corner" suggested oxalic acid could be used to restore redwood's original color. Would that work for me?

Jerry Hefling
Via the Internet

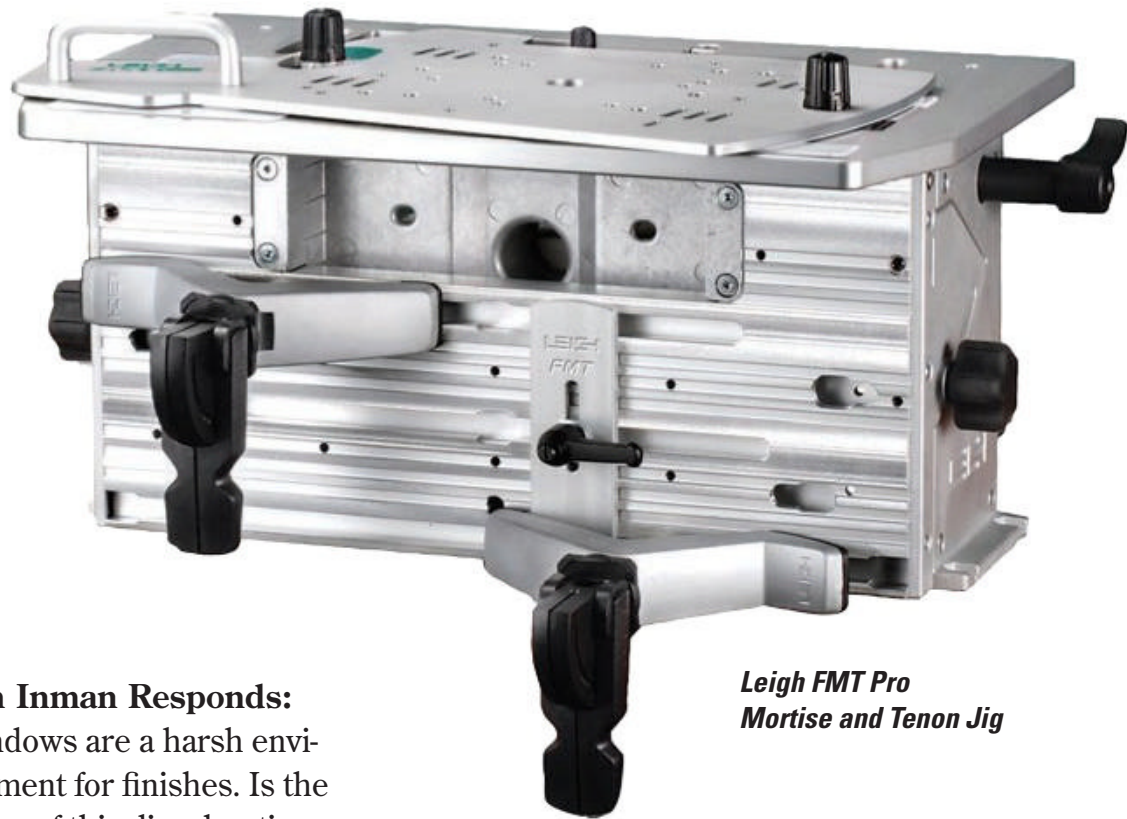
Tim Inman Responds:

Windows are a harsh environment for finishes. Is the cause of this discoloration damp condensation over a long period of time or a big leak/flooding? Constant interior dampness could mean the stain is from mildew or mold. Soaking wet around the hardware may mean the discoloration is from metal leaching. Oxalic acid can help remove mold/mildew-type stains, but not metallic pigmented ones (or plain old dirt), which have become part of the wood. I suggest that you work with what you have. Use finisher's pigment colors to blend and minimize the discoloration, but be sure to control the source of moisture first.

Glue Residue Solutions

Reading the April 2022 "Finishing Corner" question about dealing with glue residue made me want to share what works for me. Before applying any finish, I wipe down the entire project with a clean rag dampened with mineral spirits. Any glue residue shows up when the wood is wet. Using a scraper and/or sandpaper, I remove the residue, allow the spirits to dry and proceed with finishing.

Larry L. Bird
Pella, Iowa



*Leigh FMT Pro
Mortise and Tenon Jig*

As a professional wood refinisher for some 40 years, I have used a method for removing wet glue that has served me well because it does not penetrate the veneer surface. As soon as possible after applying glue, I use a wet rag to remove any excess glue. I will get into the corners or other hard-to-reach places using a wet rag over the tip of a screwdriver, or sometimes a wet toothbrush may do the trick. If there are still glue spots found when the stain is being applied, I try sanding the spot with automotive-grade wet or dry sandpaper; however-

Continues on page 14 ...



SURVEY

OUR SURVEY GROUP RESPONDS TO QUESTIONS ABOUT ROUTER BITS

Router bits and the machines that drive them help take our woodworking to the next level. Here are some details about the router bits you own.



1. Approximately how many router bits do you own?

- a. 1 to 10 9%
- b. 11 to 20 21%
- c. 21 to 30 25%
- d. 31 to 40 18%
- e. More than 40 26%
- f. I don't own router bits 1%

2. Do you own 1/4"- or 1/2"-shank router bits?

- a. Only 1/4" shanks 13%
- b. Only 1/2" shanks 0.5%
- c. Both 1/4" and 1/2" shanks 85%
- d. I'm not sure 1%

3. Which brand of router bit do you think provides the best value?

- a. Amana 3%
- b. CMT 7%
- c. Freud 27%
- d. Infinity 2%
- e. MLCS 17%
- f. Onsrud 0.5%
- g. Rockler 15%
- h. Whiteside 15%
- i. Other 12%



4. What is the largest-diameter cutter on the bits you own?

- a. 3/4" diameter 15%
- b. 1" diameter 17%
- c. Between 1" and 2" diameter 33%
- d. Between 2" and 3" diameter 23%
- e. 3" diameter 8%
- f. Larger than 3" diameter 4%

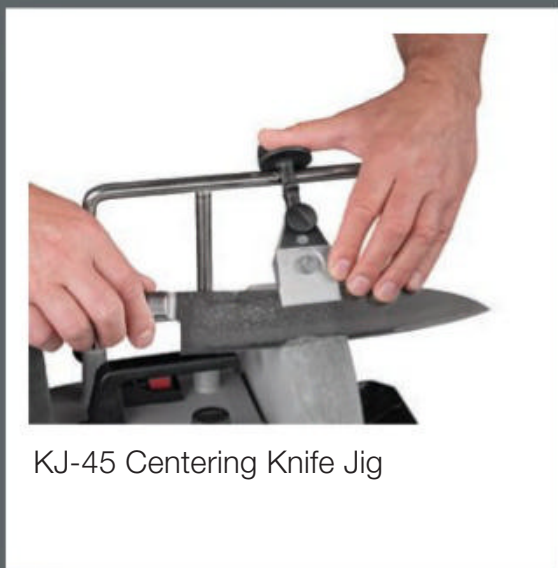


5. When was the last time you bought a router bit?

- a. Within the last month 8%
- b. 1 to 2 months ago 10%
- c. 2 to 4 months ago 7%
- d. 4 to 6 months ago 11%
- e. 6 to 12 months ago 14%
- f. Over a year ago 49%

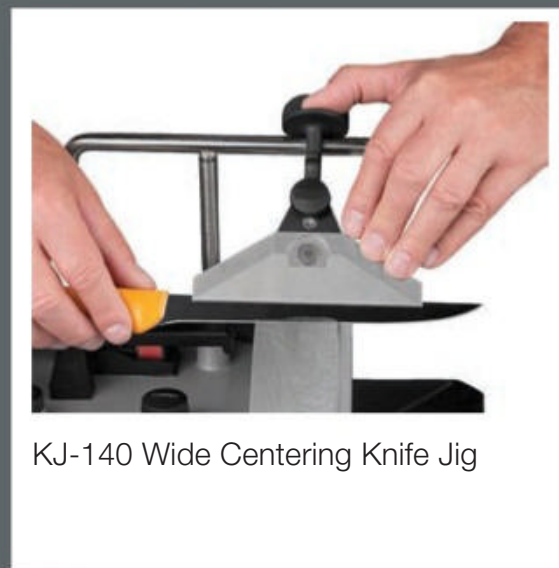
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Birch	4/4		Select	3.50	4/4			4/4	\$117.00	8/4	NA
Butternut	4/4... 2C	2.50	1C	3.25	8/4	1C	3.75	4/4	\$100.00	8/4	\$129.00
Cedar	4/4... 1C+Btr.	2.00			4/4			4/4	\$ 87.00	8/4	NA
Cherry	4/4... 1C	2.75	Select	4.90	8/4		5.75	4/4	\$126.00	8/4	\$139.00
Cypress	4/4		Select	3.00	8/4		4.00	4/4	\$ 99.00	8/4	\$109.00
Hickory-Pecan	4/4... 1C	2.00	Select	3.00	8/4	Select	3.50	4/4	\$110.00	8/4	\$137.00
Mahogany (African)	4/4		Select	5.25	8/4	Select	5.55	4/4	\$124.00	8/4	\$127.00
Maple (Hard)	4/4... Select (N)	3.00	Select (W)	3.65	8/4	Select	4.50	4/4	\$118.00	8/4	\$126.00
Maple (Soft)	4/4		Select	2.60	8/4	Select	3.00	4/4	\$ 97.00	8/4	\$107.00
Oak (Red)	4/4... 1C	2.10	Select	2.80	8/4	Select	3.95	4/4	\$107.00	8/4	\$129.00
Oak (White)	4/4... 1C	2.20	Select	2.80	8/4	Select	4.95	4/4	\$107.00	8/4	\$135.00
Poplar	4/4... 1C	1.30	Select	1.80	8/4	Select	2.00	4/4	\$ 87.00	8/4	\$ 91.00
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Drill Bit Organizer (page 26):

Overview of this project being
built (video)

Hybrid Workbench (page 30):

Chris Marshall discusses MDF as
a benchtop choice (video)

Skill Builder (page 50):

Miter joints — time-honored
and sometimes tricky options
for hiding end grain (video)

Power Tool Fundamentals

(page 52): Explore the versatil-
ity of routers and router tables
(video)

What's in Store (page 58):

Featured tools in action (videos)

Hardworking Hardware

(page 62): How to install
cross-dowel hardware (video)

er, you need to be sure to use
one grit finer than you used
to sand the bare wood. Dip
the sandpaper into the stain
and sand with the grain until
the glue mark disappears.
This trick seldom fails.

Jim Wiswell

Via the Internet

Plan Clarification

I am building the “Breakfront
Plant Stand” [February 2022]
and can't figure out how the
outer units are fastened to
the center unit. How is the
support for the upper portion
of the outer unit attached to
the center unit leg, and how
is the upper portion of the
outer unit attached to the
support?

Tom Delia

Via the Internet

Chris Marshall Responds:

Glad to help, Tom! The
answers to your questions
are found on page 48 of the
article and its photos. The



Cross Supports (pieces 7)
are attached to the un-ten-
oned ends of the Top Front
Rails (pieces 8) of the outer
units with 2" screws driven
through those butt joints.
The Cross Supports are
simply screwed to the slats
of the center unit with #6 x 1"
screws, driven through from
inside the center unit. So
these are screwed butt joints
in both instances. The Cross
Supports are not attached
to the legs of the center unit
at all — only to its slats. You
can see that connection be-
ing made in the photo above.

In the same way, the
un-tenoned ends of the
bottom front rails of the
outer units, and the bottom
side rails of the center unit,
are fastened together with
2" screws. Although these
screw joints are a bit uncon-
ventional for this project,
they're very sturdy. I have
this plant stand in my home,
and I never notice the heads
of the screw joints inside the
center unit. I chose screws
with a bronze finish, and
they blend in nicely with the
stained mahogany.

TRIVIA Standing at Ease

My first shop had a concrete floor, and it didn't take too many hours of

standing to appreciate the relief that a rubber mat afforded. I still stand on a rubber

mat at the table saw as well as other machines. These mats greatly reduce leg fatigue

and provide a nonslip surface among the sawdust and shavings on the floor. A good pair of

shoes also goes a long way toward keeping your legs and feet from developing problems. Ad-

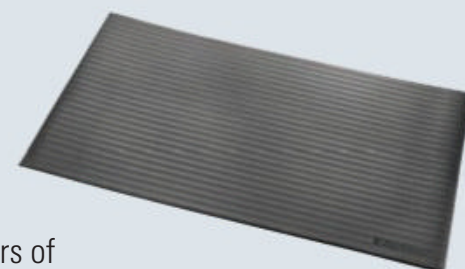
ditionally, it sometimes helps to adjust your vertical position at the (table) saw for more comfort.

For example, when cutting a lot of finger joints, I've found that standing on a low plywood platform
helps reduce leg fatigue by raising me up to a more comfortable position for this tedious operation.

Kelly Mehler

The Table Saw Book: Completely Revised and Updated

The Taunton Press; ISBN: 1561584266



STUMPERS

Tight Squeeze

Many recall this tool's juicy job.

Randy Wolfe must not have been an early riser as a youth — or he didn't grow up in the 1940s, 50s or 60s — or else he'd likely know exactly what his April mystery tool is for. Because more than 100 of you remember it well, and many still use theirs today.

"This seemed a fairly easy mystery," says **Cliff Watson** of Roseville, California. "It's made by Wear-Ever, so it's most likely a kitchen product. It has a spout, so you would expect to be pouring liquid. And it looks like an overgrown garlic press."

That last similarity, in addition to the lack of a comparative scale for Wolfe's tool in our April photo, led **Patrick Bink, Dave Wells, Walter Glass, Tim McAtee, Jim Steffner** (Nova, Ohio), **Cindie Petersen, Alexander Mackie** (Winthrop, Washington) and **Tony Reeder** (Anna, Texas) to reach that very conclusion — garlic press. Sorry, that ain't it!

The mention of a patent number (making the answer too easy, several of you say) sent several studious sleuths straight to the Internet. "This invention relates to a juice extractor and more particularly to a fruit juice extractor," reports **Adriaan Sachtler**. "The patent was published in November 1932," continues **Steve Russum** of Machesney Park, Illinois. "The inventor was George W. Bungay."



"I have a very similar tool in my bar for juicing fruit for drinks," reports Scott Rier, about his juicer here.

But dozens upon dozens of you — too many to name individually here — didn't require historical proof to identify this kitchen tool from your childhoods. The answer was obvious when you showed up for breakfast at mom's table (or grandma's, or auntie's). The Wear-Ever juicer was your ticket to fresh-squeezed juice, prior to the advent of electric juicers or frozen concentrate.

For those of us who didn't use one, or are children of later decades, here's how this cast-aluminum kitchen accessory works. "Slice the (citrus fruit) in two at its equator and put the pieces into the juicer, cut side down," says **Dwight Kauffman M.D.** "As the solid plate on the hinged end of the handle rotates into contact with the fruit," adds **John Bost** of Greensboro, North Carolina, "Squeeze the handle against the base to press the juice from the fruit." **Phil Gilstrap** says, "The juice flows into a little reservoir on the side from which you can pour it out." And the slotted basin allows the juice to drain through, while straining out the seeds and rinds, concludes **Doug Little**.

"It worked great; the only problem was, if you squeezed too hard, you'd force out too much oil from the peel, making the juice taste bitter," recalls **Joe Sawchuk** of Toronto, Ontario.

This device squeezed all manner of juicy fruits for your gustatory pleasure — oranges, lemons, limes, pineapples, grapefruits and pomegranates, many reflected. "We still use it for juicing small amounts of soft fruit for a breakfast meal — things like gooseberries, large currants, ripe cherries and ripe grapes from the yard," says **Mike Martys** of Gettysburg, Pennsylvania.

It's still one of the most useful gadgets in my kitchen," beams **Sheila Von Wald** of Hoven, South Dakota. "It's the best citrus juicer I've ever used," adds **Lyn Cote**. "It is strong," continues **Stuart Schwadron**, "And just look at those wonderful curves! Brunch cocktails never looked so fancy."

"I used one as a kid in the 60s and I thought it was fun," recalls **Mallory Boyd** of Ridgecrest, California. "But I think my grandma was exploiting free child labor!"



Dave Adams shares a photo of his Wear-Ever fruit juicer — a fondly recalled and hard-working kitchen helper. "I use mine mainly for oranges," he says. "It will squeeze anything smaller than a large orange."

What's This?



Ruth Van Kuren didn't provide details about this pair of T-handled mystery tools, aside from her desire to know what they're for. Their circular bottoms (cutters, perhaps?) are steel and appear to be attached to the handles with brass rims. Can you explain their purpose? Email your answers to

stumpers@woodworkersjournal.com

or write to "Stumpers,"

Woodworker's Journal, 4365

Willow Drive, Medina, MN 55340.

TRICKS OF THE TRADE

Rounding with and Rounding Up Hardware



Save Those Thin Offcuts!

Here's a reminder that's so obvious it almost shouldn't need to be told: Don't throw out those thin offcuts after you've ripped solid lumber for a project. I've used them countless times as stir sticks for finishes, glue applicators, thin shims, spacers underneath projects I'm finishing and of course, kindling. They're so much more useful in the shop than in a landfill!

Patti Givens
Kanab, Utah



Foam Clamping Aids for Miter-cutting Moldings

I often make picture frames with built-up moldings, and miter-cutting them on the table saw can be challenging. Their irregular shape is difficult to clamp effectively against the fence of my mitering jig. I've found that dense foam is a good remedy for the problem. It conforms to the molding while providing additional surface area for clamping. This foam is pretty common packaging material, and I've also harvested it from old seat cushions. Give it a try!

Jim Wilson
San Marcos, Texas



Washers Make Handy Radius Templates

Washers make great little radius templates for laying out corners on workpieces. There are regular washers and fender washers, so the size variations are abundant. Find the sizes with the radii you want, label them and save them with your measuring and marking tools so they're readily accessible when you need them.

Bruce Kieffer
Edina, Minnesota

Low-cost Floor Joist Light Bracket

A trip to the deck hardware section of my local home center provided the base I was looking for to hang a magnetic task light. I found that a galvanized hurricane tie plate, nailed to the exposed floor joists in my workshop, allows me to mount the light just about anywhere I need it. It's very handy and ended up costing me only a few dollars.

Thomas Marinelli
Washington, Michigan



PICK OF THE TRICKS

Easier Fastener Pickup

I often find myself rummaging through cans and other containers of spare fasteners that I've saved, but I never look forward to the tedious process of picking them all up after I've dumped them out. Sound familiar? I finally figured out an easier way to do this. I use a scrap of thin, lightweight plywood with a 3"-diameter cutout in a corner. I dump the contents on the board and search for what I need. Then I put the container under the cutout and simply push all the fasteners into the hole. This provides a quick, drop-proof way to refill the container again.



Tom Sheil
Cheshire, Connecticut



In addition to our standard payment (below), Tom Sheil of Cheshire, Connecticut, will also receive a Milwaukee M18 FUEL™ Oscillating Multi-Tool (2836-21) with an OPEN-LOK™ 9PC Multi-Tool Blade Kit (49-10-9113) for being selected as the "Pick of the Tricks" winner. We pay a one-time sum of \$150 for each trick used. To join in the fun, send us your original, unpublished trick. Please include a photo or drawing if necessary. For your chance to win, submit your Tricks to Woodworker's Journal, Dept. T/T, P.O. Box 261, Medina, MN 55340. Or send us an email: tricks@woodworkersjournal.com

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SHOP TALK

Full Circle Woodworking School

By Joanna Werch Takes

Wayne Miller's school near Ft. Worth focuses on hand tool fundamentals.



Three Primary Joints

"There's only three woodworking joints: the dovetail, the mortise-and-tenon and the housing dado," Miller says. "I didn't want to teach how to make a chair, how to make a box. There are a lot of schools that are doing that, but if you want to learn how to do layout and how to cut the three woodworking joints by hand, you don't have many options. So I thought, 'OK, I'm going to focus on that niche.'"

The "Introduction to Joinery" class serves as a prerequisite to other courses. A candle box class, for example, is mostly dovetails; a side table class is all mortise-and-tenon; and the wall shelf course is "housing dados with a couple of mortise-and-tenons."

Project classes are two days long; others are one-day offerings.

Miller also teaches classes on spoon and spatula making and bowl carving. "Not everybody wants to build furniture," he says. "Many people just want to be able to sit down and make a spoon or spatula with a couple of basic tools."



Wayne Miller's Full Circle Woodworking School focuses on hand tool woodworking. "I'm optimistic that people are tired of spending all their free time with their nose in technology," Miller says. "It's not as rewarding as putting your hands on something and creating."

The school has been in Texas since 2018, but it originally opened in Kentucky. "The idea was to live on my

acreage and make furniture," Miller says. "I decided to start the school because there was no one teaching the fundamentals, that I could find, other than where I went."

Miller had attended instruction from Paul Sellers and Frank Strazza at what's now Heritage School of Woodworking. In his own school, he has replicated their focus on hand tool joinery.



Although Miller (left) doesn't offer a bench building class, he's happy to help his students reach their goals, even with one-on-one tutorials.

Shop Space and Supplies

Miller originally tried running classes out of his two-car garage, “but the ambiance wasn’t what I wanted,” he says. He built a 1,600-square-foot shop and now uses about 25 percent of it for Full Circle Woodworking classes.

Four student workbenches, with a vise on each corner, allow two students per bench. Miller also has his own single bench in the classroom area. One quadrant of the shop is for display and storage, another is for wood storage and the fourth is for machinery.

“Most of the lumber I buy is roughsawn,” Miller explains. “I can plane a board flat and true and to dimension with a hand plane, but it’s not an efficient use of my time. There are machines that are much faster at it, and so I use them. I want to spend my time doing the joinery.”

He does provide wood for students in his classes, as well as tools — although students are welcome to bring their own hand tools if they have them. “Everything’s provided, and most of the time, I throw in a lunch as

well,” Miller says.

With the school’s location in Azle, Texas, about 12 miles west of Fort Worth, “there are ample things to do to keep spouses engaged if they don’t want to participate in the class,” Miller says. Specific attractions mentioned include the Fort Worth Stockyards, Sundance Square Plaza and Kimbell Art Museum.

Sometimes, however, spouses or entire families take his classes together. Previous students have been “young, old, male, female, educated, some of them not,” Wayne says. “I couldn’t pinpoint a specific demographic for people that are interested in this.”

Learn a Skill, Go and Do

Although he’s happy to see students return for additional classes, that’s not Wayne’s goal. “If they come and they take one class, and they can go do their thing, I’m happy,” he says. “I feel like I’ve achieved what I wanted to do: I’ve taught someone a skill, and now they’re off doing something with it.”

He helped one former student — a sushi bar owner



“I’m trying to get people engaged with their hands at a fair price and as simply as I can put together a curriculum,” Miller says.

— build the workbench that then allowed the restaurateur to build tables and sushi serving platters.

“I don’t want students to feel like they’re married to me,” Wayne said. “I want to teach them something, and I want them to be able to go employ that knowledge. I don’t need groupies; my dog is my groupie. I just want to teach and to keep the craft alive.”

For more information about Full Circle Woodworking, visit fullcircleww.com or call 817-444-1122.



Miller built this stool using cutoffs of timbers sawn for repairs to the Mayflower II replica Pilgrim ship.

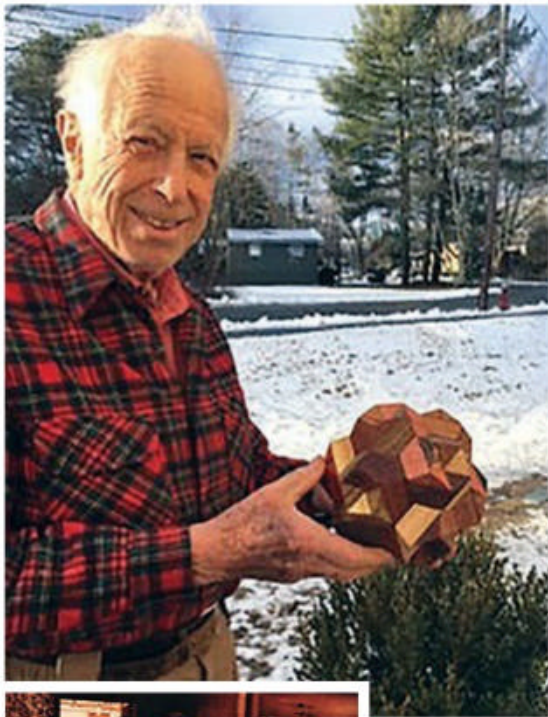


Full Circle Woodworking School did not shut down during 2020 and 2021. “A few people were brave enough to come out and weather the storm, so to speak,” Miller says. He has seen an increase in enrollment in 2022.

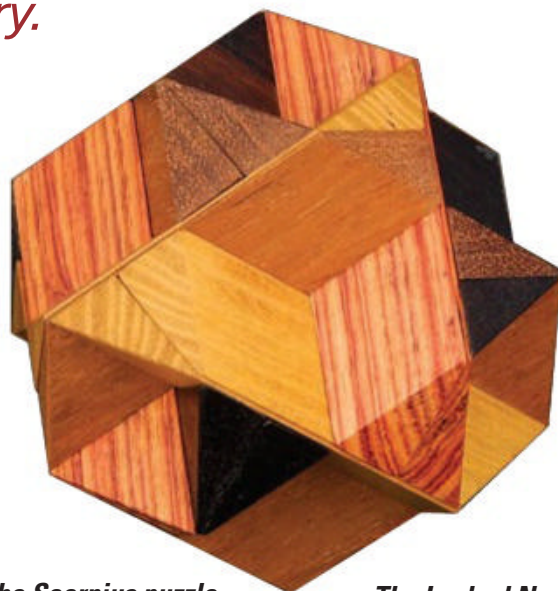
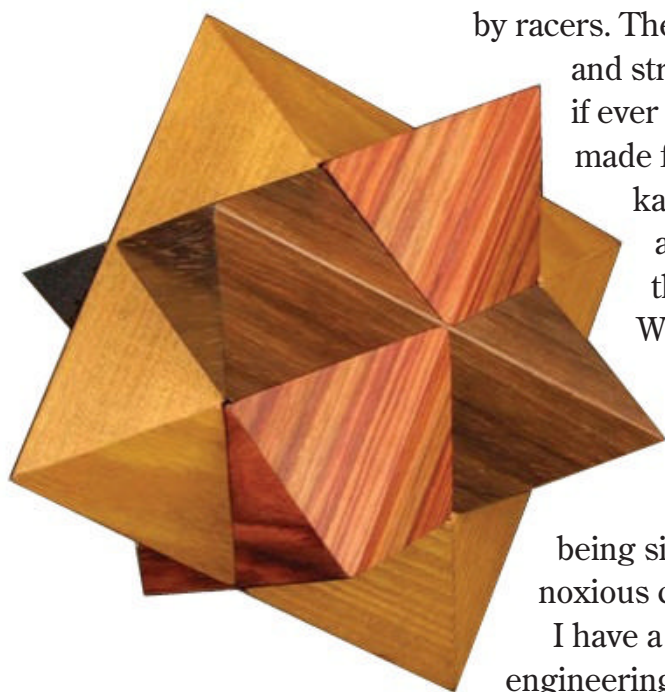
Paddle-maker Turned Puzzle-maker

By Stewart Coffin

Lifelong woodworker recounts a half century of interconnected geometry.



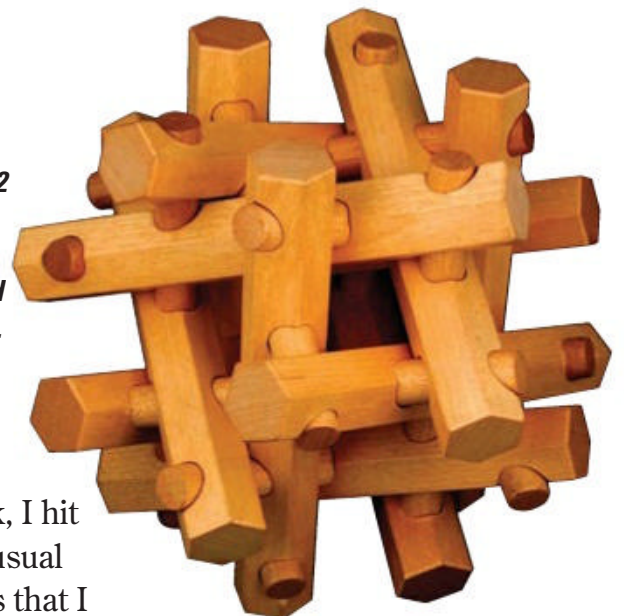
This six-piece Star puzzle is shown here in three contrasting woods: canarywood, walnut and yellowheart.



The Scorpius puzzle (above) is made up of 24 triangular sticks joined in fours to make six interlocking parts.



The popular Jupiter puzzle consists of 60 pieces joined in fives to make 12 interlocking parts.



The Locked Nest puzzle (right) has 12 hexagonal sticks and 12 dowels, six of which are joined together in elbows.

If you Google my name, you will find me listed as a designer and maker of geometric puzzles. Actually I prefer to call my woodcraft “AP-ART, the sculptural art that comes apart,” as the word “puzzle” can sound too much like jigsaw puzzles.

Fifty years ago, you might have found me listed as a maker of canoe and kayak paddles. My paddles were much in demand, especially by racers. They were big

and strong, and rarely if ever broke. I also made fiberglass

kayaks, being a pioneer in that business.

What brought that otherwise successful venture to an end was

being sickened by the noxious chemicals.

I have a background in engineering and a family

background in art.

So while casting around for a more healthy line of work, I hit upon designing unusual geometrical puzzles that I could then license for manufacture. But after a year of that with not much success, in 1971 I decided to set up a woodworking shop and make them myself.

At the start, most of my sales were at craft shows. Oh how I long for those memorable days, involving my wife, Jane, and our three children. But all that changed in 1978 when my work was mentioned in Martin Gardner’s column in *Scientific American*, and I soon had more business than I could handle. I never spent a cent on advertising.

I have produced three books about my work, and the most recent, “Geometric Puzzle Design,” is still in print. There have also been

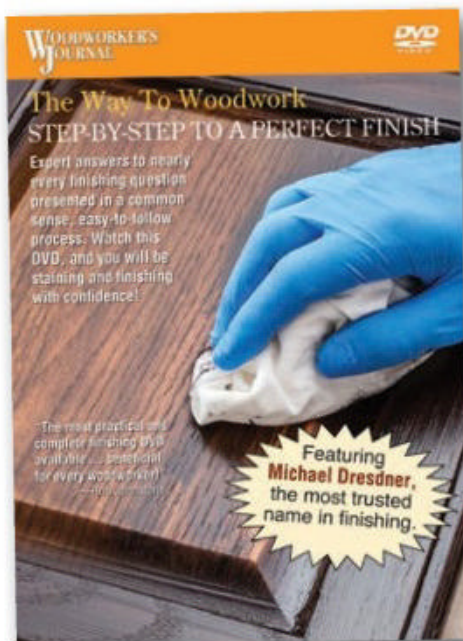
many magazine articles.

In 2018, I put together and self-published “AP-ART, a Compendium of Geometric Puzzles.” For short, I just call it my “Compendium.” Copiously illustrated, it can be found on my website: stewartcoffin.com.

Last year I discontinued woodworking. Not because of my age (now 92) but because my partner Valerie and I acquired a farmhouse in Massachusetts, built in 1789 on three acres of land. We are enjoying returning it to productivity. And after all, with 600-plus puzzle designs created over the span of 50 years, and uncounted thousands made and sold, isn’t that enough?

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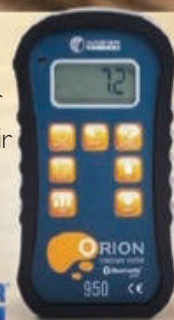
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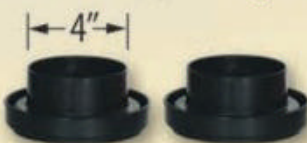
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WOODTURNING

Turning Pins for a Children's Bowling Game

By Ernie Conover

Whether they get strikes or not, this bowling set is sure to score points with children in your life. It's based on the author's antique set.



Try your luck at miniature bowling when you turn a set of hardwood pins and, perhaps, a few balls.

The bowling pins for this project are based on the set you see above that my wife once found in an antique store. Yes, I am a sucker for turned historical items, and these days anything older than I am counts as an antique. Our

bowling game was designed for children, and from the workmanship I think it was made in the 1880s or 90s. The pins were turned from less-than-seasoned wood (near green I would say), because they are oval when you spin them between your fingers. The balls were turned between centers and are not round at all. They have flat spots where the lathe centers held them.

Fortunately, due to Newton's First Law of Motion (*A body at rest or moving at a constant speed in a straight line will remain at rest or continue moving in a straight line at constant speed unless*

acted upon by an outside force), the balls roll surprisingly straight, as long as the thrower imparts decent momentum. The only outside force in this case is friction, which a lumpy ball may actually have less of. However, it is harder to put English (hook) on said lumpy ball, because of the reduced friction. This is all to say that anyone can turn a ball better than these.

Turning the ten 11 $\frac{3}{16}$ "-tall pins is straight spindle turning that can be done with just a roughing-out gouge and a mini lathe. A spindle gouge is expedient too, for shaping the top and bottom of the pin.



To watch a video of the author turning several hardwood balls for this bowling game, visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



The author's antique pins were probably turned from green, or more likely, poorly seasoned wood. The telltale sign is that the pins have dried oval in cross section, which can be felt by turning them in hand.



The antique wood balls are more lumps than orbs. Turned between centers, they have flat spots where they once were held in the lathe. The arc between the center points was likely turned by eye.

Choosing Lumber for and Preparing Pin Billets

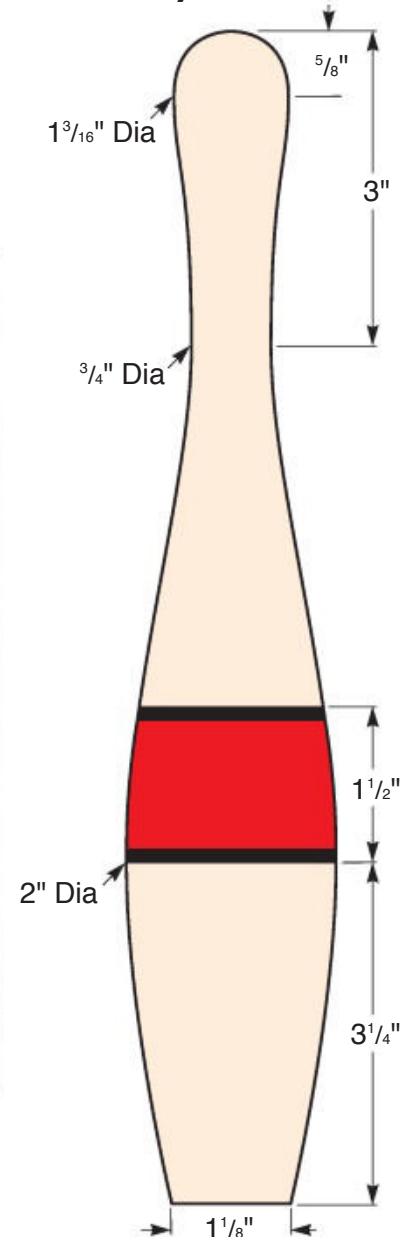
Hardwood is sold by quarters of an inch. When you speak of wood in this way, you are signaling to the lumber supplier that you want roughsawn wood that has been kiln- or air-dried. In the lumbering process, the wood is sawn a bit thicker than the specified dimension to allow for shrinkage during drying. Therefore, 4/4 (pronounced four quarter) wood would be at least $1\frac{1}{16}$ " thick and as thick as $1\frac{1}{8}$ ". This board will usually plane smooth at $\frac{13}{16}$ ".

Likewise, an 8/4 roughsawn board will be at least $\frac{1}{16}$ " thicker than 2", if you select your board carefully (pick narrow ones that are around 5" wide, free of cup and twist and straight along their length). Crosscut this plank into 12" lengths and rip each section into square billets. Trim the billets to $11\frac{13}{16}$ " long, and mark their centers by drawing diagonal lines between the corners. Once you bring the resulting billet to just round in the lathe, you should be rewarded with 2" in diameter or a bit more for your trouble.



An 8/4 plank of hard or soft maple, ash, hickory, beech or birch will yield billets for pins with no lamination required. Crosscut the lumber into 12" lengths, then rip the pieces into square blanks. Mark their ends with centers so you can mount the pin blanks between drive and live centers.

Pin Layout



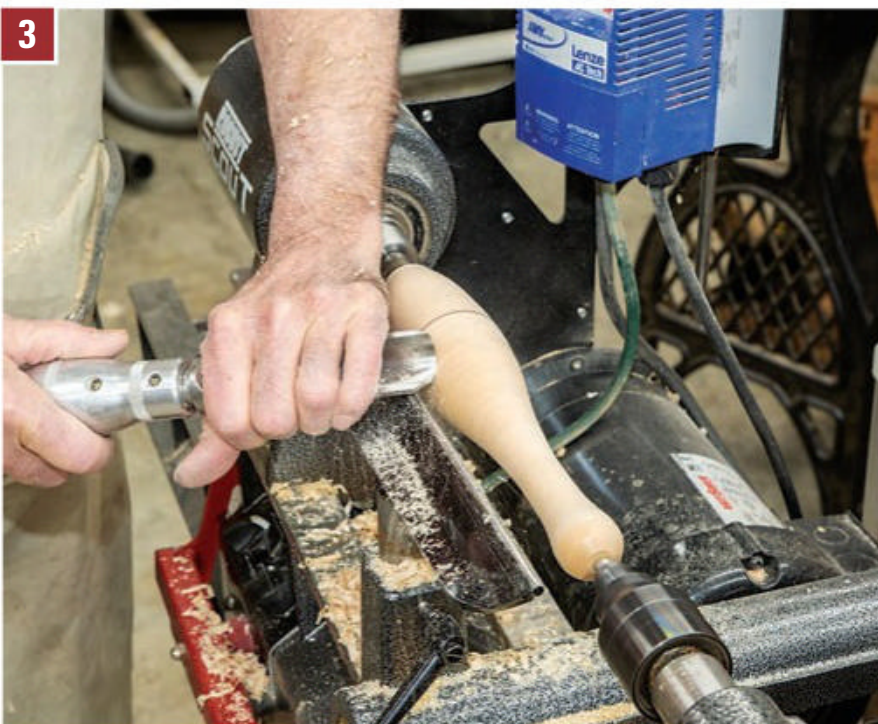
WOODTURNING continued



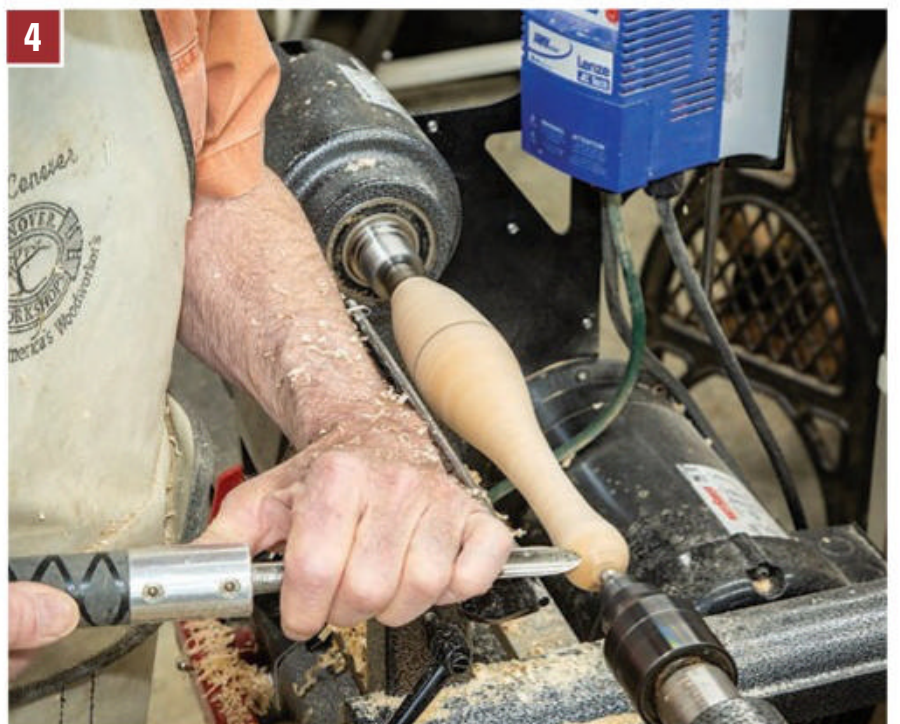
1 When chucking the billet, orient the bottom of the pin toward the drive center and the top of the pin against the live center. Turn it just round and check the diameter with calipers. Don't be afraid to reverse the billet if it tapers undersized toward the headstock. Remember, the only place you need a 2" diameter is about a third of the length from the bottom (see Pin Layout, page 23). The rest of the pin's profile is smaller in diameter.



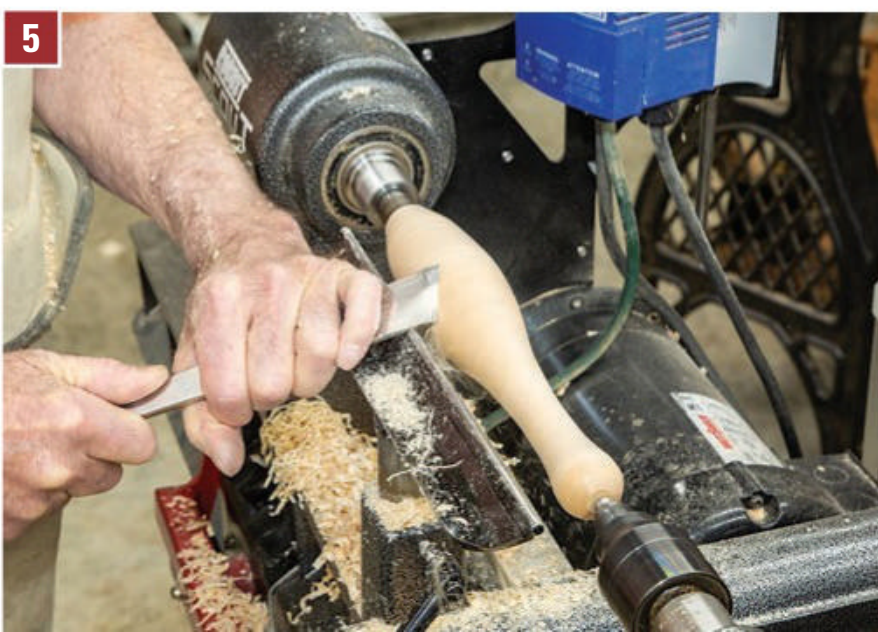
2 Draw a pencil line $3\frac{1}{4}$ " from the drive center (headstock) to demarcate the thickest area of the pin. With a parting tool and a set of calipers, plunge a groove at a distance $\frac{5}{8}$ " from the live center to a diameter of $1\frac{3}{16}$ ". Then cut another groove to a diameter of $\frac{3}{4}$ " at 3" from the live center. This second groove indicates the smallest diameter. Size the base of the pin to $1\frac{1}{8}$ " with a parting cut exposed on the bottom face.



3 If you're hesitant to use a skew, a spindle roughing-out gouge can establish the basic shape of the pin instead. Turning the roughing-out gouge about 30 degrees left or right allows taking a planing cut with a smooth surface in its wake.



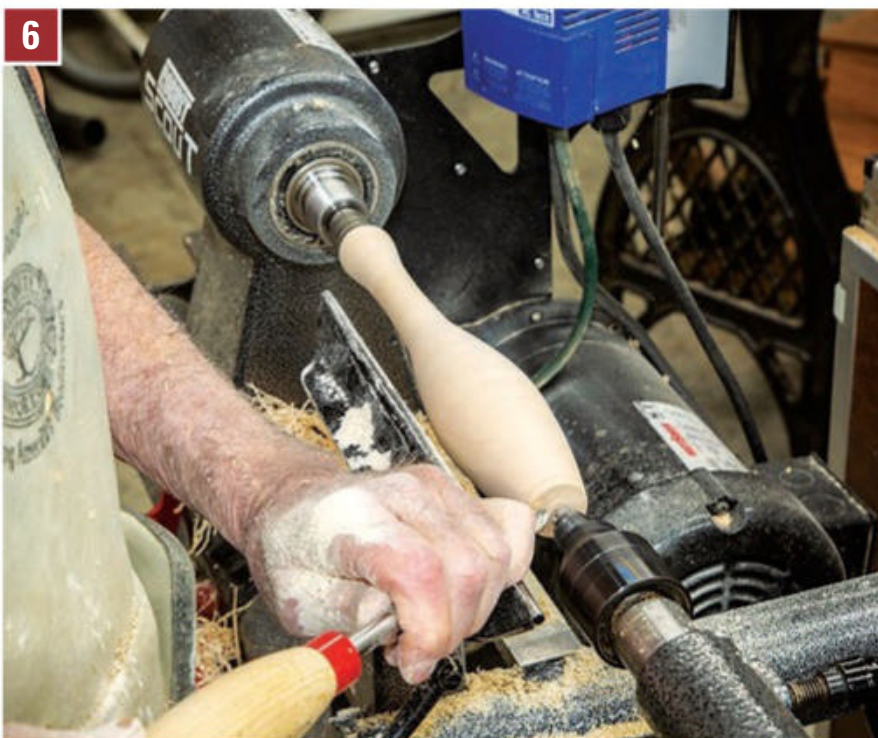
4 A spindle gouge is the best tool to round the top of the pin to a small flat spot around the live center. It's also good for putting a small chamfer on the bottom of the pin to give the pins a finished look and to help prevent chipping if the game is played on rough surfaces.



5 You will need 10 blanks measuring $2\frac{1}{8}$ " x $2\frac{1}{8}$ " x $11\frac{3}{16}$ " for this project's pins, with a couple of extras for good insurance. Full-size bowling

For those comfortable using a skew, it's the best tool for bringing the pins to their final shape and smoothness.

pins are made from rock hard maple, and it would be excellent for this project, too. However, soft maple, oak, ash, hickory, beech or birch will work fine. My antique set measures 2" in diameter at the largest place on the pin. I have added $\frac{1}{8}$ " to the billet dimension to allow for



6 Reverse the pin between centers and undercut the base with a spindle gouge or a parting tool to create an even smaller contact surface of the pin with the floor/ground. Here the author is using a 60-degree live center point so that he can undercut to a 1/8" nub, which he removes with a gouge once the pin is turned and off the lathe.



7 Clear shellac makes a durable, quick-drying topcoat that's easy to apply to the pins with a brush, then burnish smooth with shavings. Once it dried, the author set the lathe to a slow speed and in reverse. He used a stripping brush to apply a thin pinstripe just above the pin's large diameter.



8 Placing the tool-rest an inch or so away from the bowling pin provides a helpful rest for steadying your hand when painting both pinstripes. The author located the second stripe at the pin's largest diameter.



9 Acrylic paint, available at craft and art stores, is perfect for this embellishment. It sticks to shellac, dries quickly and forms a tough finish. Fill in the area between the pinstripes with your favorite color.

centering and rounding errors. If an 8/4 plank will only yield 2", center it carefully. The worst outcome is that the pins would be 1/32" or so undersized — but youngsters won't notice this at all.

The 2 3/4"-diameter balls can be turned, and I show two methods in a video you can

find in "More on the Web." Or, Rocker sells 2 1/2" (item 91992, \$6.99) and 3" (item 21501, \$9.99) birch balls that would be good substitutes, if turning the balls is daunting.

Once you have the pins and balls made, it's time to head to the basement or other smooth floor for some

fun. Distance and pin spacing is a matter of choice, based on the age and skill of the players as well as the size of your playing space. Enjoy the fun!

Ernie Conover is the author of The Lathe Book and Turn a Bowl with Ernie Conover.

Drill Bit Organizer

By Rob Johnstone

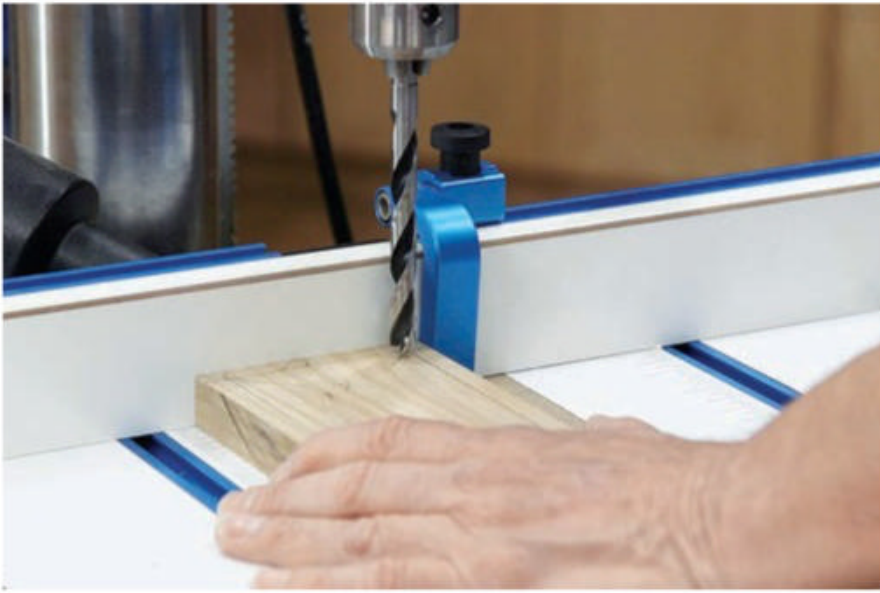
This simple organizer, which can be customized to suit your needs, will save time and keep your drill bits from going astray.



Drill bits, I must confess, have been one of my Achilles' heels over the years. I am hard on them, regularly breaking bits of smaller diameter, which are almost impossible to then remove — and frequently losing bits around the shop. One of the reasons that I lose so many is that they are cylinders and roll around with the slightest encouragement. Lay one down on a supposedly level surface, and if you are not paying attention, it could be on the floor and rolling under whatever is around it in the blink of an eye. This problem is compounded by the fact that I usually only need two or three bits for any specific job, and I move them around the shop to where I need them. (Then I lay them down, and then they roll away, and then I say a bad word.) It is frustrat-



All of the parts listed in the Material List on page 28 can be brought to size on the table saw. Lumber choice is completely optional, so feel free to use scraps left over from other projects.



The author made use of a fence with a stop to bore holes precisely in the corners of the drill bit case holder block. This opening must be sized to fit the particular drill bit container you use.



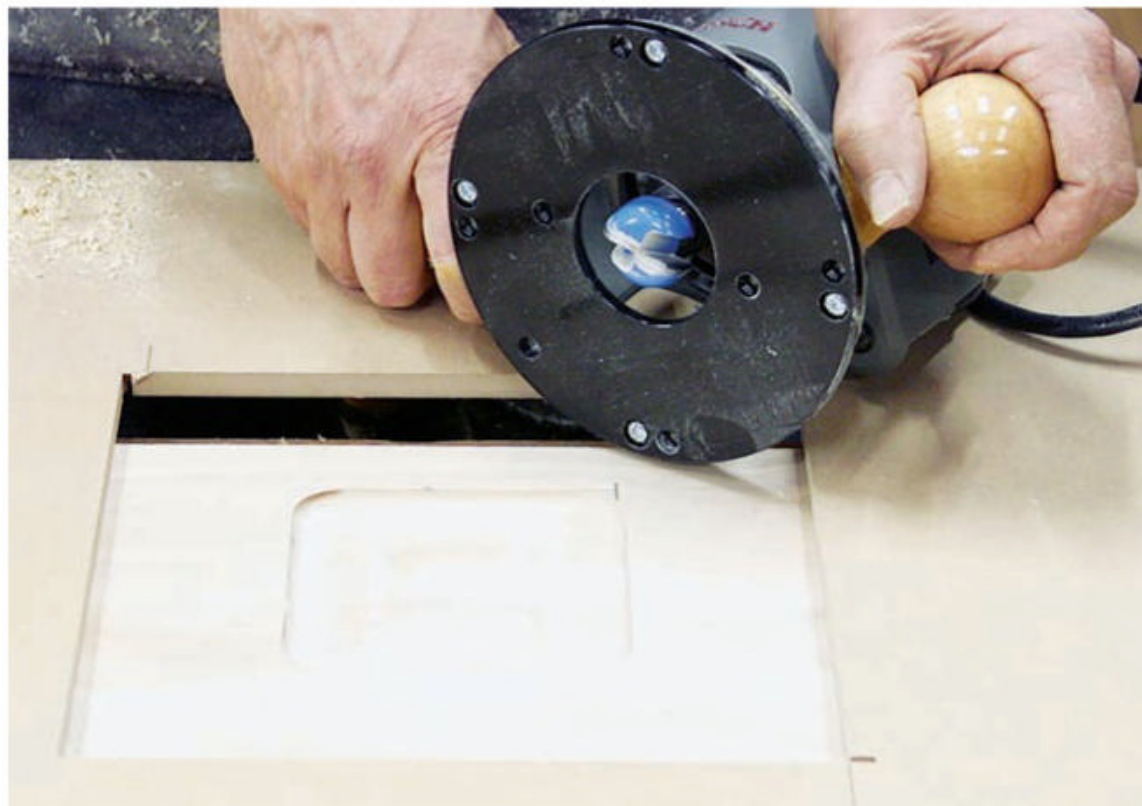
Cut from hole to hole in the block to remove the center section of the bit holder block. A good way to safely secure the block as it is cut is to use a bench vise. A handheld jigsaw is just the tool for the job.

ing because top-quality bits, like the Fisch brad-point bits I show here, are not cheap. For all of those reasons and more, I came up with this stone-simple drill bit organizer. You can customize it to suit different bit boxes and accessories. I included sanding drums, but you might want to put some of your often-used Forstner bits on the base. It has a place for my drill press chuck key (another item that seems to have a perverse habit of inexplicably wandering around the shop) and a recessed “tray” section to hold this and that ... screws, washers, driver bits, M&M’s, it’s up to you. But the feature that is most useful to me is the rare-earth magnets embedded into the base. They will keep my selection of drill bits from rolling away and hold them safely. (I am careful to put the business ends of these brad-point bits pointing away from me. Those Fisch bits are stinking sharp!)

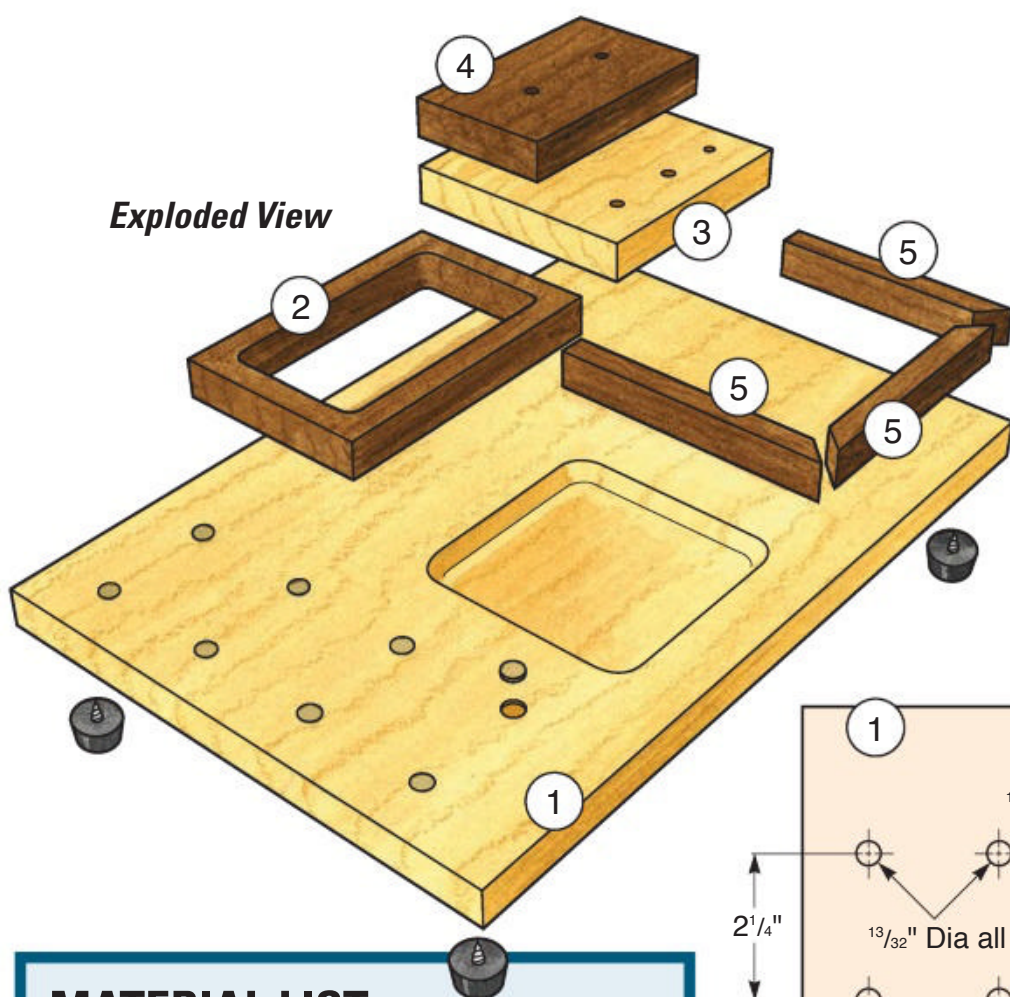
Ready, Set ... Organize!

I made this organizer from scraps of wood that were hanging around my shop and just taking up space. You can make it from any kind of stock or plywood, but if you are following my dimensions, that stock should be 3/4" thick. I used a table saw to cut the pieces to size, after which I quickly sanded each piece (with the exception of the sleeve-frame molding, piece 5) just to clean up the edges and avoid splinters.

The next thing I did was to cut out an opening in the bit case holder block to accept the plastic box that contains the bits I am using (see photos above). This is an area where you will have to customize the holder to fit your bit box, be it plastic or metal. I drilled out the corners of the opening and then used a handheld jigsaw to remove the center section. I tested the fit just to be sure.



Locate the recessed tray section of the base using a template made of 3/8" MDF or something similar. The author sized his template's opening so the rim of the router base could be used as a contact edge against it. Clamp the template securely in place and use a 1 1/4"-diameter bowl-carving bit to form the tray. The bit forms gently curved edges that flow down to a flat recessed area.



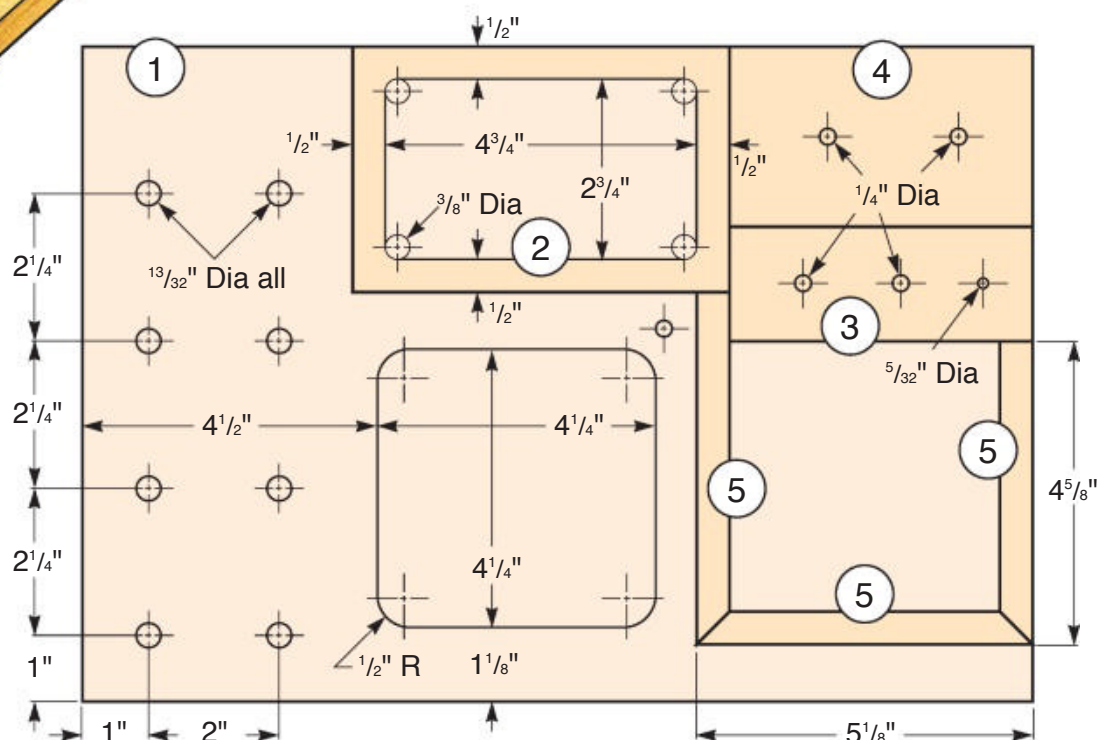
Exploded View

www.woodworkersjournal.com
MORE ON THE WEB



For a video demonstrating the building process of this drill bit organizer, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

Drill Bit Organizer
 (Top View)



MATERIAL LIST

	T x W x L
1 Base (1)	3/4" x 10" x 14 1/2"
2 Bit Case Holder (1)	3/4" x 3 3/4" x 5 3/4"
3 Sanding Drum Base (1)	3/4" x 4 1/2" x 4 5/8"
4 Sanding Drum Top (1)	3/4" x 2 3/4" x 4 5/8"
5 Sleeve-frame Molding (1)	3/4" x 1 1/2" x 18"*

* Cut Sleeve-frame parts to fit

Drill Bit Organizer Hard-to-Find Hardware

Screw-On Case Feet (1) #58411 \$4.99 pk.
Rare Earth Magnets 3/8" x 1/10" (1) #32907 \$19.99 pk.
12 Piece Long Drum Sander Kit (1) #44545 \$26.99 ea.

To purchase these and other products online,
 visit www.woodworkersjournal.com/hardware
 Or, call 800-610-0883 (code WJ1577).



Lay out and then bore the shallow holes that will capture the rare-earth magnets. The magnets are the key to this handy organizer. They hold the bits safely and securely when they are selected for a job.

Set that block aside and grab the piece of wood you've cut out to be the base. There are a couple of machining steps that are best done before you start gluing the various blocks to the base. First up: the recessed tray area. I used a 1/4" bowl-cutting bit to form the depression in the base. I ran into a bit of a challenge in that I had planned to use a rub collar to guide the bit against an MDF template, but the diameter of the bit was too large to fit through any of the rub collars I owned. Rats! Moving on to plan B, I made the opening in the 3/8"-thick MDF large enough to guide the cut by running the edge of the fixed-base router against the edge of the opening. And while it was a really big opening, it worked great.

With that done, step back to your drill press to bore the holes that will capture the rare-earth magnets. If you don't have a drill press, a handheld drill will do the job. The magnets are 3/8" in diameter, so I found that a 13/32" bit worked perfectly to capture the small disks. (7/16" would likely work as well, but 3/8" was too tight.) The *Drawing* above shows the locations of the magnets on the base. Drill these holes just deep enough to set the top faces of the magnets flush to the base's surface. But wait to glue the magnets in place until after you finish the organizer. Sand the base smooth and set it aside for the moment.



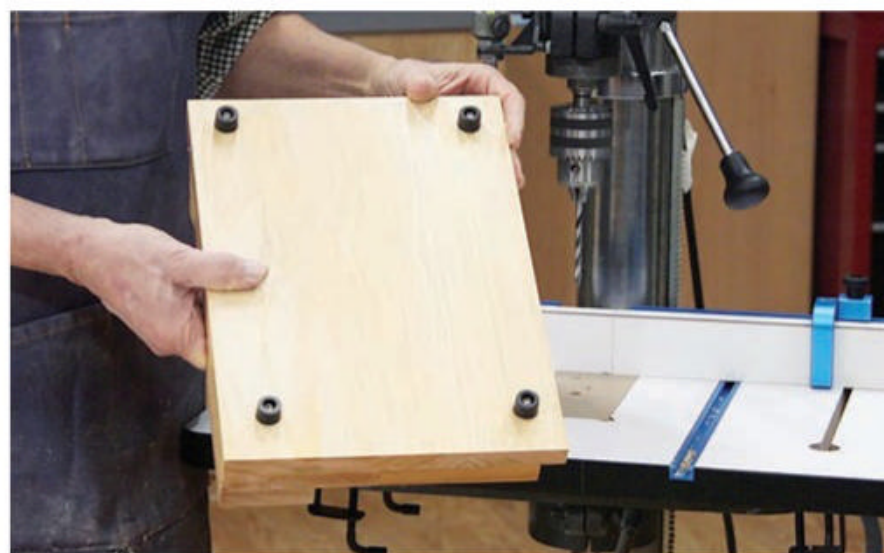
The author bored holes to hold the shanks of small sanding drums located on the drill bit organizer. He finds them handy for quick edge-sanding jobs, especially on small pieces or curved edges. Secure the various blocks and molding to the base with glue. After assembling the parts, the author used an aerosol spray shellac to put a finish on the piece.

Customize Your Organizer

I regularly use the small sanding drums shown in the main photo on page 26 to quickly sand an edge, especially one with a curve. But as with drill bits, sometimes I put them safely away and then forget where I put them. So this organizer is a great place for me to keep them.

Of course not everyone uses that sort of sanding drums, so this is a place where you can customize the organizer to fit your needs. Perhaps you have a few spade bits or conical stepped bits that you use regularly. Maybe you have counter-boring bits that would be handier if they had a place on the organizer. My only piece of advice is that whatever you put there, make sure the sharp edges are pointed down. Your fingers will thank you.

Go ahead and bore the openings that suit your needs into the remaining blocks and sand them smooth. I attached them by putting some glue on the bottom of the block and then rubbing it back and forth until I got a good tack, then I put a clamp on it. When you've got all the blocks glued in place, grab the sleeve-frame molding and cut it to fit as needed. I mitered the ends, but that is not a requirement. Glue the



Mounted to the base, these relatively large rubber feet are tall enough so it's easy to get fingers under the organizer to lift it up. They also grip firmly and resist vibration to keep the project in place.

pieces in place. When all the glue cures, it's time for a bit of sanding and this project is ready for a finish. I used a rattle can of spray shellac — it covers well, dries quickly and does not smell bad. The finish is up to you, but I would avoid something like Watco Danish oil, as you still need to glue the magnets in place and the oil might resist the CA glue.

After the finish has cured, it's time to glue the magnets in place. First thing is to wipe the magnets down with paint thinner or alcohol to remove any residual oils. Then put some thin CA glue in the magnet holes and follow up with a spray of accelerator. I found the magnets to be so strong they would leap around the surface if I did not place them directly into their openings.

The last task is to attach four rubber feet to the bottom of the organizer. Rockler's Screw-on Case Feet (item 58411) I used are tall enough that you can easily get your fingers under the base to pick the whole thing up.

This simple project saves me time, not to mention exasperation, by keeping my drilling supplies close at hand.

Rob Johnstone is the publisher of Woodworker's Journal.

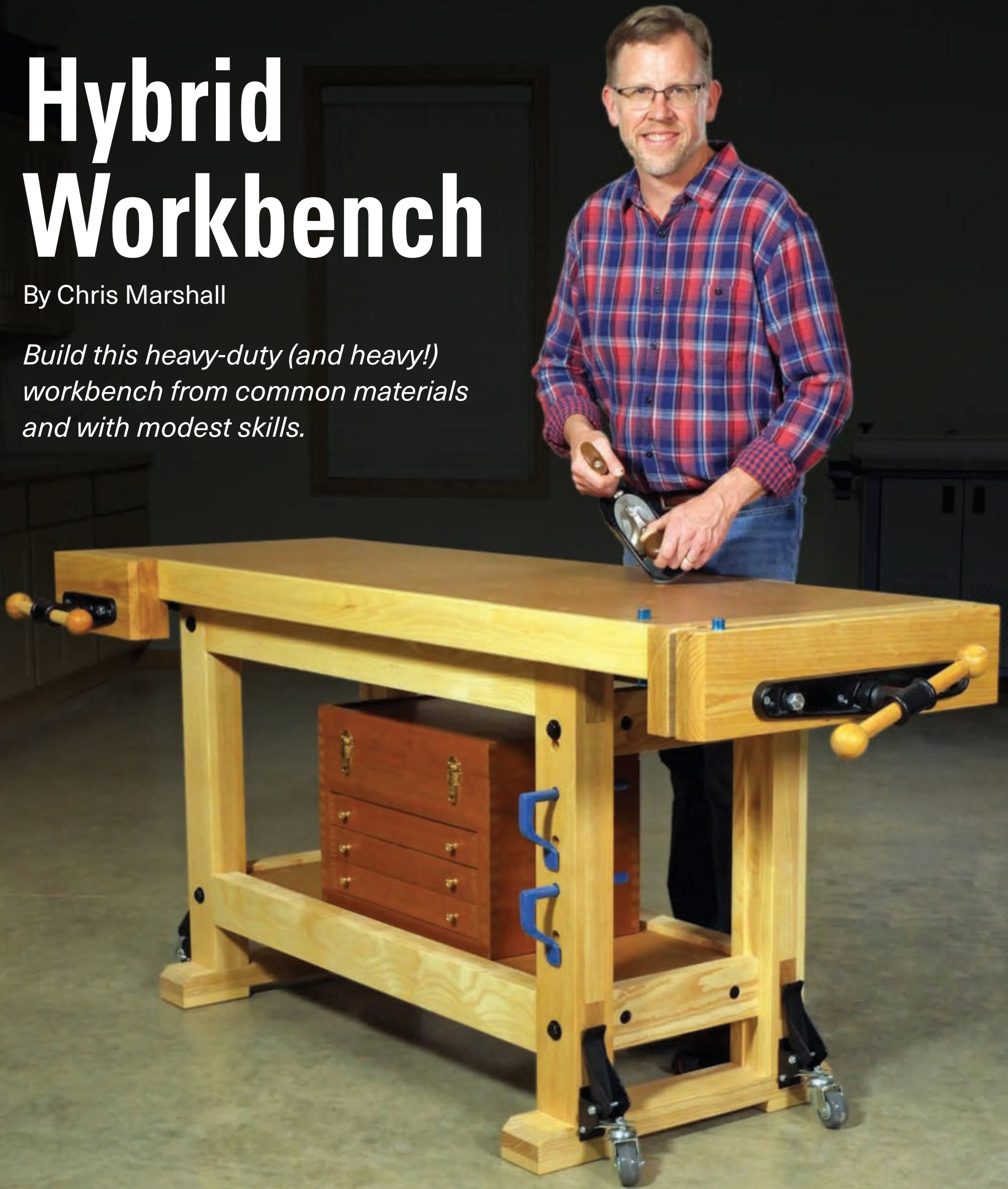


Clean the magnets with solvent first, to remove any manufacturing residue. Then secure them in the base holes with dabs of thin cyanoacrylate glue and accelerator.

Hybrid Workbench

By Chris Marshall

Build this heavy-duty (and heavy!) workbench from common materials and with modest skills.



Today's trendy Roubo workbenches can require a bank loan to afford and feature some complex details that are challenging to make for the average woodworker. These modern "wonder benches" are up to task, without a doubt! But they don't have to be the be-all and end-all of bench designs. Stout and heavy with a flat top is what you want. Fancy and expensive, however, need not be part of that equation.

Twenty-plus years ago, my first attempt at a "workbench" was a modest affair. It was an oversized table I made from 2x lumber and a doubled-up layer of 3/4" MDF for the top.

It took a beating for a lot of years and helped me build many projects until I finally retired it. I traded up — or so I thought — for an expensive prefab bench that has never really been heavy enough not to skitter along the floor when I'm hand-planing or wrestling large assemblies on it. And it's had a wide tool tray down the middle that I would gladly have traded for a more flat benchtop instead. So I've been musing about building a workbench that had more heft and a better top.

Recently, I was browsing the Internet and ran across a bench made by hand-tool guru Rob Cosman. His design,



Surface enough lumber to make parts for the legs and stretchers in one jointing and planing session. That way, you'll gain efficiency during the building process with stock of uniform thickness.

which he uses for students, is made with a triple layer of 1" MDF for the top. It made me recall how stout and hard-working that first humble worktable of mine once was — thanks to dimensionally stable, easy to work with and economically priced MDF. So I set about designing the bench you see here. It features large mortise-and-tenon and bridle joinery for securing the legs to the long front and back stretchers. But there's no fancy machining required — just glue the workpieces together in staggered fashion to create the tenons and mortises without drilling, routing or chopping. And the top is simply four laminations of 3/4" MDF wrapped with solid-wood edging. You can build the undercarriage from any dense hardwood or softwood you prefer. I used ash, which is still reasonably priced these days. While the workbench purists may scoff at MDF, I'm looking forward to using it again as a dense, flat and durable work surface. And I hope you will, too.

Making the Legs

Prepare enough 3/4"- and 1 1/2"-thick stock for the first six parts of the *Material List* on page 33. (If you can't get thick lumber, you could laminate what you need from 3/4" stock for the centers of the legs and stretchers.) Even though we'll start by making the legs, you'll gain efficiency in the surfacing process by including stock for the long stretchers now, too.

Rip and crosscut blanks for the inner and outer leg workpieces. Leave them about 1/8" overly wide for now. Make up four leg blocking pieces, too. Arrange the dimensions of the leg blocking so their long grain follows the 3 3/4" dimension; that way it will align with the long grain of the other leg parts.

The tops of the legs and the long top stretchers connect in bridle joints at the top corners of the bench's base assembly. In a similar way, the long bottom stretchers engage the legs in mortise-and-tenon joints, where the inner portion of these stretchers form a tenon that fits between the leg blocking and the inner leg laminations. To keep the center opening of the bridle joints and the mortises consistent when assembling the legs, make up a pair of 4"-wide x 6"-long spacers from scrap 1 1/2"-thick stock. Surface these spacers 1/32" or so thinner than the inner leg and stretcher laminations, and wrap their



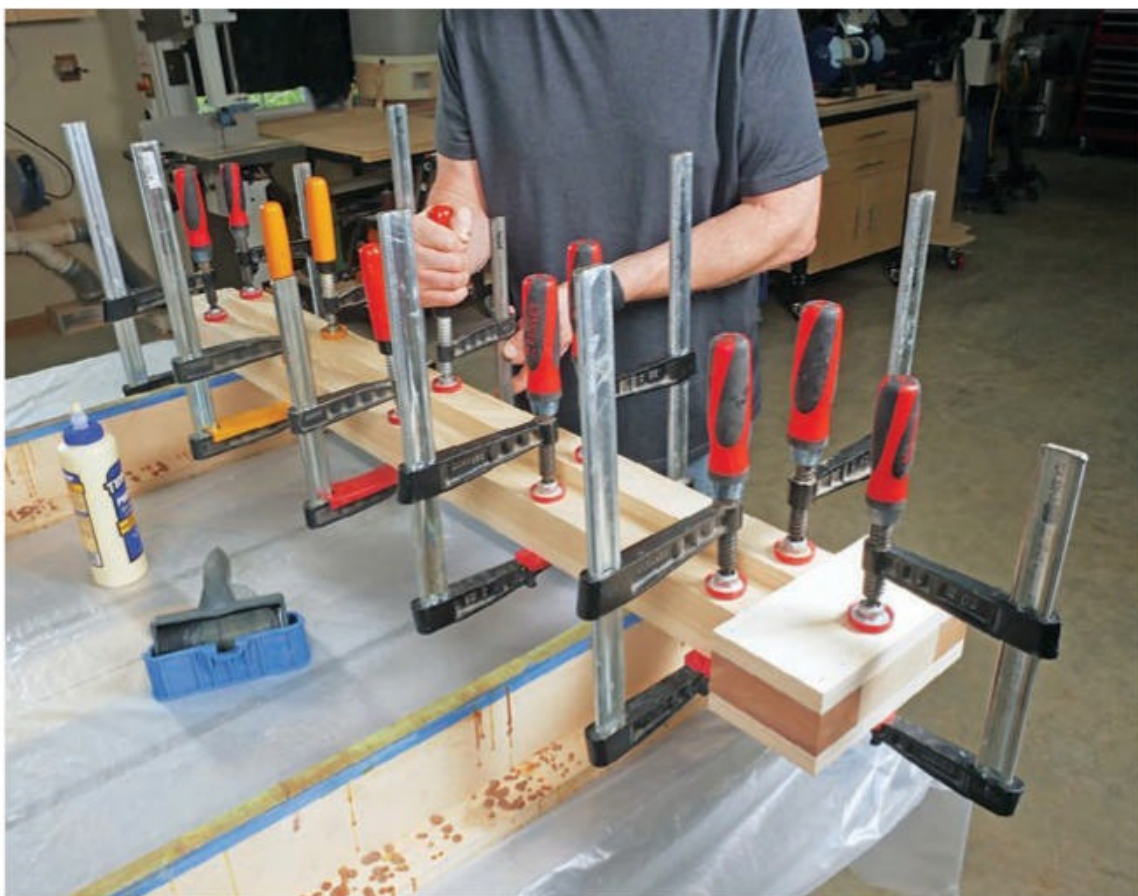
Glue up inner and outer leg workpieces and bottom blocking to create each laminated leg. The author used scrap blocks wrapped in tape (inset) to fill the mortise and bridle joint openings while also sizing these openings correctly.



Each leg receives a 1/4" x 1 1/2" groove along its inner face. Mill these grooves at the table saw with a 7/8"-wide dado blade in two passes, flipping the legs end-for-end between passes to center the cuts.



Before gluing up the long top and bottom stretchers, make sure their 1 1/2"-thick inner laminations will slip easily into the bridle joint openings and mortises of the legs. Plane them slightly thinner if they don't.



The long top and bottom stretchers, like the legs, are also three-piece laminations. During glue-up, the author used a scrap-made jig that wrapped around one end of the stretcher's inner lamination, to ensure that the outer stretcher pieces would align with one another. Doing so created even shoulders for the tenons formed by the inner stretchers.

faces and edges with wide strips of painter's or packing tape to prevent glue from sticking to them. Then glue and clamp two outer legs, an inner leg and a blocking piece together with these spacers installed to create the first leg. When the clamps are in place, give the leg an hour or so for the glue to set before sliding the spacers out of their openings so you can reuse them to glue and clamp each of the other three legs together. When the spacers come out, carefully clean away any glue squeeze-out from these open-

ings before the glue hardens.

Flatten one laminated edge of each leg on your jointer, and run the legs through your planer to flatten the other edge and reduce them to a final width of 4".

Mark the bench's four legs for the orientation you want them to be in when the framework is fully assembled. Notice in the *Exploded View Drawing* on the next page that the bench's short stretchers (pieces 8) fit into grooves on the inner faces of the legs. These grooves will prevent the short stretchers from twisting out of alignment in the base over time. Cut these 1/4"-deep, 1 1/2"-wide grooves in the legs with a 7/8"-wide dado blade installed in your table saw. Set up for the groove cuts by raising the blade to 1/4" and positioning the rip fence 1 1/4" away from the closest face of the blade. Plow each groove into the leg in two passes, flipping the leg end for end between passes. This way, the grooves will be automatically centered on the inner leg faces.



After the cross-dowel bolt holes are drilled in the legs, clamp the front legs and long top and bottom stretchers together so you can extend the bolt holes through the stretcher tenons with a handheld drill and 1/2" bit. Repeat for the back leg/stretcher subassembly.



The top bridle joints closest to the tail vise won't take advantage of the cross-dowel bolts for locking them together. Install a pair of 3/4" hardwood dowels across these joints instead to secure them.

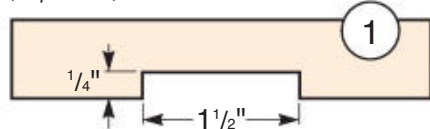
Creating the Stretchers

Before fabricating the upper and lower long stretchers, make sure the thickness of the inner lamination pieces allows them to slide easily into the bridle joints and mortises of the legs. If they don't, plane the inner stretchers slightly thinner to create a "slip fit" into the legs that doesn't require pounding in.

Rip the four inner and six outer stretchers about 1/8" overly wide, and crosscut them to length. Rip and crosscut the pair of narrower shelf supports to final size. Then glue and clamp an inner long stretcher between two outer stretchers to create each long upper stretcher. Make sure the tenons on the ends of these components are 4" long and their shoulders (formed by the outer stretcher laminations) are even with one another. I used a simple scrap-made jig, which wraps around the inner lamination, to guarantee that the shoulders would align.

Assemble the long lower stretchers by gluing and clamping an outer stretcher, inner stretcher and shelf support together. Here again, the inner stretchers form 4"-long tenons on the ends of these components. Position the shelf supports so their

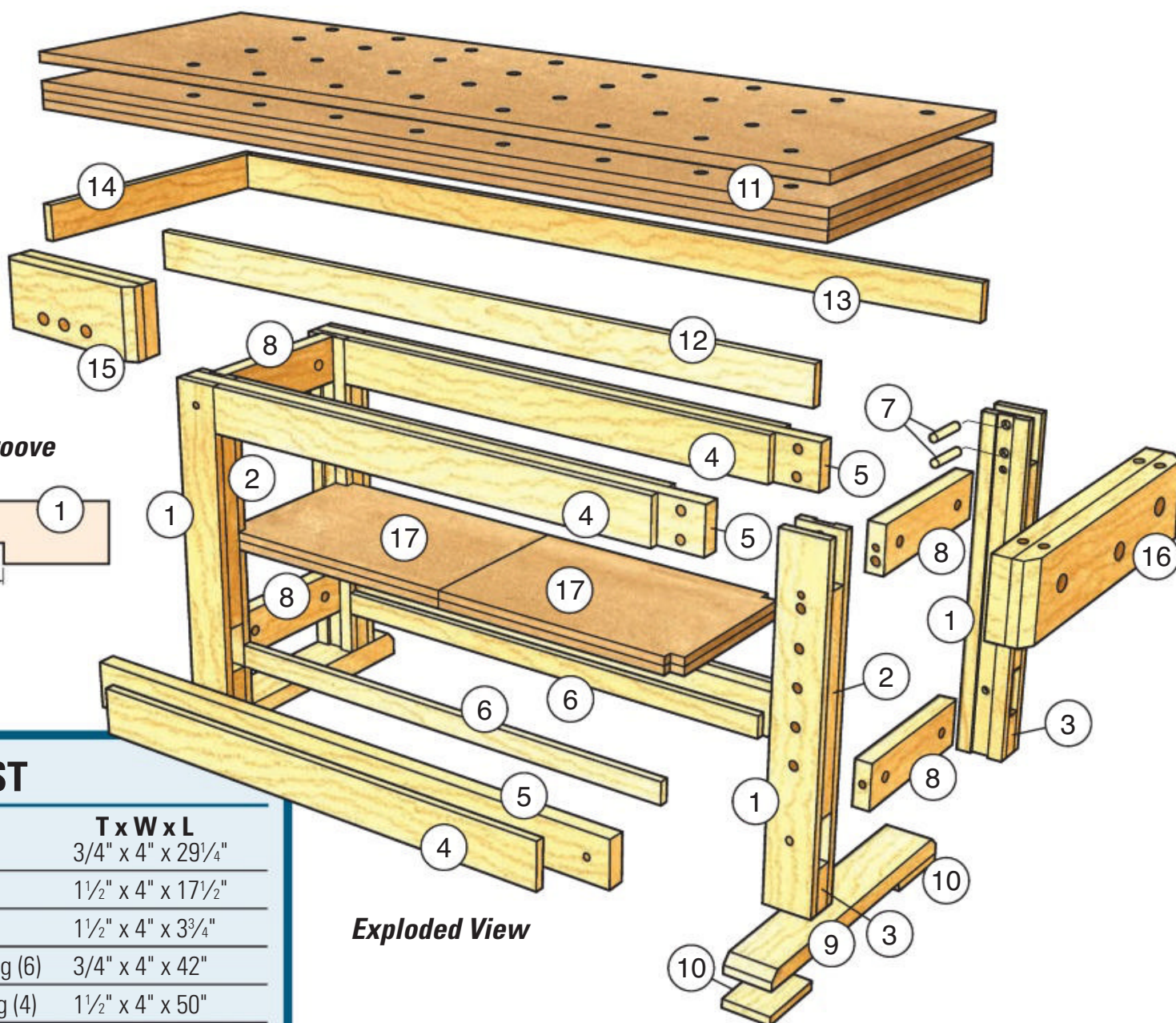
Outer Leg Inside Groove (Top View)



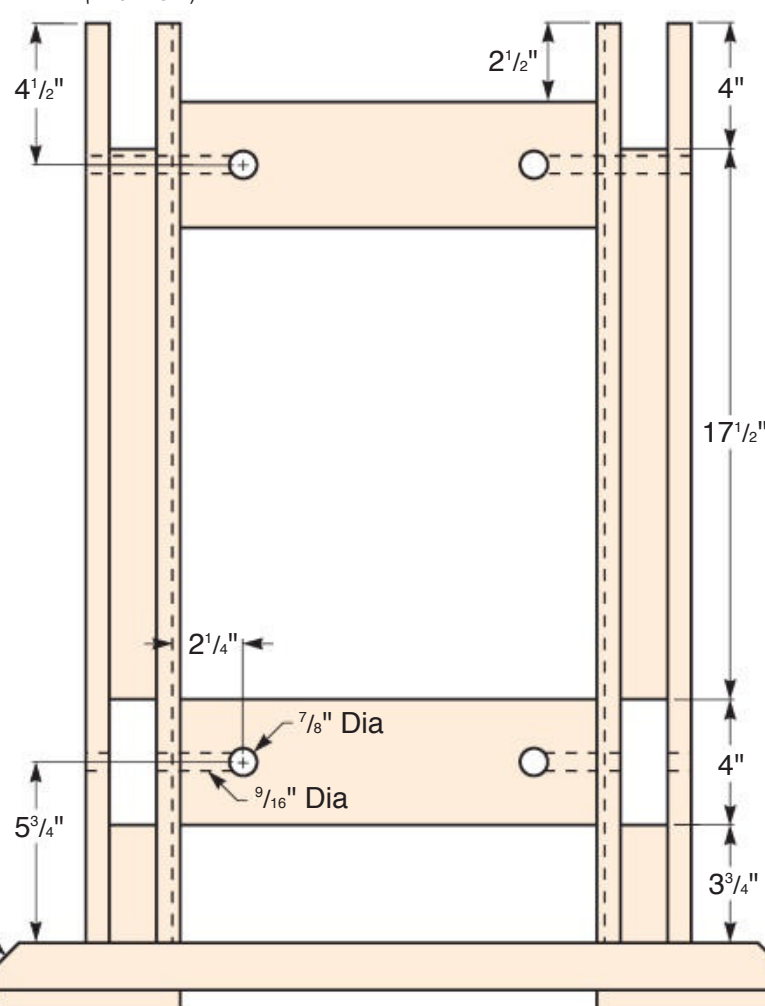
MATERIAL LIST

	T x W x L
1 Outer Legs (8)	3/4" x 4" x 29 1/4"
2 Inner Legs (4)	1 1/2" x 4" x 17 1/2"
3 Leg Blocking (4)	1 1/2" x 4" x 3 3/4"
4 Outer Stretchers, Long (6)	3/4" x 4" x 42"
5 Inner Stretchers, Long (4)	1 1/2" x 4" x 50"
6 Shelf Supports (2)	3/4" x 2" x 42"
7 Bridle Joint Dowels (4)	3/4" Dia. x 2 1/2"
8 Short Stretchers (4)	1 1/2" x 4" x 13 3/4"
9 Leg Bases (2)	1 1/2" x 4" x 25"
10 Feet (4)	3/4" x 4" x 5 7/8"
11 Top Laminations (4)	3/4" x 23 1/2" x 71 1/4"
12 Top Edging, Front (1)	3/4" x 3" x 58"
13 Top Edging, Back (1)	3/4" x 3" x 71 1/4"
14 Top Edging, Side (1)	3/4" x 3" x 24 1/4"
15 Side Vise Faces (2)	1 1/2" x 6" x 14"
16 Tail Vise Faces (2)	1 3/4" x 6" x 25"
17 Shelf Sections (4)	3/4" x 14 3/4" x 22 1/4"

Exploded View



Tail Vise Leg Assembly (End View)



Hybrid Workbench Hard-to-Find Hardware

Heavy-Duty Cross Dowel and Bolt (1) #36073 \$27.99 pk.
 Rockler Workbench Casters, 4 Pack (1) #43501 \$69.99 pk.
 Rockler Heavy Duty Front Vise (1) #27838 \$179.99 ea.
 Rockler 12" Quick Release End Vise (1) #37180 \$299.99 ea.
 Rockler Portable Drill Guide (1) #52885 \$189.99 ea.
 Rockler Round Bench Dogs (1) #21868 \$34.99 pr.
 Rockler 4 1/4" Hold-Down Clamp (2) #90407 \$19.99 ea.

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See *Hardworking Hardware*, page 62, to learn how to lay out and drill for the cross-dowel hardware for this workbench. This knockdown, heavy-duty joinery solution attaches the bench's short stretchers to the legs.



Rip and crosscut a couple of leg bases to size, and chamfer their top corners. Fasten them to the bottoms of the legs with four 3" lag screws apiece, driven into counterbored pilot holes.



Although not available at press time, Rockler soon will offer a drilling jig for installing cross-dowel hardware entirely with a handheld drill/driver. No drill press or doweling jig will be required.

bottom edges are flush with the bottom edges of the outer and inner stretcher laminations.

Join the bottom laminated edge of each stretcher flat, and run them through your planer to flatten the top edge and reduce these bottom stretchers to their final 4" width.

Assembling the Base

Consider drilling a series of 3/4"-diameter holes into the front face of the front leg opposite the one that's nearest to the side vise (it's the right front leg in the *Exploded View* drawing). These holes can be useful for inserting pegs to help hold up workpieces that are being clamped on-edge in the side vise, for hand-planing edges. Four or five, spaced about 3" apart, should be sufficient. Bore them on a drill press with a 3/4"-diameter Forstner bit. I drilled mine all the way through the leg so they can stow my collection of hold-downs when I'm not using them. I chamfered the rims of these holes to minimize the chances of them splintering during use.

We'll attach the legs and short side stretchers with Rockler's heavy-duty 1/2" cross-dowel bolts and cross dowels. To learn how to drill for and install this hardware, flip over to page 62 — it's this issue's *Hardworking Hardware* topic. These bolts also will lock the bridle joints together on one end of the bench as well as secure all four of the mortise-and-tenon joints of the lower stretchers. Mark the cross-dowel bolt locations carefully on the legs, making sure they are exactly centered on the widths of the legs. Locate them 5 3/4" up from the bottoms of the legs and 2" down on the legs that will be on the opposite end of the bench from the tail vise (on my bench, these are the left front and back legs). The short upper stretcher closest to the tail vise, however, will need to be positioned 2 1/2" down from the tops of these legs to allow clearance for the tail vise hardware. So, mark center points for those cross-dowel bolts 4 1/2" down from the tops of the legs. Drill the cross-dowel bolt holes through the legs.

Next, rip and crosscut the four short stretchers from 1 1/2"-thick stock, and drill them for both the 7/8"-diameter cross dowels and their 1/2"-diameter bolts. Locate the center points of the cross-dowel holes 2 1/4" in from the part ends.

Dry-assemble the long top and bottom front stretchers and front legs, and clamp this assembly together to close the bridle and mortise-and-tenon joints tightly. Extend the cross-



Add a pair of 3/4"-thick hardwood feet to the bottom face of each leg base, positioned flush with the base ends. Install these feet with 1½" countersunk screws, then chamfer the bottom edges of the feet to add durability.

dowel bolt holes through the stretcher tenons of all four joints with a 1/2" brad-point or twist drill bit, using the bolt holes in the legs as guides. Repeat this process for drilling bolt holes in the long top and bottom back stretchers and back legs.

Now drill four holes through each long top stretcher at your drill press for lag screws that will eventually attach the base to the benchtop. Make sure the hole diameter is large enough to allow clearance for the shanks of the lag screws you'll be using to slide through (my lag screws are 3/8" in diameter, so the holes were slightly larger). I then counterbored these holes on what will become the bottom faces of the stretchers in order to recess the lag screw heads by 1/2".

Take some time to sand the legs and long and short stretchers smooth while their faces and edges are still fully accessible. It's easier to do this now than after assembly. Ease the long edges of the legs and stretchers with roundovers or chamfers to minimize splinters. The top edges of the long top stretchers can remain square, since they'll butt against the bottom face of the benchtop.

Because the upper short stretcher closest to the tail vise is set down from the tops of the legs to clear the vise hardware, the cross-dowel bolts that secure this stretcher don't intersect and lock together the bridle joints of the long stretchers above them, as they do on the other end of the bench. Instead, we'll pin these two bridle joints together with glue and 3/4" dowels driven into them from the inside faces of the legs. So, dry-assemble the front and back leg/stretcher assemblies again but spread glue onto the contact surfaces of the two "tail vise" bridle joints. Clamp the assemblies and check their diagonals for

Creating the benchtop core involves laminating larger layers of MDF progressively to layers already glued together and routed to final size. Here, a flush-trim bit, with a guide bearing following the trimmed core, reduces the new layer to a perfect dimensional match with the other layers.



The core of this bench's top is a quadruple-thick lamination of 3/4" MDF. But don't cut the four laminations to final size first. Trim one to the Material List dimension and the other three 1/4" larger in both dimensions.

square. Now drill a pair of 3/4" holes 2½" deep through the glued bridle joints for dowels. Cut two hardwood dowels for each joint, spread glue inside the holes and drive the dowels home with a mallet (see bottom photo, page 32).

Bring the front and back frame subassemblies together by installing the short stretchers between them. Insert the cross dowels and bolts into their holes, thread them together to engage the hardware and tighten the framework securely.

Let's finish up some details on the leg bottoms. Rip and crosscut a pair of leg bases to size, and head to the table saw to nibble their top outer corners off at 45 degrees — they'll be less of a nuisance for your feet this way when standing close to the bench. Invert the workbench base framework so you can attach the leg bases to the bottoms of the legs with pairs of 3" countersunk lag screws driven through the bases and into the center laminations of the legs.

Now prepare a couple of feet for each base from 3/4" hardwood stock. Attach the feet to the bottoms of the leg bases, flush with their ends, using glue and 1½" countersunk screws. Ease the bottom ends and edges of the feet with a 1/4" round-





Rockler's Portable Drill Guide ensured that each bench dog hole extended straight through the MDF core. Use an auger bit with a brad-point spur (left in inset photo) rather than a screw-tipped auger bit to bore these holes.

dover bit to prevent them from chipping when the bench is dragged around the shop floor.

Laminating the Top

The 3"-thick core of this bench's top consists of four laminations of 3/4" MDF. You'll need two 4x8 sheets to create the top blank. If you haven't worked with MDF before, it's dense

and heavy but easy to cut, rout and glue together. The challenge to laminating this top, however, is keeping the ends and edges of the MDF sheets aligned while the glue is acting as a lubricant and you're tightening the clamps. Here's the solution to that conundrum. We'll laminate the top in stages and progressively flush-trim each layer to final size before installing the next layer. That way, the laminations will align perfectly in the end, regardless of whether a little misalignment occurs during each stage of the glue-up process.

Begin by cutting a piece of MDF carefully to 23½" x 71¼". Cut the second layer 1/4" oversized in both dimensions. Roll a thin layer of glue over one face of the larger (second) panel, set the smaller panel on top of it and adjust the sheets for an even overhang. Weigh the top layer down with heavy bags of sand, concrete blocks or five-gallon buckets of water (I used ten full buckets). Install clamps around the perimeter of the sheets to squeeze the glue seam tightly together all the way to the panels' edges.

When the glue fully tacks up — give it a good hour or so — flip the sheets over on a raised work surface, and flush-trim the edges of the larger sheet with a handheld router and piloted flush-trim bit. The bit's bearing should ride along the smaller sheet for this cut. Once routed, both sheets will be dimensionally identical. Repeat this process two more times, applying the next overly large lamination, then flush-trimming it to match the edges of the stacked core.

Next up, it's time to lay out and drill a grid of 3/4"-diameter bench dog holes through the top. Where you place them is up to you. (A PDF diagram of my bench's hole placement is available as a free "More on the Web" supplement.) Here's a case where you'll want to drill squarely through the thickness of the top, so install your handheld drill in a portable drilling guide. I used a 6½"-long auger bit with a brad-point tip on it for boring these holes. A typical auger bit with a threaded tip won't work well in this application, because the bit's screw threads will plug up with MDF fibers, and then it won't self-feed and stops cutting. But brad-point

Attach the benchtop's edging pieces with a mechanical connection as well as glue. The author used 6 x 40 mm Dominoes installed in two rows to reinforce these joints. Splines, biscuits, loose tenons, nails or screws also would work fine.





For a video discussing the use of MDF for this workbench top, or to download a free PDF of the dog hole pattern, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

auger bits are often available at home centers, or you can find them online. Alternately, you could also opt for a long Forstner or twist bit. When all the holes were drilled, I chamfered their rims with a router to tidy them up.

Rip and crosscut the front, back and side edging strips for the benchtop from 3/4"-thick hardwood. The purpose of this edging is to cover and protect the more fragile edges of the MDF core as well as hide them. Arrange the edging for your bench's top to suit whether you'll install the shorter side vise on the front left or right corner. (Right-handed users should locate this vise on the left corner, as I did on my bench. Lefties would locate this vise on the front right corner instead.) Then round over the outside corner of the side edging strip that will form the outside back corner of the benchtop, opposite from the side vise. I did this with a 1/4" roundover bit in a compact router.

The edging strips should be attached to the benchtop core with a mechanical connection, such as biscuits, splines, Dominoes, nails or screws. Glue alone won't offer enough shear strength for a sturdy connection. I used size 6 x 40 mm Dominoes and glue to install the edging on my bench, inseting the Dominoes 1/2" in from the top and bottom faces of the core and spacing them about 7 1/2" inches apart in pairs.

When you unclamp this glue-up, plane, scrape or flush-trim the top and bottom edges of the edging, if needed, to bring them flush with the benchtop faces. Then ease the top and bottom corners of the edging with a 1/4" roundover bit, or chamfer them, to prevent splinters. At this point, I applied two coats of water-based polyurethane to the bottom face of the benchtop to seal the MDF.

Installing the Vises

To prepare for installing the bench's tail and side vises, make up two pairs of wooden vise faces for each from 1 1/2" or 1 3/4"-thick solid stock — it's okay to laminate thinner stock together to make up these thick faces. For my tail vise, I had enough 8/4 ash lumber on hand to make the tail vise faces from single pieces. For the smaller side vise, however, I glued up 4/4 boards to create blanks for the vise faces instead. Rip and crosscut the four vise faces to final size.

Let's install the tail vise first. Set one of the two wooden faces against the end of the bench and clamp it in place. Now unbolt and remove the vise's guide rods and screw/end plate assembly from the cast-iron base piece. Then set the vise's



Lots of clamps is the name of the game for attaching the edging pieces to the MDF core. Strips of painter's tape can prevent glue squeeze-out from sticking to the MDF.



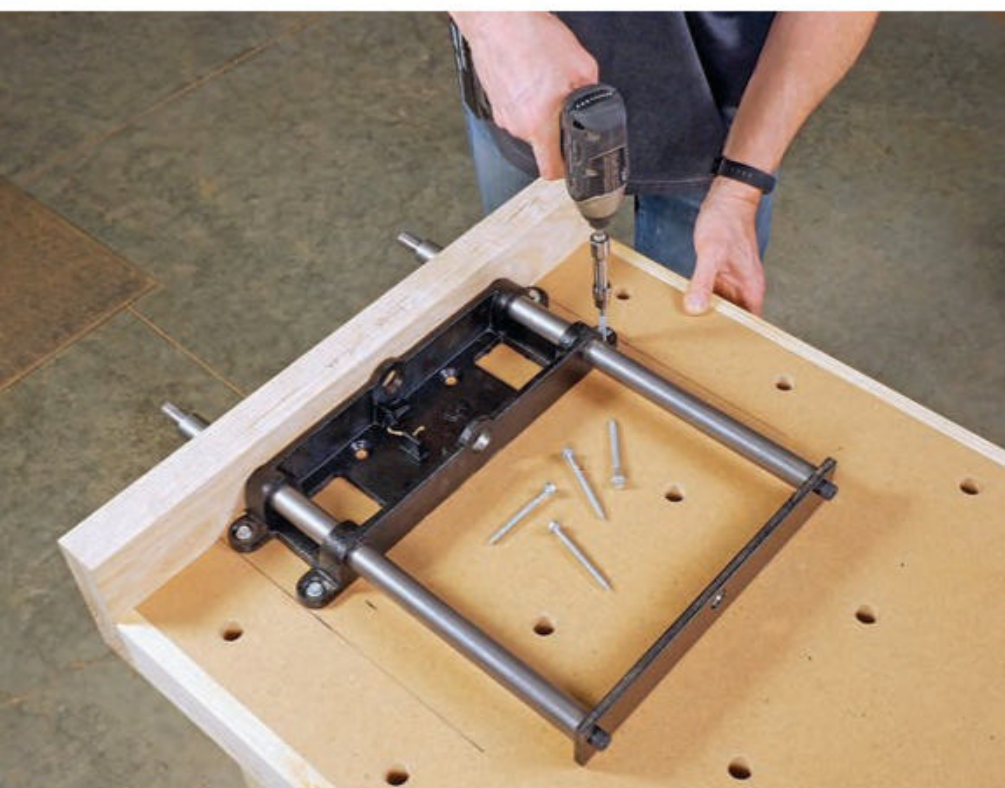
To install the tail (or side vise), first clamp a wooden vise face into place and set the vise's base into position. Reverse the guide rods in the base, and trace their locations and the center screw position onto the vise face.



Use a 1 1/8"-diameter Forstner bit to bore holes through both wooden tail vise faces for the guide rods and center screw. Register each drilling position with a stop block so the holes line up exactly on both vise faces.



Fasten the inner wooden vise face to the end of the benchtop with three 5" lag screws driven into countersunk pilot holes.



Mount the vise's cast-iron base to the MDF core with #12 or #14 wood screws or deep-threaded lag screws, as the author is doing here. This is heavy hardware, so choose fasteners offering maximum strength.



Complete the vise installation by sliding the outer wooden vise face over the guide rods and securing the outer cast-iron plate to the rods with nuts. The author then removed the outer vise face and chamfered its corners.

base against the back of the wooden vise face and center it carefully, widthwise, on the bottom face of the benchtop. Slide the steel rods back into the

base in the opposite direction so their flat ends can make contact with the vise face, rather than the threaded ends. Trace around each of them on the back of the vise face to mark the exact position of the three holes (two for the guide rods, one for the vise screw) you need to drill through the vise face. Drill three 1 1/8"-diameter holes through both vise face workpieces at the marked locations. Do this at a drill press, using a stop block clamped to a fence to register the positions of the holes so their placement matches on both vise faces.

Now fasten the inner vise face to the end of the benchtop; I used four 5" lag screws driven into pilot holes with 1/2"-deep counterbores to recess their hex heads.

If you haven't done so already, reinstall the guide rods and end plate assembly on the vise's cast-iron base, and set the base into position on the benchtop, extending the guide rods through the holes in the vise face. Mark center points for each of the base's mounting holes, drill pilot holes and fasten the base to the benchtop with #12 or even #14 x 2 1/2" wood screws, if you can find them. Instead of screws, I decided to use washerhead lag bolts with deep threads, for maximum strength.

At this point, I cut large chamfers on the corners of the outer vise face for each vise at my table saw. Slide the outer wood vise face onto the guide rods, and replace the vise's screw assembly and cast-iron outer plate, attaching them to the guide rods with nuts. Wrap up the installation by securing the outer wood face to the vise's outer cast-iron plate. I used #14 x 1 3/4" wood screws here.

Repeat this whole process for installing the side vise on the front edge of the benchtop. For this vise's smaller hardware, you'll switch to 7/8"-diameter holes for the vise screw and guide rods instead. I used washerhead lag screws again to mount the vise's base and #14 x 1 1/2" wood screws to secure the outer wooden vise face.

Call a Buddy to Help You Finish Up

We're nearly done building this heavy-duty shop fixture! Find a buddy to help you move the now much heavier (thanks to those vises!) inverted benchtop carefully to the shop floor, with scraps of wood underneath it to protect the top surface.



Set the benchtop down onto scraps on the floor. Position the base frame over it, checking carefully that the bench dog holes aren't obstructed and the tail vise moves freely. Fasten the components with 6" lag screws.



Rockler's heavy-duty workbench casters flip up or down with a foot lever. They make it easy to park this bench wherever it's needed or roll it out of the way conveniently without lifting or straining.

Turn the bench's base framework upside down, and move it into position on the benchtop. Adjust the frame so the top will overhang it evenly on the ends and so the tail vise assembly is carefully centered between the legs. Check to make sure the outermost dog holes are also clear of the long top stretchers and legs. When everything registers, drill pilot holes for 6" lag screws into the benchtop at the eight screw holes you drilled through the long top stretchers. Drive a lag screw into each hole to attach the framework to the benchtop.

Now, with assistance, flip the bench upright onto its feet. I installed a set of Rockler's workbench casters to the outside faces of the legs with 1½" lag screws and washers, following the instructions that come with the caster set. These flip up and down, making the bench easy to move around the shop.

I drilled two bench dog holes all the way down through the thickness of both faces of my tail vise; they align with the outermost rows of bench dog holes on the bench.

With that done, I used the four remaining MDF offcuts from the benchtop as doubled-up sections for the bench's lower shelf, trimming their corners to wrap around the legs. It was a good way to add more weight to the bench's undercarriage and put those leftover scraps to good use. However, you could also use a couple layers of 3/4" plywood if you prefer, or even pieces of 2x dimension lumber. The choice is up to you for completing this utility shelf.

Complete this ambitious build by giving your new workbench several coats of a wipe-on finish. I used satin poly, but an oil/varnish blend such as Watco Danish oil would work great, too. Apply at least three coats to the bench's top surface. A wipe-on finish will offer some protection against moisture absorption and spills without building to a slippery surface — that's a no-no for workbench tops. It's also easy to renew when needed by simply wiping more finish on.

Apply a protective finish of some sort to all exposed surfaces of the bench. The author used wipe-on satin polyurethane, but other thin oil/varnish blends would work well, too. The goal is to provide some protection against glue drips and spills but not to make the benchtop slippery smooth.



Chris Marshall is senior editor of Woodworker's Journal.

Dog Stairs

By Colleen Carey

Whether your pooch is very young or very old, these doggie steps can help them climb onto the couch more easily.

Mavis the wonder dog climbs the steps in anticipation of a short nap on the sofa.

www.woodworkersjournal.com
MORE ON THE WEB



Technical drawings for a “bed height” set of dog steps are available at woodworkersjournal.com – click on “More on the Web” under the Magazine tab.



For some dogs, these dog steps are just not necessary. My dog Mona, for example, is a Great Dane. Even though she’s a senior, she can climb onto the couch with ease. (Often leaving no room for me to sit down!) But for elderly mid-sized dogs, pooches with arthritis or small dogs like the puppy in the photo above, they can be very useful and extremely practical. (I know some folks who lift their arthritic canine buddies up onto the couch every

evening to watch TV with them.) These little steps require a half-sheet of 3/4" plywood. I cut one dimension down to 39" just to make it a bit easier for me to handle. The next step is to rip that piece into three 12"-wide strips that are 39 inches long.

Flip over to the *Material List* on page 42 (near the *Exploded View* drawing) to find the exact dimension of the steps, risers and supports. On that same page you will find a diagram that demon-

strates the best way to get the various components of the dog steps cut out of those 12"-wide pieces. I used a crosscut sled to make my parts. It adds safety to the crosscutting process, and mine has a stop that lets me make repetitive cuts (such as for the risers, pieces 2) quickly and accurately.

I’d like to offer one more piece of advice about cutting plywood on a table saw: a saw blade designed to cut plywood, with 60 to 80 teeth, will give you



The author cut her 3/4" plywood to 48" x 39" to start the process, then cut out the rectangular parts from it at the table saw (left photo). The crosscut sled (inset) is a safe, easy and accurate way to crosscut your stock. A saw blade with a high tooth count, designed for cutting plywood, will deliver clean, smooth edges with a minimum of tearout.



the best results. A combination blade (40 teeth) will do the job too, but a plywood blade will cut more smoothly and with less splintering along the edges.

With all of your parts now cut to size, it's time to break out your router and router table for some joinery work.

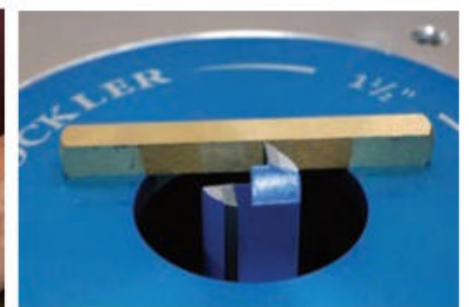
Dadoes, Grooves and Rabbets

I decided to use dadoes, grooves and rabbets as the connective joinery for this project. They all make assembling these doggie steps easy, and the glued-up joints are extremely sturdy. All the joint cuts are 1/4" deep. I could have formed them on my table saw with a dado blade, but my preference — especially on a project this size — is to plow those joints using a handheld router and my router table.

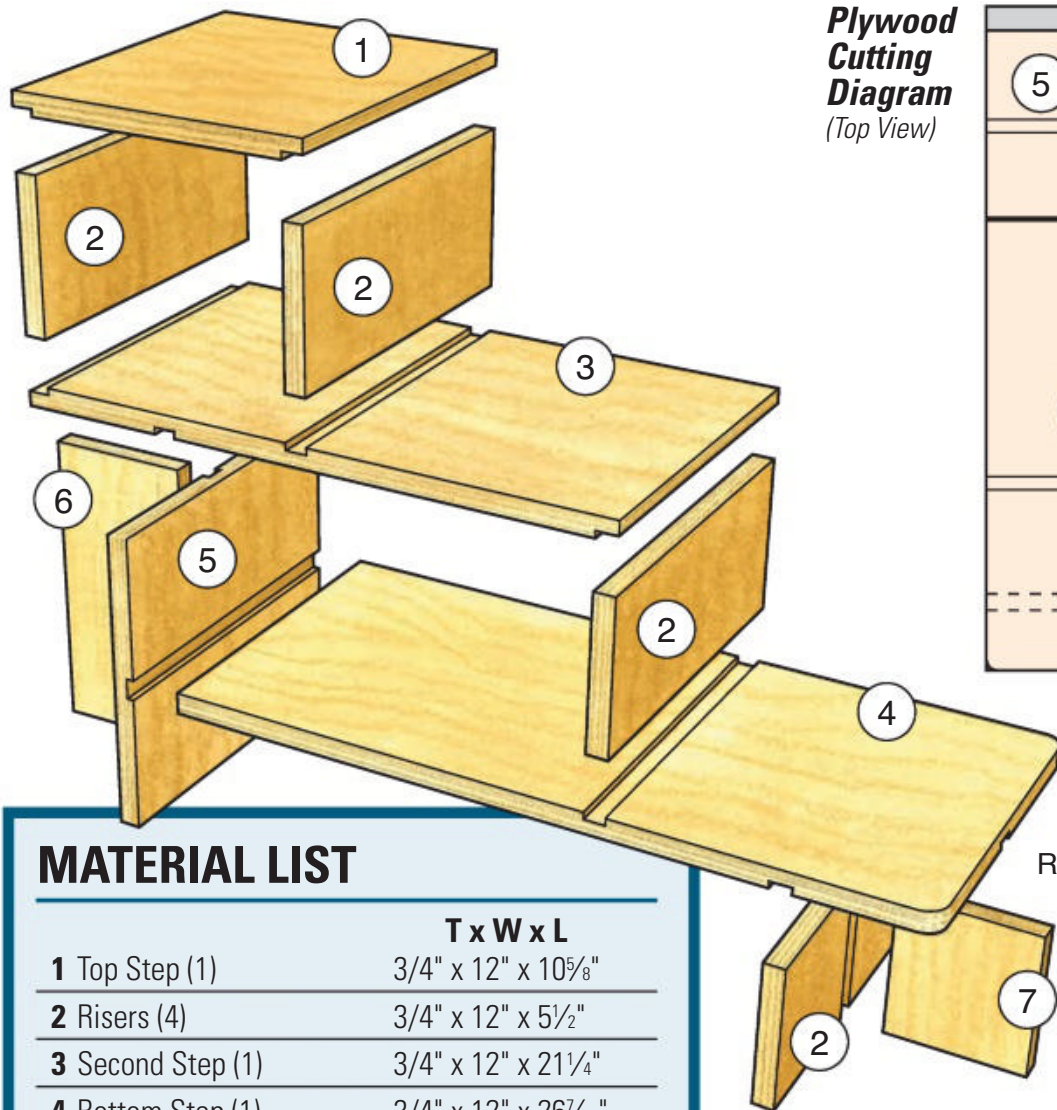
Curiously, 3/4" plywood rarely if ever measures a full 3/4" thick. For that reason, I made use of a router bit for undersized plywood. It cuts 23/32" channels and made dadoes and grooves that fit the thickness of my plywood really well. Find the locations

for all the joinery in the *Drawing* on page 42. All of the dadoes and grooves, except two, can be made on your full-sized router table. The dadoes that capture the risers in the second and bottom steps must be made with a handheld router guided along a straightedge. Take your time, mark out the joints carefully and then plow the dadoes, grooves and rabbets. As they are only 1/4" deep, you can make them in a single pass with a mid-size router. When

you have completed the joinery cuts, you have one more routing task to take on. At the end of the bottom step, form a radius on the two exposed corners (see the *Drawings*). At the advice of my coworkers, I tried out Rockler's Corner Radius Routing Template (item 57510) in the 1 1/4" size. I was a little unsure but it worked great!



Even high-quality plywood is often less than exactly 3/4" thick. Special "undersized" router bits are made to form grooves and dadoes that are properly sized for the true thickness of standard plywood. All of the dadoes, grooves and rabbets in this project are plowed 1/4" deep. The author used a brass setup bar (inset) to set the bit height.

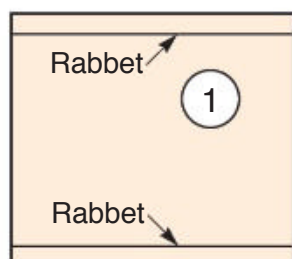


MATERIAL LIST

	T x W x L
1 Top Step (1)	3/4" x 12" x 10 5/8"
2 Risers (4)	3/4" x 12" x 5 1/2"
3 Second Step (1)	3/4" x 12" x 21 1/4"
4 Bottom Step (1)	3/4" x 12" x 26 7/16"
5 Left Vertical Support (1)	3/4" x 12" x 11"
6 Left End Support (1)	3/4" x 5 3/16" x 11"*
7 Right End Support (1)	3/4" x 4 3/4" x 5 1/4"*

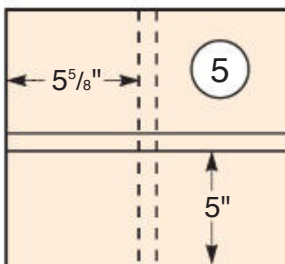
* Dry-fit, mark and cut to fit

Top Step
(Bottom View)

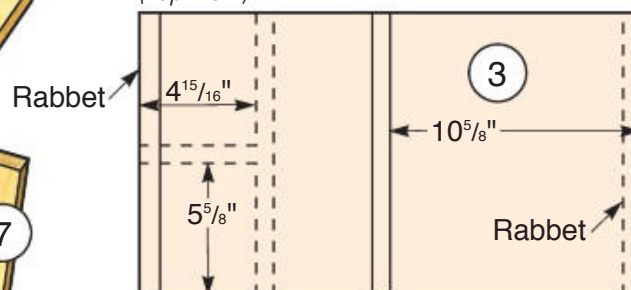


NOTE: All the dadoes and grooves are the width of the bit and 1/4" deep.

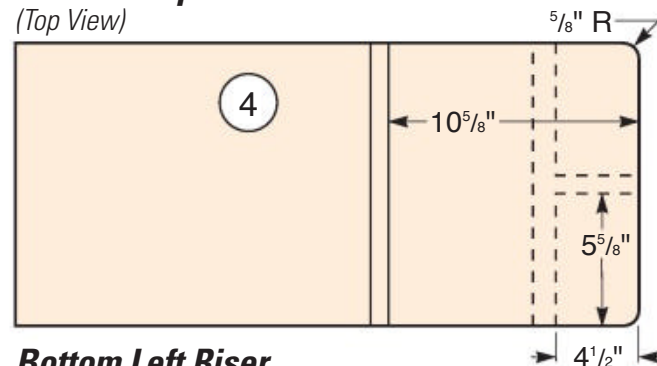
Left Vertical Support
(Side View)



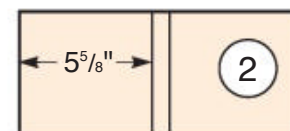
Second Step
(Top View)



Bottom Step
(Top View)



Bottom Left Riser
(Side View)



Putting a radius on the exposed corners of the bottom step will help to prevent barked ankles. A super easy and accurate way to form the rounded corners is with this 1 1/4" Corner Radius Routing Template from Rockler.

Dadoes across the second and bottom steps (pieces 3 and 4) must be plowed using a straightedge to guide the router. The locations of all of these joinery cuts can be found in the Drawings.



Dry-fit the pieces together to confirm the parts are all correct. Then glue and clamp subassemblies of the dog steps in manageable groups, a few parts at a time. Check routinely for square as you proceed.



Finishing the steps is a matter of personal choice. Here, the author painted the flat surfaces in two different colors and left the edges of the plywood exposed for a modern look.

Putting It All Together

With the machining all done, there were two tasks that needed to be completed before I moved onto assembling the project with glue and clamps. As the saying goes, “Work smarter, not faster,” and it is way easier to sand all of these panels before they are put together. I got out my random-orbit sander and sanded each piece, starting at 100-grit and finishing at 180-grit. Next, I dry-fitted the entire project together without glue. This is a critical step to any assembly, even a modest one like this. I found I needed to trim my end supports to fit just a bit better, so this was time well spent. (Smarter, not faster!) I was now confident that all of the parts were correctly made and they fit together, so I could start with the glue and clamps. (There is no reversing glue!)

I started out my glue-up by joining pieces 6, 5 and 3. It was a very manageable subassembly, making it easy to clamp the parts securely. A rule of thumb when gluing and clamping is to always check to be sure the parts are square to one another. After the glue had cured, I continued to glue and clamp parts together in more subassemblies. When all the parts are together,

remove any glue squeeze-out and then gently break the edges with sandpaper.

You’re nearly done, but the next step is applying a finish. The choice of product is entirely up to you, but I decided to paint the vertical surfaces one color and the horizontal surfaces another. My selection was General Finishes Blue Moon and Antique White Sand Milk Paints. You could use a clear finish like shellac or polyurethane, but don’t use a penetrating oil — the self adhesive treads will not stick to an oiled surface.

What treads, you ask? Well, I added adhesive-backed non-slip “Puppy Treads” I found on Amazon. These will help provide solid footing, especially for older dogs. I removed the backing, pressed the treads in place and trimmed them to fit (see right photo).

Even More Features

This version of dog steps is sized for an average-height sofa. We have technical drawings for a taller “bed sized” set of steps online, in our “More on the Web” offerings for this issue. You can, of course, customize your version by adjusting the sizes of the vertical components (pieces 2, 5, 6 and 7). On both versions, there are open spaces to store



The last detail for these doggie steps is a self-adhesive, clear plastic tread treatment. The treads are textured for sure footing.

toys, brushes and maybe even a leash. Really talented dog owners might even be able to train their pooches to “put away” their toys. (If you manage that, send us a video!)

This project was a great time in the shop and fun to build. It gave my router a workout and will be a useful gift for a dog-owning friend that will receive it.

Colleen Carey is a woodworker, dog owner and staff videographer for Woodworker’s Journal.

A photograph of a plant stand holding a large, textured, silver-colored pot with a tree-like plant. The stand is made of dark wood with four legs and a horizontal support. The pot is filled with dark soil and has a tree with several thin, light-colored trunks and green leaves growing out of it. The stand is placed on a light-colored wooden floor against a white wall.

Plant Stand

By Nick Brady

Beautify your home with this Danish Modern inspired plant stand. Build it from start to finish in one day.

Spending time outside in July and August offers ample opportunity to enjoy lush green landscapes. But for those of us in the north, a bit of greenery in the winter is like a breath of fresh air. This plant stand accommodates a large-enough pot so that it can hold anything from a plethora of coleus to a small tree and can easily bring us that mid-winter respite.

The stand is inspired by Danish Modern design, a style of Scandinavian influence that came into popularity after World War II. Focusing on form and function, the simplicity of the designs lent themselves to production-style woodworking. That made Danish Modern furniture affordable as well as trendy. Teak was the primary species of wood used in those 1950s-era pieces, and its mid-range hue and pleasing figure were a key component in the popularity of the style. I used black walnut with a clear, natural finish for this plant stand, and I think it makes a worthy substitute for expensive teak.

Getting Started

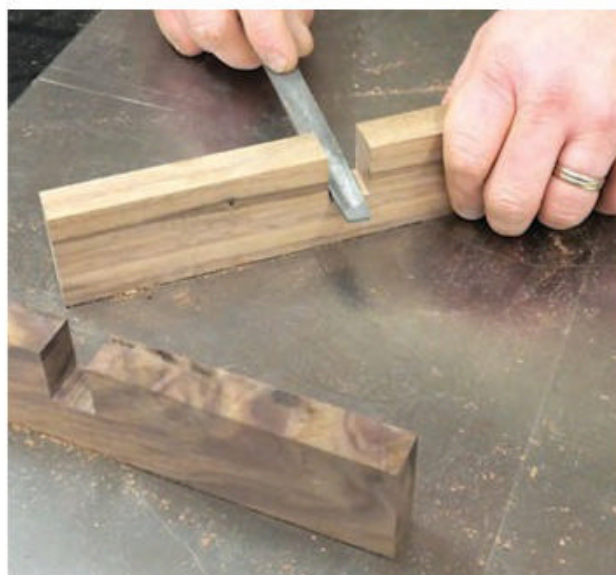
Start out by selecting your lumber. For this project, plainsawn lumber will produce the best look. When choosing your stock, try to avoid cathedral-grained boards. Instead, look for figure with a good bit of movement that runs the length of the piece. The leg on the left in the image at left is a perfect example of the type of figure I'm suggesting.

You can go ahead and cut all six pieces of stock to the dimensions found in the *Material List* on page 47. Check to be sure that all

all of the stock is surfaced to the exact same thickness, as this will make your joints fit properly.

From the pieces you've cut, grab the two supports (pieces 2) and step over to your table saw. These parts will connect with a half-lap or cross-lap joint. That's where you cut two notches that fit together as shown in the photos at right. While the concept of this joint is very simple, cutting it to fit perfectly takes a bit of concentration. Here's how I do it. First, I use some scrap material to set up the cut. It should be the exact same width and thickness as your project pieces, but it doesn't need to be as long. One good method to form a cross-lap joint is to use a dado blade. In this case, with just one joint to make, I decided to simply use my combination blade and nibble away the waste. That helped me cut the width of the notches to their exact width — I could sneak right up to it. It's also critical to cut the notches to the correct depth. And while you are testing that depth, remember that every adjustment in blade height will be doubled, because it affects both pieces of wood.

Once I had the setup dialed in on scrap, I was ready to cut the real thing. Notice that I clamped the pieces together and formed both notches at the same time (see top photo). Refine the cuts with a file, if needed. When the notches slip together well, set these parts aside for now, and move onto the legs (pieces 1). You will stay on the table saw for these next steps.



Clamp the supports (pieces 2) together and cut 3/4"-wide x 1"-deep notches at their centers. It's best to cut the notches a little narrow and short so that you can then sneak up on a final tight fit with a file.

Shaping the Legs

You have already cut the legs to length and width, so now you need to form their inside tapers. There are two tapers on each leg — a longer one on the lower part of the leg and a shorter taper on the upper section. As I indicated earlier, I prefer to form these tapers using a table saw. Rockler's taper jig is just the ticket for this task. It is adjustable, and you can make repeatable cuts as needed on each leg. A shop-made taper jig will, of course, work just fine if you prefer to go that route. If neither of those options float your boat, you can make the tapers using a band saw and sand the saw marks away



Lay out the long and short tapers on each leg. These tapers are cut onto the inside edge of the leg, leaving a $1\frac{15}{16}$ "-long flat area where the legs will be joined to the supports.

later. Use the *Drawings* on the next page to lay out the tapers on each leg. Then set up the taper jig to form one of the two tapers (the jig makes this very easy to do). Cut this taper on all four legs, then reset the jig for the second taper and repeat the process. Take a moment to sand away any saw marks that are left behind, and you are ready to make some more joinery.

Loose Tenons Create Rock-solid Joinery

The supports are joined to the legs with loose tenons. Now, if you are fortunate enough to have a Festool Domino, go grab that machine and get busy. But if that's not an option, you will need a different method. This planter is designed to hold up a really large pot full of dirt, and that pot and plant will be

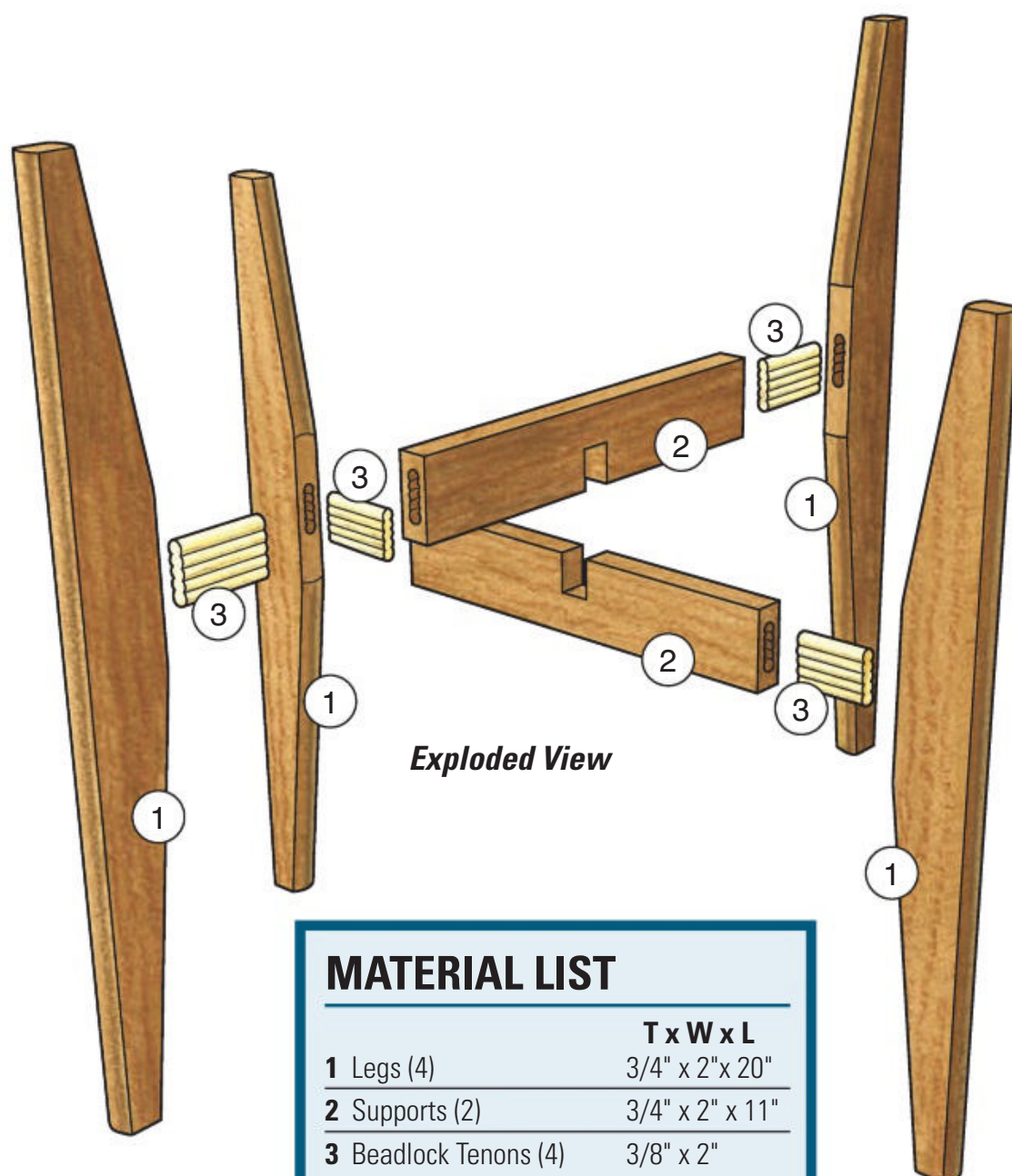
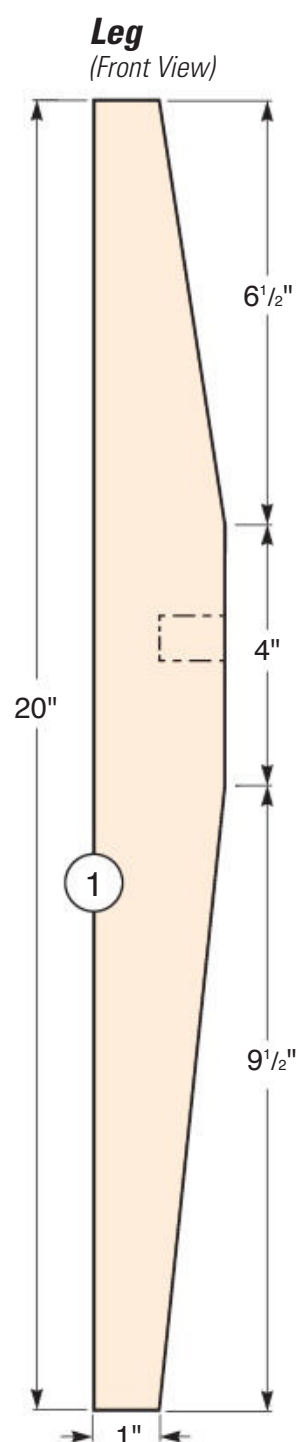
heavy. I used Rockler's Beadlock® loose tenon system because it is easy to use, affordable and produces super-strong joints.

Set up the Beadlock drilling jig with the $\frac{3}{8}$ " guide, and use a $\frac{3}{8}$ " drill bit (I prefer a brad-point bit) to form the mortises in the supports and legs. The two-step drilling technique creates a specially shaped mortise that pairs perfectly with the Beadlock tenon stock. Center the mortises on the ends of the supports and at the center of the untapered area on the leg's inner edges. Drill all eight mortises 1" deep for 2"-long tenons.

Once the mortises have been formed, there is one more important machining step that needs to be done: shaping the edges of the legs. Step over to your router table and chuck a $\frac{3}{4}$ "-radius roundover bit into the router. Most of these bits will have a guide bearing mounted to the top of the bit. Raise the bit so the cutting edges are $\frac{1}{2}$ " up from the top of the table. It is important to measure to the top of the cutter, not the bearing. (See the top left photo on page 48.) Next, align the router table fence with the forward rim of the guide bearing; using a straightedge will help to do this accurately. By setting the bit and fence in this fashion, you will create what some folks call a "fingernail arc" on the edges of the stock. It is a gentle arc, not a full roundover. The fingernail arc is a vintage Danish Modern detail. (See the photos



Using a taper jig on the table saw allows you to make accurate and repeatable cuts on narrow stock without putting your hands in harm's way. This jig came in handy, as each of the four legs of the planter requires two different taper sizes.

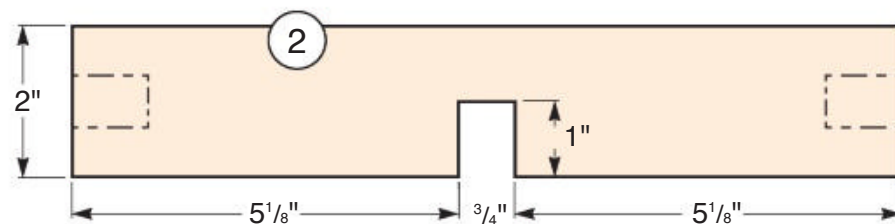


MATERIAL LIST

	T x W x L
1 Legs (4)	3/4" x 2" x 20"
2 Supports (2)	3/4" x 2" x 11"
3 Beadlock Tenons (4)	3/8" x 2"

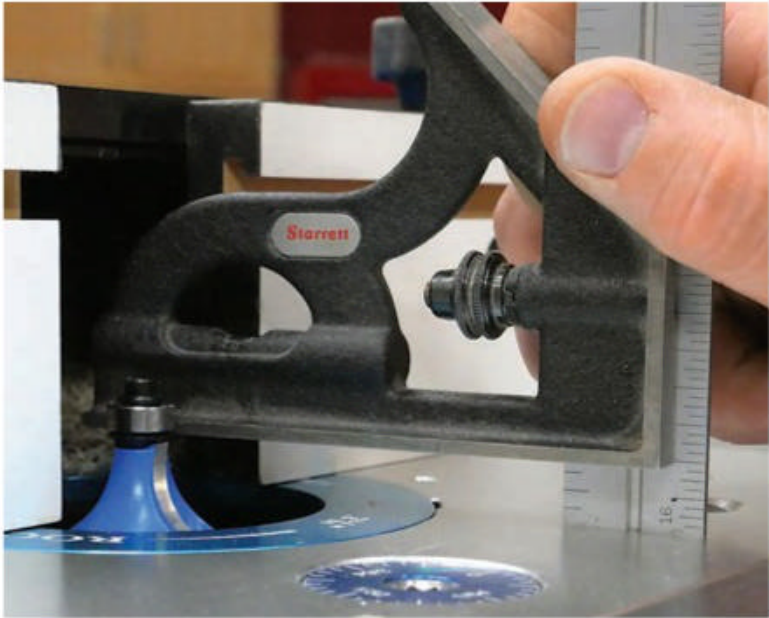
Support

(Front View)

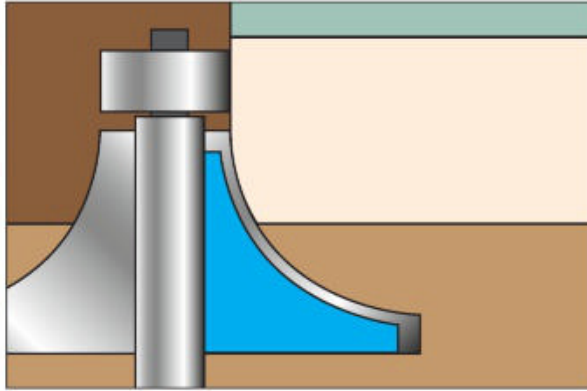


The Beadlock system creates solid loose-tenon joints quickly and easily by simply drilling a series of overlapping holes through a jig to create the mortises. Take time to clear any accumulating chips from the mortises while drilling them.





The fingernail profile on the edges of the legs is formed by running the workpieces past a 3/4"-radius roundover bit. Set the top edge of the bit's cutters (just below the guide bearing) to 1/2", and align the fence with the front rim of the bearing. That's all the cutter exposure you'll need for this operation.



By only using a portion (1/2") of the cutter, you'll form a fingernail profile instead of a full roundover or bullnose. The subtle curvature is a distinctive detail of many Danish Modern furniture designs.



Clamp two legs back-to-back and against a backer board for stability and to reduce tearout. Rout the profile across the top and bottom ends of the legs. Then flip the legs over and rout the profile on the other ends of these faces to complete the fingernail arc profile.

on this page.) Test the setup on scrap lumber to confirm the cut, then machine the leg edges. The outside (un-tapered) edges of the legs are easy to do. Move the stock past the bit in a smooth motion at a moderate pace. The tapered edges of the legs, however, require a bit more focus. Only shape the angled areas, leaving the mortised area on each leg (where the supports will join the legs) alone.

The final bit of shaping on the legs will form the fingernail arc onto their top ends. As this is end grain, you will need to rout carefully. Clamp two legs back-to-back (see photo above at right). Then use a backer board to reduce tearout. Push the ends slowly through the cutter. If the wood burns a little,

you can sand that off later, but you need to avoid tearout.

With that task done, it's time for the most exciting process in every woodworking project: sanding! I recommend sanding to 220-grit.

Remember those supports you made at the beginning of this task? Grab them, the Beadlock tenons and the legs and get ready to assemble the plant stand. There is one critical thing to keep in mind during this glue-up stage, and that is the orientation of the notches on the

supports. To say it simply, one notch must point up and the other down. That way, the cross-lap joint will fit together and complete the base. Glue the legs and supports up in pairs, minding those notch orientations. When the glue cures, glue and clamp the cross-lap joint. Remove any glue squeeze-out.

I recommend that you now give the whole project a 320-grit hand sanding. Watco Natural oil finish is perfect for this project. Apply at least three coats, letting the finish cure between coats. One great thing about this finish is if the plant stand gets some water on it and needs a touch-up, just clean the surfaces and apply another coat of the oil. It's as simple as that!

Now all you need to do is find a pot, a bag of potting soil and a plant that befits this large, beautiful wooden planter.

Nick Brady is a project builder for Woodworker's Journal.



Sand the parts smooth and assemble the plant stand with glue and Beadlock tenons. Then apply three coats of penetrating oil to finish up.



Be careful to stop the fingernail profile of the legs (inset) so it doesn't extend into the flat mortised area that butts against the supports.

WOODWORKER'S
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The Way To Woodwork: Mastering the Table Saw



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— Sandor Nagyszalanczy

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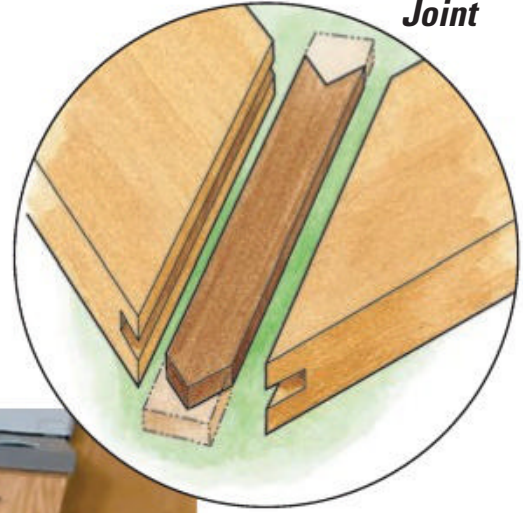
SKILL BUILDER

Miter Joints

By WJ Staff

Hide end grain elegantly when you join the angled ends and edges of parts together.

Splined Miter Joint



Miter saws are designed to make the angled cuts that create a miter joint. However, it's crucial that the blade be set to the exact angle required for each cut to prevent cumulative errors. Even a fraction of a degree off target can impact the joint's accuracy and prevent a frame from closing properly at the last joint.



The corner joint of this tambour console provides a good example of a waterfall joint, where the grain pattern continues around each corner. Miter joints hide the end grain, making this effect possible.



Bar clamps may offer little help for clamping angled joints, like these bevels. Here's where strap clamps (shown), wide packing tape, rubber bands, lengths of cord or even automotive hose clamps can fill the bill.

The corners of nearly every typical picture frame exemplify what a basic miter joint looks like: two members crosscut at matching 45-degree angles to form a corner. In addition to being a popular joint for picture frames, shadow boxes, chair seats and such, miters are commonly used to join trim pieces, such as decorative ogee moldings framing the drawer faces of a fancy dresser as well as shoe, chair rail and crown moldings used to add style to a kitchen's or dining room's decor.

Miters are also great for joining corners when building carcasses — jewelry boxes, blanket chests and the like. They're ideal when the grain pattern of workpieces is intended to wrap around a corner in a continuously flowing fashion, almost as though the joint isn't there at all. You'll see this often these days in natural-edge slab designs where a tabletop "folds" down into a support.

Regardless of the application, mitered assemblies have a clean look, because the end grain of solid-wood frames and the plywood edges of carcass panels are hidden inside the angled interface of the parts when the joint is assembled.

Technically, when two

VIDEO Learn more about miter joints by visiting woodworkersjournal.com and clicking on "More on the Web" under the Magazine tab.

Joint Report

Strength: **Weak**
 Difficulty: **Moderate**
 Versatility: **Moderate**

workpieces are crosscut at an angle other than 90 degrees with the blade un-tilted, their union is a miter joint. Alternately, when the blade is tilted off of 90 degrees to cut angled joint parts, the joint being made is actually a bevel instead. But bevel joints are commonly called miters anyway.

Cutting Miters

The first challenge to creating well-fitting miter or bevel joints is cutting the parts accurately. Once their edges or ends are brought together, any deviation from an accurate angle setting on the saw will create a joint that is more acute or obtuse than the desired. For instance, crosscutting each workpiece at 44 degrees instead of 45 will produce a mitered corner that's two degrees shy of a right angle and out of square. And when those joints bring together a closed framework, such as a box, picture frame or multi-sided polygon, the error of each mitered or beveled corner compounds around the form. The final joint either won't be able to close because the parts are shy of touching, or the parts will actually cross past one another instead.

The remedy, as you might guess, is to set the blade

angle accurately and make test cuts first, to see how the parts will fit. It's also important that each mitered frame member is cut to the precise length or width required; if you can use a stop block to register the end of the part off of a fence, be sure to do it. The tiniest error in length can lead to an open joint.

Assembly Challenges

Even when miter or bevel joints are cut carefully, a second challenge is assembling them. It's difficult to clamp angled part ends or edges with bar clamps, since applying clamping pressure across the joint often shifts the parts out of alignment. Here's where strap clamps, temporary glue blocks or even strips of masking tape can come to your aid to keep things registered properly.

Reinforce When Possible

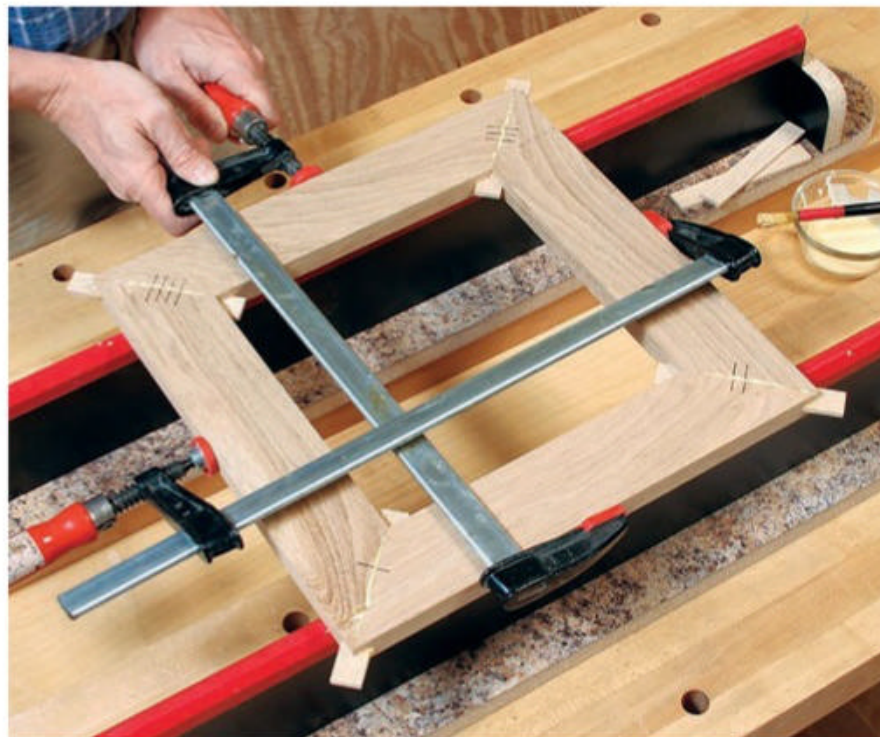
Strength is a third miter joint bugaboo. When end grain surfaces are glued together, glue soaks into the open wood fibers and can starve the joint of adhesive. So add splines, biscuits, dowels, loose tenons, nails or screws to bolster joint strength. Most of these reinforcements will also keep the joint aligned during clamping.



Closed forms created with miter joints will require that each workpiece is cut to precise length or width. When possible, use a stop block clamped to a fence (here on a table saw miter gauge setup) to control part lengths.



Clamping miter joints can be tricky, especially when glue is behaving as a lubricant before it sets. A pair of angled glue blocks, installed on each joint member with hide glue, can provide improved clamping surfaces.



The end grain to end grain interface of a miter joint offers only a marginal glue bond. So reinforce miter joints by some mechanical means to strengthen them. Here, long-grain splines are inserted across each joint.

POWER TOOL FUNDAMENTALS

Routers and Router Tables

By Rob Johnstone

Shaping edges, milling joinery and duplicating parts are all within the wheelhouse of these remarkable tools.



At its most basic level, a router is simply a motor with a cutting bit attached to it, installed in a base for controlling it by hand. The motor spins the bit at extremely high speeds. This is our modern handheld router in a nutshell.

That basic combination of motor, base and bit provides one of the most versatile and productive portable power tools in our woodshops. Routers are made in myriad sizes and configurations, some with fancy electronics and other just a bare-bones tool with an On/Off switch.

There are more industrial versions of the router concept. As a young man in my dad's shop, we produced "Fish & Fillet Boards" using a 20hp overhead router. These days, huge CNC routers power major manufacturing in a host of industries.

But this article is about the tools we find in hobbyist shops, whether being used by hand or under a router table.

What They Do

With a router you can plow dados, grooves and rabbets. Other joints include box, dovetail, miter lock, mortise-and-tenon and more. They can form moldings and decorative edge shapes. Routers have become the go-to machine for creating rail-and-stile joints and raised panels for cabinet doors. They can straighten edges much like a jointer, bore holes, duplicate part shapes and even surface lumber or slabs flat. It may be easier to mention what they do

not do. (A reader once tried mounting an egg beater in his trim router to whip cream ... that was a BAD idea!)

Routers perform so many functions in part, thanks to a plethora of router bits. But we will save an in-depth discussion of those cutters for another day.

Direction Needed

True for every form of router is the fact that they must be

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MORE ON THE WEB



For a video discussing router basics, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



Large Routers: 3.25hp; Designed for heavy-duty use, especially in router tables.



Mid-Sized Routers: 2 to 2.5hp; These are the all-around shop standard.



Cordless Routers: 12- or 18-volt; Available in a few configurations, they are becoming more functional and practical.



Trim Routers: 1 to 1.25hp; Used commonly for trimming laminate plus many other edge-forming and cutting tasks.

ROUTERS MUST BE GUIDED

Fence



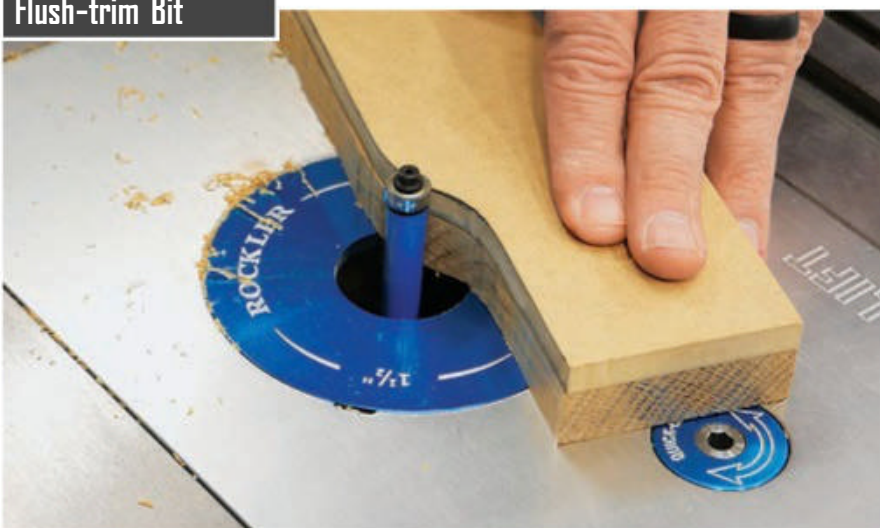
Straightedge



Pattern-routing Bit



Flush-trim Bit



guided accurately. Fortunately, woodworkers have come up with an amazing array of fences, rub collars, guide bearings, jigs and fixtures to keep those spinning bits cutting where we want them to cut. The photos bordering these two pages show many of those guiding options.

Plowing a groove is easily done using a straightedge (second photo at left), but it's just as easy to do using a router table configured with a fence, as shown in the top photo at left. Choosing which option is up to the woodworker, based on the needs of the application and the tooling options at hand.

Guide bearings mounted on "piloted" router bits (middle and lower left photos) are another means of accurately controlling a cut. The bearing typically rolls along the edge of a workpiece to limit the cut. Router bits with guide bearings can be used in a handheld router or in a router table setup.

Bearing-guided router bits come in a wide range of offerings, from pattern and flush-trim styles shown at left to rabbeting bits, roundovers, ogees, chamfers and many other decorative shapes.

Often, methods of guiding the bits are combined, using bearing-guided bits in tandem with a router table fence, for example.

Router Tables

Flipping a router upside down and mounting it to a flat surface is a common way to add functionality. These "router tables" can be remarkably basic or amazingly fancy, thanks to many accessories now on the market.

When we produced those Fish & Fillet boards in my dad's shop, one of the last machining steps was to cut a 1/8" roundover around their top edge. The router table we used to do that task was a piece of melamine mounted on a metal stand. A 3/4hp metal-bodied Stanley router was mounted underneath, and we literally ran tens of thousands of boards over that modest setup.

Router tables come in all sizes — from portable, lightweight frameworks to substantial cabinets with cast-iron tables. You can make your own (a fun project for which *Woodworker's Journal* has several plans that you could use for a starting point) or purchase all or some of the components ready-made. In fact, Rockler has a handy online router table configurator that let's you "build" a router table to match your desires and/or budget.

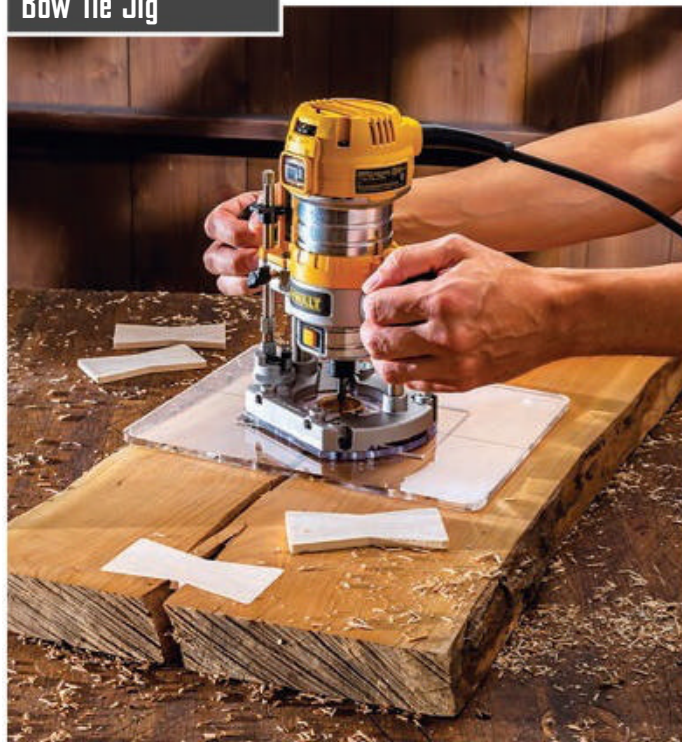
There is no denying the value of a router table for woodworking. I mentioned earlier that rail-and-stile and raised-panel joinery is

done primarily using routers these days. The only way to create the frame joinery and shape the panels safely and accurately is on a router table with fences and jigs to guide the stock past those specialty cabinet door bits. (I like to set up three router tables for door-making, one performing each cut, but I digress.) Plunging mortises is another task most easily and safely done on a router table.

I mentioned earlier that there are many accessories on the market to enhance a standard router table. From On/Off switches to various safety, workholding and dust collection products, the list is long. You can purchase micro-adjustable fences, tabletops of laminated MDF, phenolic or cast-iron and router mounting plates of various material types, too.

In my opinion, no router table accessory offers more enhancement than a router lift. Router lifts provide a controlled way of adjusting the router motor from above the table. They greatly simplify some frustrating router table operations, including accurately setting depth of cut and accessing the collet for bit changes. Lifts can be basic or highly featured and are priced accordingly. Coupled with a large router motor, they make stationary shapers nearly obsolete.

Bow Tie Jig



Box Joint Jig



Doing the Jigs

Jigs offer effective ways of controlling a router. Be they shop-made or purchased, they take a 20,000 rpm spinning dynamo and direct it to do even delicate work.

Many woodworkers aspire to make dovetail joints, which can be fussy to form with saws and chisels. But a jig and router provide a viable alternative to hand-tool finesse. A variety of dovetail jigs abound, each with its own advantages and limits. The Leigh jig shown at right is a premium option, offering functionality that few can match. It also cuts box joints, and so do more basic jigs.

Bow tie accents have been popular since at least George Nakashima's time.

Now there are templates (top left photo above) to help you rout them with ease.

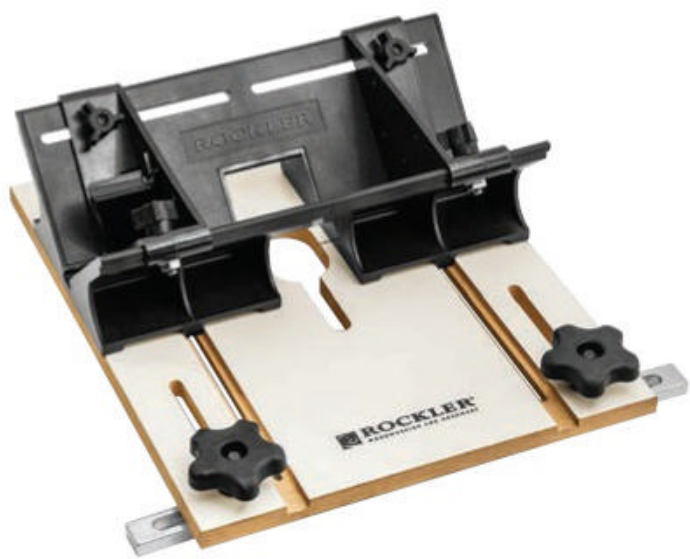
Ellipse/circle-cutting jigs produce a range of perfect ovals or circles by simply mounting the router to a pivoting arm and pushing the tool forward to cut them out.

Dovetail Jig



Ellipse/Circle Jig

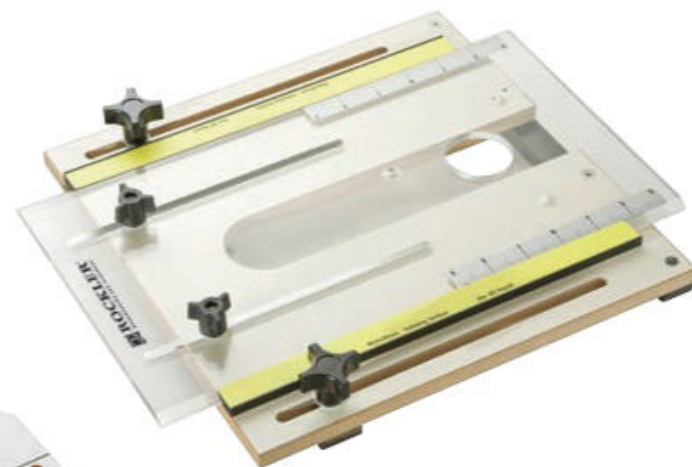




Spline Jig



Indexing Dado Jig



Fluting Jig

Next Generation CNC



The handheld Shaper Origin represents the latest in CNC router technology. Key to its functionality is its guidance programming. Every router needs to be directed or guided in some fashion to be useful. The Shaper Origin utilizes, for lack of a better term, a kind of GPS system to guide the bit. Its onboard computer orients itself using domino-looking patterns on a special tape applied to the work surface. Programming allows the operator to place the intended shape or pattern to be routed on a virtual surface, and then the Shaper machine helps to guide the cutter, with the operator pushing the tool while following a cutting path on screen.

Back to Bits

Router bit development has kept pace with improvements in routers over the years. While the goal of this article is not to go into depth about router bits, a few deserve some brief commentary here. For example, there are specialized bits for shaping tambour slats. I made a Mid-Century modern project with sliding tambour doors a few years ago, and those bits



worked like a dream. There are bits to form key hole slots, lock miter joints together and form seamless solid-wood edging on plywood. There are bits ground with mesmerizing spiral cutting edges that reduce tearout on edge grain to almost nothing. Take some time to become acquainted with the incredibly wide range of bits available to you. I bet you'll be impressed!

Safety Considerations

Routers are indeed remarkable additions to our woodworking shops. But like all power tools, especially those designed for cutting wood, safety is an important concern.

Protecting your eyes, ears and lungs are at the core of working safely. Routers are a bit like miter saws in that there is often not a really good way to collect sawdust

at the point where it is generated. When working with materials such as MDF that produce copious amounts of fine dust, a good dust respirator is essential to keep your lungs protected.

Routers have universal motors that produce a lot of power and torque but also make a deafening amount of noise! Wear earmuffs or earbuds offering a noise-reduction rating of at least 25 decibels when using either handheld routers or a router table.

Regarding eye protection, router bits spin at tremendously high revolutions, upwards to 20,000 rpm or

Small Circle Cutting Jig



Small Box Joint Jig



Router Terms

Bit Profile: Contours of the cutting edges of a router bit. A bit's profile determines the range of shapes it can create in the wood.

Collet: Holding device for router bits that threads onto the router motor's shaft and tightens with a wrench.

EVS: Electronic Variable Speed. Controls bit speed and applies more power when needed to keep the bit spinning at a relatively constant rpm.

D-Handle Base: Non-plunging router base with a triggered, D-shaped handle that offers good control.

Fixed Base: Common, non-plunging router base. Once the depth of cut is set, the bit is engaged with the workpiece by feeding into it from an edge or end.

Plunge Base: Router base with a spring-loaded post system that allows the bit to be plunged into a workpiece to a specific cutting depth.

Shank: Cylindrical shaft of a router bit that serves as the clamping area for the router's collet. U.S. shank diameters are 1/4", 1/2" and sometimes 3/8".

more. If a cutter grabs a piece of wood and flings it, there's a good chance it will pack a punch. Protect your eyes with good-quality goggles or safety glasses. (This is a failing of mine, as I sometimes think my regular glasses will do the job. I am kidding myself.)

Speaking of spin hazards, when using large-diameter router bits, it's important to dial down their rotational speed. Their packaging should recommend a speed range, and you can find speed charts online as well.

Trying to shape small parts on a router table is asking for trouble if you are not using a small parts sled or

other means of keeping your fingers clear of the cutters. Router bits also must not slip in their collets during use. Be sure the collet and internal sleeve are clean, in good condition and properly tightened on the bit's shank before starting a procedure.

And of course, follow the general power tool rule: If you don't feel safe doing a specific task, just stop. Learn how to improve your method to make it safer.

Routers and router tables open new horizons for shaping and joining wood. Once you try them, watch the project possibilities grow!



Lifting the Craft Beyond Shapers

Router lifts are the single most useful addition to a router table on the market today. Their robust functionality takes a router table from a home shop fixture to a professional-quality cutting system. Shaping large pieces of stock, whether forming decorative shapes or finger joints, was traditionally the province of a shaper. It's a large stationary power tool with an adjustable split fence that uses cutters mounted to a motor-driven shaft. Twenty-plus years ago, there was not a serious cabinet shop or highly skilled home woodworker without a shaper. But with the advent of 3hp and larger router motors, large-diameter carbide router bits and the added control offered by router lifts, shapers have become fairly uncommon today. Router lifts also make specialty cutters like tambour bits and even rail-and-stile cutters more practical, due to their micro-adjustability.



WHAT'S IN STORE

Clever Gizmos for Tuning, Clamping and Lifting

Contact Information

ISOtunes
317-740-0419
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Kreg Tool
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Rockler
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Triton Tools
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MORE ON THE WEB

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Super-tune your table saw's blade and rip fence for parallelism with one another, and get cleaner, safer and more accurate cutting as a result, when you use **Rockler's Table Saw Alignment Gauge** (item 66646; \$59.99). It features a precision dial indicator that's accurate to 0.001", with a bright, easy-to read face and a plunger that travels up to 1". It mounts to a glass-reinforced plastic body and a 6" aluminum miter bar that fits any 3/8" x 3/4" miter slot. The miter bar has expandable tensioning guide blocks to snug it up in a miter slot with an included Allen wrench. Outrigger feet on the plastic body prevent the gauge from rocking in the miter slot during use, and low-friction touch points on the underside add stability. The gauge has six lateral positioning holes for adjustment with a knob, so it can be used on saws having miter slots ranging from 3 3/4" to 7 3/4" from the blade.



Rockler Table Saw Alignment Gauge

With **ISOtunes® FREE Aware Noise-Isolating Earbuds**, built-in Aware Technology™ will screen out harmful noise spikes like hammer strikes and popping nail guns, while still letting you hear ambient



conversations and warning signals. They offer Bluetooth 5.2 connectivity and an ANSI-certified noise reduction rating of 25 decibels (dB), while also limiting volume output to 85 dB. A background noise-reducing microphone filters out noise that would otherwise be

heard over phone calls. Controls on the buds play and pause music, answer and end calls and adjust the volume. Seven pairs of eartips in various sizes are included, as is a USB-C charging cable, charging case and lanyard. Battery life is about 13 hours per charge. ISOtunes FREE

Aware Noise-Isolation Earbuds (Rockler SKU 63561) sell for \$199.99.

If you've been frustrated by the inability to temporarily position dust hoses where you want them, these **Dust Right® Clamping Hose Holders** from **Rockler** offer a helpful solution. The reinforced plastic



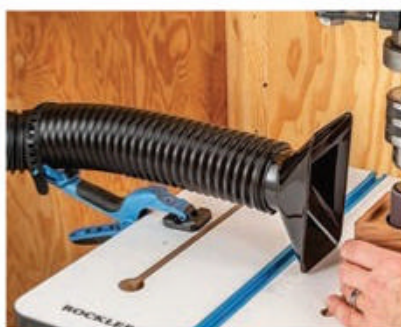
ISOtunes FREE Aware Noise-Isolating Earbuds

clamps have straps that hold hoses up to 2½" in diameter, enabling you to locate them wherever a spring clamp can be secured — to benches up to 2½" thick, rafters, joists, wall studs and so forth. The utility straps can either be mounted to the top of the jaws or at the back of the handle, and the strap locations have toothed notches that provide eight different locking positions. The 1¾" x 1¾" pivoting clamp feet with rubber pads provide a strong hold. Rockler Dust



Right Clamping Hose Holders come in a 2-pack (item 62840) that's priced at \$14.99.

Triton's TMNRTR 1.2HP Trim Router with Plunge Base is a full-featured, 6.4-lb corded tool that offers plunge-cutting capability up to about 1⅞" deep. It has a no-load variable-speed range of 11,500 to 31,000 rpm, soft start and can accept 1/4"-shank bits with cutters up to 1⅜" in diameter. A spindle lock enables quick and easy bit or collet changes. Its plunge base and included table height winder work together as a built-in router lift. The plunge base also has a depth stop and turret for setting repeatable, precise, stepped-off cutting depths. Two 1/4" collets come with the router, and so does a trimmer base, trimmer roller guide, parallel fence and wrench. The parallel fence will inset the router bit up to 5⅛" from a workpiece's edge. The 7.3-amp Triton TMNRTR 1.2HP Trim Router sells for \$179.99 and is available from Rockler as item 62495.



Full-size 4x8 sheet goods can be unwieldy to lift and carry alone. But with the **KMA3000 Panel Carrier** from **Kreg Tool** (Rockler SKU 61466; \$19.99), you can safely lift and carry panels up to ¾" thick and 100 lb on-edge with one hand and without fear of dropping, denting or damaging the material. Its GripMaxx™ pads auto-adjust and ensure a secure hold without marring even fragile face veneers. The more you lift up on the handle, the tighter the pads squeeze. The ergonomic handle has thick, durable padding so it won't dig into your hand.

Kreg KMA3000 Panel Carrier



TOOL PREVIEW

3-in-1 Cabinet Scraper Sharpening Tool

By WJ Staff

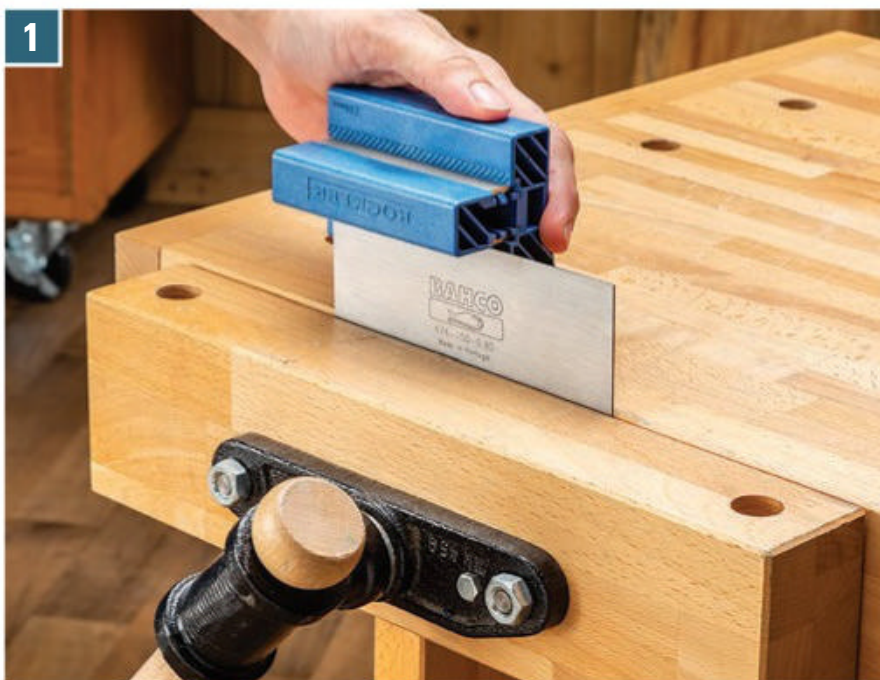
New jig simplifies the process of filing, honing and burnishing card scrapers with all-in-one convenience.



Sharpening a cabinet scraper isn't particularly difficult, but the process will require three separate tools: a file (often installed in a holder to ensure that it's held squarely to the scraper's edge), a fine-grit sharpening stone and a hardened-steel burnishing rod. If you don't perform this routine maintenance on your scrapers very often, you'll also need to remember the correct order of operations for using those tools to sharpen effectively. It can make an otherwise quick task one you might tend to avoid, so your scrapers are only occasionally performing at their best.

Rockler's innovative new 3-in-1 Cabinet Scraper Sharpening Tool (item 66275; \$24.99) is designed to simplify the sharpening process in both regards. Its glass-filled nylon base is outfitted with all three tools you'll need for the job: a double-cut second file, a 2,500-grit diamond hone and a burnishing rod. So you won't have to scrounge for the tools you'll





1 *Filing is the first step to sharpening a scraper. It flattens the edge (on straight-edged scrapers) and creates square corners along the scraper's faces. A double-cut second file on this tool removes steel quickly.*

2 *Flipping the sharpener over switches it from filing to honing — the second step of the sharpening regime. Super-fine diamond grit removes filing marks on the edge and sharpens its corners.*

need just to prepare for the task. The tool is also helpfully embossed with step-by-step reminders on each of its fences, including some diagrams — and this may be its greatest benefit. You don't have to remember the sharpening steps or search for the instruction sheet that comes with it. The tool is its own tutor!

Sharpening Made Easy

The first step to sharpening a scraper is filing a flat, square edge with the scraper clamped vertically in a bench vise (see Step 1). A square fence beside the tool's file is held against the face of the scraper, and 10 to 12 passes will remove the former edge as well as flatten it.

Flipping the 3-in-1 Cabinet Scraper Sharpening Tool over presents Step 2: honing. Here, tiny striations and other roughness left by the file's teeth can be smoothed away with several strokes of the diamond hone. The diamond grit also serves to sharpen both corners of the edge.

Laying the scraper flat on a work surface and turning the

tool around to Step 3 enables you to draw out the scraper's corner beyond the edge. This happens by distorting the steel with the tool's hardened-steel burnishing rod. It creates the first stage of the micro-burr that does the actual cutting when the scraper is in use.

Finally, re-clamping the scraper vertically again transitions to the final stage of sharpening (Step 4 on the tool): rolling the burr down past the edge to orient it toward the scraper's face. Rockler has designed the fence used for turning the burr so it tips the burnishing rod about 10 degrees down from square, effectively "hooking" the burr to prepare it for use. Several strokes with moderate pressure along the edge are all it takes to finish the burr.

With a little practice, you can turn both edges of a scraper into four burrs in very little time. And that should help make scraping a more effective part of your general surface preparation process.



3 *A hardened-steel burnishing rod is used next for Step 3, to draw the scraper's corners out into burrs that extend beyond its edge. A few passes along the corner, pressing down with moderate pressure, is all it takes.*



4 *The angled fence held against the scraper's face in Step 4 tilts the burnishing rod about 10 degrees past square. When it's pressed along the scraper's edge, the rod turns the burr downward to complete it.*

HARDWORKING HARDWARE

Installing Heavy-Duty Cross Dowels and Bolts

By WJ Staff

Here's knock-down convenience for securing legs to rails or stretchers where maximum strength is required.



36073; \$27.99) can offer a solution with simpler machining and no appreciable compromise in strength. Even better, the steel hardware can be disassembled in less than a minute with a ratchet and socket whenever you need to break the joint down.

Just Three Parts

The system consists of a 1/2" x 5 1/2" hex bolt and washer that threads into a 7/8"-diameter, 1 1/4"-long cross dowel. The bolt passes through the leg and engages the cross dowel housed in a hole bored perpendicular to the rail's or stretcher's faces. Tightening the bolt draws the cross dowel toward it, pulling the joint together. Twelve threads per inch are coarse enough to tighten without fear of stripping the parts and make the bolt and dowel easy to start.

These Heavy-Duty Cross Dowels and Bolts offer some degree of joint variation, in terms of how thick the leg can be. But the farther the cross-dowel hole is from the end of the rail or stretcher, the stronger the joint becomes. Legs around 3" thick, connecting to rails or stretchers in the 1" to 1 1/2" thickness range, are ideal.

There's no question that mortise-and-tenon construction creates rock-solid joints for attaching legs to other members of a framework or rails to stiles. But sometimes the trusty mortise-and-tenon isn't ideal. Consider a bed frame, for instance. You may need the convenience of disassembling it just to get it out of the shop and into a bedroom once you've built it, not to mention each time the bed is moved from one room or

house to another. Mortise-and-tenon joints aren't typically "knock-down," reversible options.

Or perhaps you need to connect a massive leg to a stretcher or rail, such as in the "Hybrid Workbench" project in this issue (see page 30). For large frameworks of this sort, you might not want to bore and chop enormous, deep mortises into the leg or mill tenons on the ends of heavy, long rails or stretchers that are unwieldy to handle.

In situations like these, Rockler's Heavy-Duty Cross Dowels and Bolts (item

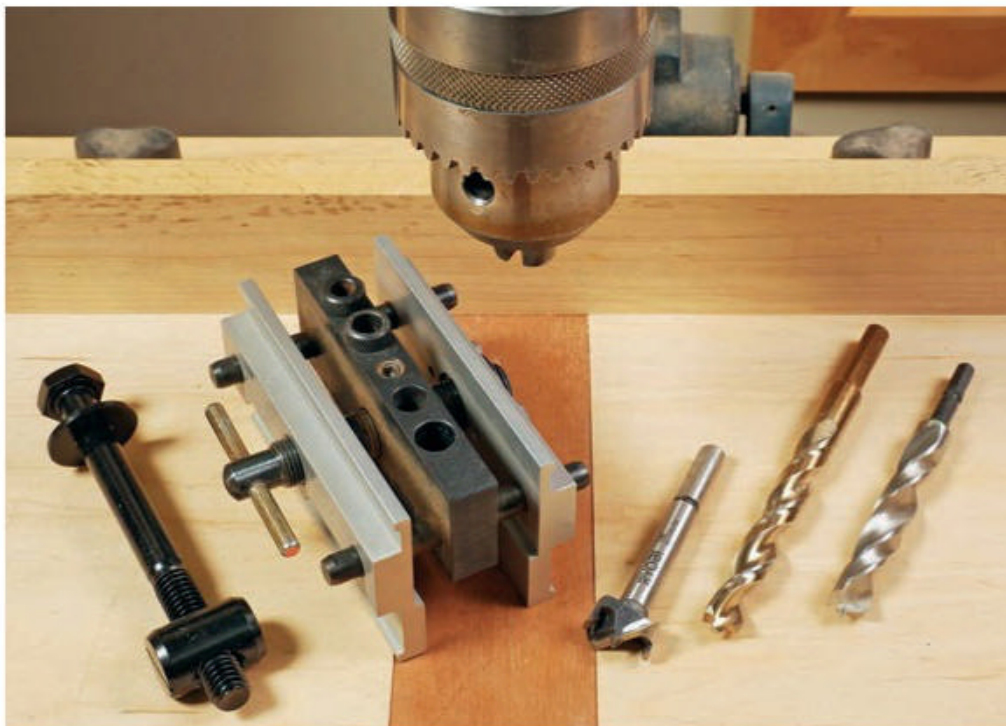
MORE ON THE WEB



To watch a video about how Heavy-Duty Cross Dowels and Bolts are installed, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

Straight, Clean Drilling is Key to Cross-doweling Success

Cross-dowel joinery is about as simple to install successfully as driving screws into a butt joint. However, sloppiness here will likely lead to a bolt that won't engage the cross-dowel threads correctly or a rail/stretcher that shifts out of registration when tightened up. Mark your joint parts carefully before machining them. Then use a drill press, if at all possible, or even a right-angle drilling guide to bore a bolt hole straight through the leg. A self-centering doweling jig, like the one shown at right, can ensure that the bolt hole also will extend straight into the end of the rail or stretcher and be centered on its thickness. Use a sharp bit for boring the bolt hole (a fresh twist bit or long brad-point bit are ideal). A 7/8" Forstner bit is a better choice than a spade bit for drilling the cross-dowel hole, as it will produce much cleaner rims when entering and exiting the workpiece.



1 Start by marking the leg with the center point of the bolt hole. Note: Depending on your application, the bolt does not have to be located at the center of the leg, as it is for the leg/stretcher on this workbench project.



2 Chuck a 1/2"-diameter twist, brad-point or Forstner bit in a drill press, and bore the bolt hole all the way through the leg. In this photo, the leg mortise is filled with a scrap block to prevent tearout inside the mortise area.



3 Mark the bolt hole location on the end of the rail or stretcher. Then use a doweling jig to drill it carefully, making sure the hole penetrates straight into the workpiece and deep enough to intersect the cross-dowel hole.



4 Draw a line on one face of the rail or stretcher that represents the centerline of the bolt hole. Use it to locate and mark the center point of the cross-dowel hole. Here, the cross dowels will be 2 1/4" in from the part ends.



5 Bore a 7/8"-diameter hole through the rail or stretcher at the center point marked in the previous step to house the cross dowel. Use a backup board beneath the workpiece to ensure the bit will exit it cleanly.



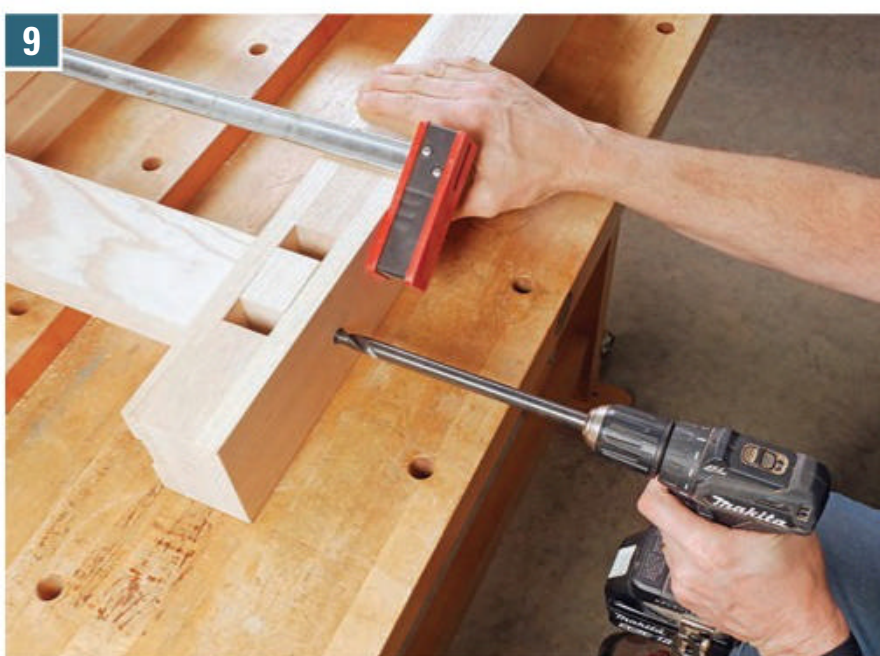
6 While this step isn't mandatory, easing the rims of the cross-dowel holes with a chamfering bit in a router is a good idea, because it creates a tidier-looking joint and removes any rough edges left by the Forstner bit.



7 Insert the bolt and washer through the leg, and slip the cross dowel into its hole in the rail or stretcher. Align the parts so the bolt can engage the cross dowel. Tighten the hardware with a socket or a wrench.



8 **Drilling Variation, Step 1:** If you don't have a doweling jig, you can still install this hardware. Drill the bolt hole through the leg at a drill press, if at all possible. It's imperative that this hole runs through the leg squarely.



9 **Drilling Variation, Step 2:** Clamp the leg and rail/stretcher together as desired. The bolt hole in the leg can now serve as a makeshift doweling jig for extending the hole into the rail/stretcher with a long 1/2" twist bit.

Drill, Insert, Tighten

Machining your project parts for this hardware isn't difficult — if you can drill holes, you'll have it made in the shade. But drilling the bolt hole straight through the leg is key, in order for the bolt to engage with the cross-dowel threads squarely. It's also important that the portion of the bolt hole penetrating the end of the rail or stretcher is centered on the part's thickness, or the end of the cross dowel may protrude beyond the part face (this wouldn't

weaken the joint much, but it will look like a mistake).

The order of operations for machining these joints is straightforward: Drill a hole through the leg and into the rail/stretcher for the bolt, then drill a hole through the thickness of the rail/stretcher for the cross dowel. Locate the cross-dowel hole so the bolt will thread most of the way through it for maximum strength, but be sure to allow several full rotations for the bolt to tighten the joint.

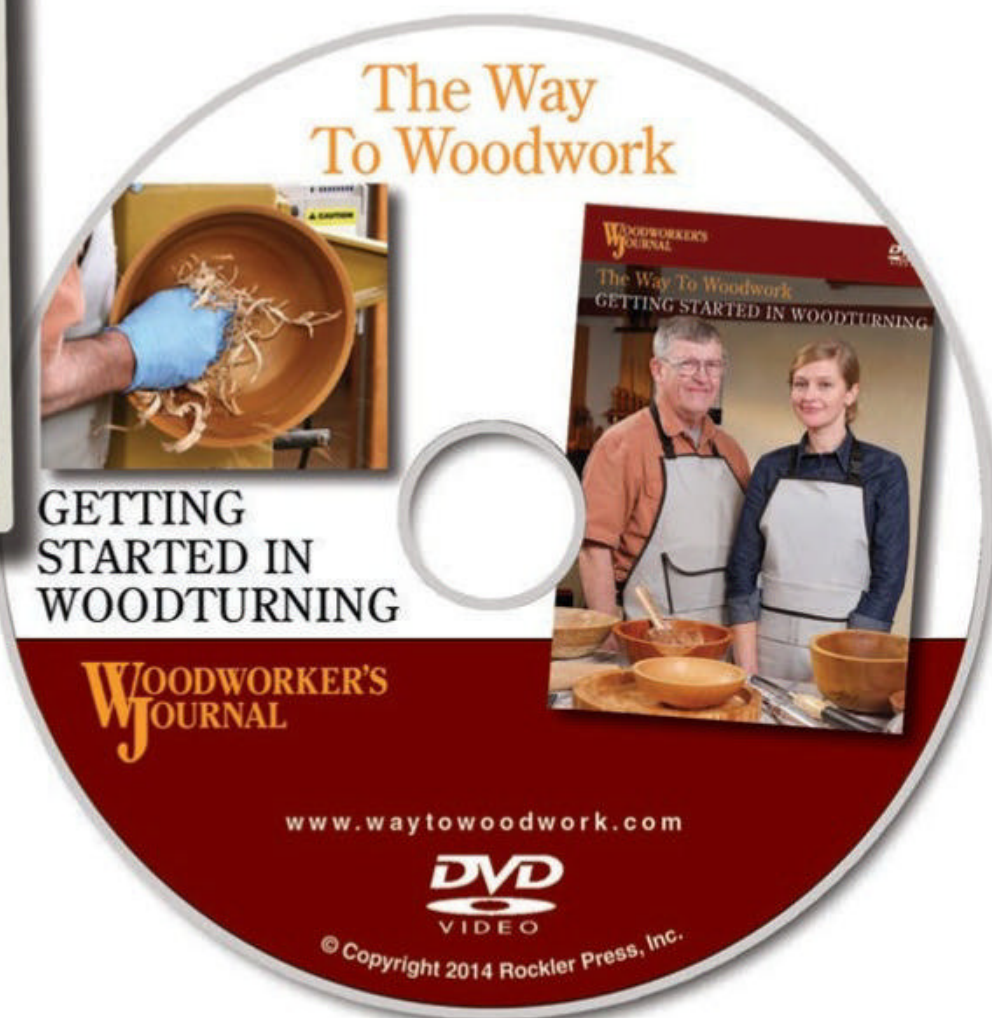
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FINISHING CORNER

How Do I Make a Tack Cloth?

By Tim Inman and WJ Staff

There are simple options for charging a cloth so it removes dust better. You might not really even need a “dedicated” tack cloth.

Tim Inman is a professional woodworker and finishing expert and the author of *The Art of Classical Furniture Finishing*.

Q Is there a home concoction one can make up to create a tack cloth for removing dust prior to finishing?

A Woodworking and wood finishing textbooks all offer recipes for homemade “tack” cloths. Usually, they use some varnish or oil such as boiled linseed or tung diluted with mineral spirits to moisten the lint-free cloth. Actually, any oily substance compatible with your topcoats and stains would be fine. A cloth simply dampened with water works, too. Don’t overthink this. It’s just a dust cloth.

If you do decide to make up your own oiled tack cloth, keep it sealed in a fireproof container, or better yet, dispose of it immediately after use in a fireproof container. Oils, especially linseed oil, can oxidize and generate enough heat to ignite on their own. Be careful! Commercially made tack cloths typically contain sticky waxes. I don’t like to use these. If the duster (me) is heavy handed (I am), the wax can be rubbed off the cloth and onto the wood, where it can cause problems in both staining and finishing.

— Tim Inman

You can also use a cloth dampened with denatured alcohol. It will help pick up



Tack cloths for cleaning wood that will be finished with an oil-based topcoat can be made by dampening a clean rag with a mixture of boiled linseed or tung oil and mineral spirits.

the dust and will not raise the grain significantly. Once the alcohol flashes off the cloth, it’s also safe to store again.

— Rob Johnstone

I’ve used both denatured alcohol and mineral spirits to dampen a cloth for wiping away dust. The alcohol dries much faster, so that’s what I prefer. Both options also help identify any pesky glue splatches I might have missed. I don’t use tack cloths that contain varnishes or oils. Sometimes, I’ll just pull my compressed air hose outside and blow the dust off my project that way. Or vacuum it thoroughly instead. All three surface-prep options can work fine.

— Chris Marshall

Q How do you undo glued joints without damaging them?

A Most glue joints are simply not designed to come apart after the glue cures. However, you can break down white and yellow PVA glues with a combination of heat and moisture (steam is commonly used). Epoxy will release under heat. Most epoxies will break down after they reach 250 degrees Fahrenheit. Hide glue joints will come apart with water and pressure. It’s the most civilized of wood glues in this regard.

— Rob Johnstone



Wood joints bonded with hide glue are easier to disassemble than those made with other common adhesives like PVA or epoxy.



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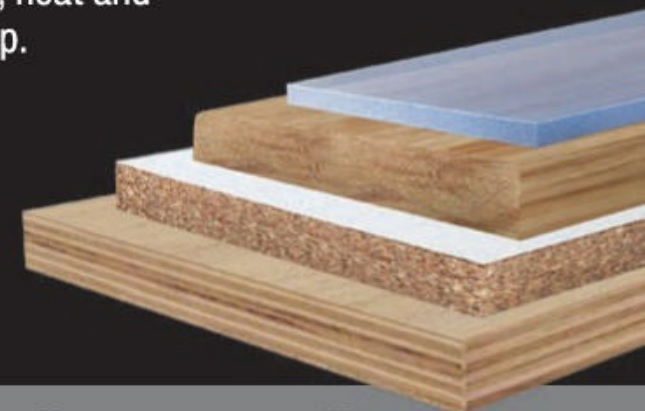
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