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Summer Ready Porch Swing

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Woodworker's Journal

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Projects



Summer-Ready Porch Swing

By Chris Marshall

With built-in cup holders and a contoured seat and back, our porch swing promises many summers of relaxation.

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Graceful Bar Cart

By Kimberly McNeelan

A removable top tray adds versatility to this elegant accessory for entertaining: serve your guests in style.

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Small-Scale Kiln

By Willie Sandry

Save money when you dry your own lumber in a dehumidification kiln with a design based on the traditional backyard shed.

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Hanging Herb Garden

By Sandor Nagyszalanczy

Grow a green thumb with modular planters, a hanging framework and drip irrigation.



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ACHIEVE IN MINUTES WHAT TAKES MOTHER NATURE DECADES

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Chestnut canopy legend, Japanese woodblock prints, the last Shaker chairmaker.

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It's cool to see how many subscribers take advantage of the Premium Content section of *WoodworkersJournal.com*. If you haven't been there yet, then you should check it out now. We just added two full-length DVDs, *Step-by-Step to a Perfect Finish* and *Getting Started in Woodturning*, to the Premium Video library. Each DVD normally costs \$29.99 in stores, but you can view them both online for **FREE**, just for being a subscriber!

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— Dan Cary



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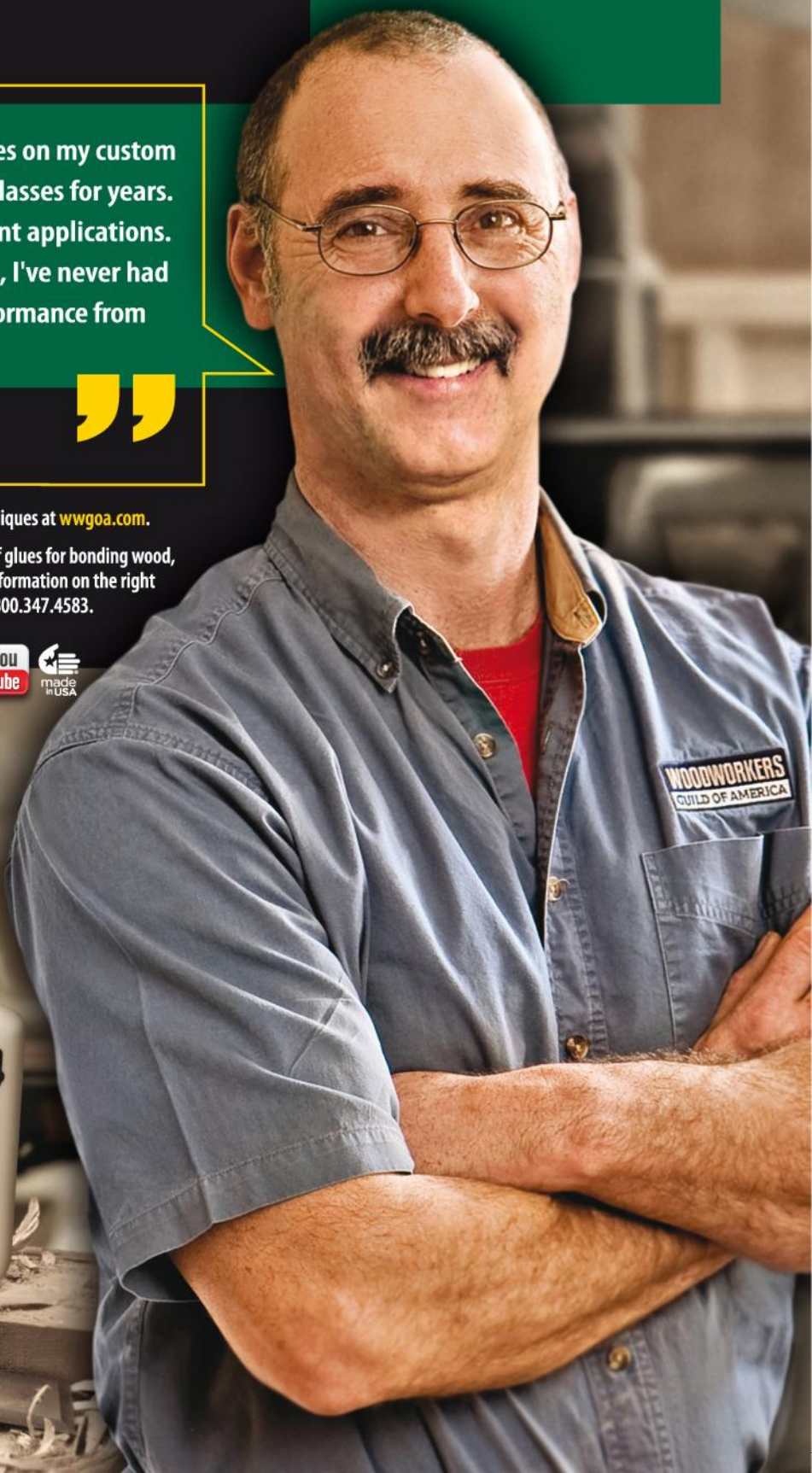
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Letters

From the Ground Up



I WILL BE BUILDING A NEW SHOP SOON ...

The bad news is that I am currently without a dedicated shop space, something that has not been true for a very long time. The good news is that I will get the chance to design and construct a woodshop from scratch over the next year. Now, I have a lot of ideas as to what I want to do with this new space ... some are must-haves and some depend on whether I win the lottery or not. Even so, I thought it would be a good

idea to solicit advice from folks who have been through this experience — namely, some of you who are reading this right now.

If you've built your own shop, what worked and what didn't? For example, my last shop was large (over 1,200 square feet of working area), but the ceiling was only 8' tall. The number of times I jammed the corners of 4x8 plywood sheets into my ceiling was beyond counting. So 10' ceilings will be the minimum for my next shop. If you were starting from the ground up, what would you change about your current shop?

There is a lot to think about: electrical supply, dust collection and control, lighting and machine placement, just to get things started. If you have some advice to help me avoid problems in the future, drop me a line. This is getting serious, and I need the feedback!

— Rob Johnstone

Plastic Preferred

My wife is an accomplished quilter, so when I saw [February's] Pick of the Tricks I showed it to her, as she uses a rotary cutter for her fabric. She was talking to another quilter at the time and said to her, "Using a steel straight-edge is the worst thing you can



do for the rotary cutter. A plastic straightedge would not dull the rotary cutter blade." Thank you for great tips and tricks.

Tom Stamm
Lebanon, Pennsylvania

His Spin on Finishing

I enjoyed the "Finishing Turntable" article by J. Norman Reid [*Jigs & Fixtures*, February]. A finishing turntable is essential to any shop, with or without a spray booth. I have used one for many years and wouldn't want to be without it. However, I think he has over-engineered this fixture and made it more bulky and expensive than it needs to be.

My turntable is made out of two 24" rounds of 3/4" plywood with a 12" low-profile lazy Susan base (similar to Rockler's #28985) which is rated 1,000 pounds and costs about \$10, plus the cost of a few screws. I have used it to finish projects that required two people to lift and never found it lacking, so I see no need for a 1½" base. Mine stores easily against a wall when I'm not using it for finishing.

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Letters continued



Reader Ron Whitney likes the idea of a finishing station: the one he built uses a sturdy lazy Susan like this one.

possibility of uneven floors. Otherwise, it's a very good weekend project.

Thanks for your excellent magazine.

Gordon Osborne
Newport, Vermont

I like the idea of handholds and may incorporate that into mine, but I don't quite get why I would want to dismantle it. I use it with Bench Cookies® or Painter's Pyramids, particularly the kind that can be screwed to the top. I'm not sure I would trust the stability of a couple of 1x2s on edge to support a large project as shown in the article.

As a long-term subscriber, I appreciate the magazine and always get good ideas from it. A good tip has been more than worth the annual subscription price.

Ron Whitney
Maple Plain, Minnesota

Suggests a Cleat

The "Classic Five-board Step Stool" project [February] indicates that the grain direction of the legs, item 2 in the *Material List*, is vertical. This poses my safety concern: the legs could split and the stool could collapse. My suggestion is to install a horizontal 1" to 1½"-wide cleat/strap across (behind) each leg. Considered here are the weight of the user and

Glue Size is About Joint Strength

Although I greatly appreciate Michael Dresdner's finishing column, he completely missed it on the subject of Jerry Metz's "glue size" [*Questions & Answers*, February]. This is not a finishing question. It does, in fact, concern joint strength.

Every time I read Metz mention "glue size," it was in response to a plea from a furniture manufacturer who was having an unacceptable failure rate of joints in their production cabinet doors or other such furniture parts. And it concerned joints that had one part that was end grain butted up to another part (probably not end grain). The "glue size" was



to be applied to the end grain. As you probably know, end grain sucks up moisture easily. On certain woods, it can suck the moisture out of the glue too fast and weaken the joint, causing some to fail prematurely. Sealing them can help prevent that. A slightly diluted application of ordinary woodworking glue gets sucked into the pores, thus sealing them before the actual full-strength glue is applied. I have used that method for years, after learning it from Jerry Metz.

Continues on page 12 ...



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Nathan Wiens
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MORE ON THE WEB

Check online for more content covering the articles below:

Woodturning (page 24): Steps for making a coopered birdhouse (video); full-size patterns for floor, roof rings and acorn (PDF)

Porch Swing (page 32): Choosing a finish for a porch swing (video)

Small-scale Dehumidification Kiln (page 38): Breakdown of energy cost of running a shed kiln; information on using a WiFi sensor; equipment and sources used for shed kiln (PDFs)

Tool Review (page 54): Behind the scenes of our review of benchtop lathes (video)

Weekend Projects (page 70): Cutting tapered staves; installing drip irrigation (videos)

What's in Store (page 78): Table project with Freud CNC router bits (video and .tap files), plus other featured tools in action (videos)

On the subject of using hot-melt glue to seal end grain for staining — I suppose that would work, but nobody has hot-melt glue today. And if they used today's woodworking glue for that, they would probably be disappointed. A good sanding sealer would be easier and more effective.

John Atkisson
Sparta, Wisconsin

Quick Tip Speed Formula

I just read the trivia about tip speed for various tools [Hey, Did You Know?, February].



Here is a quick method for calculating the tip speed of any rotating tool: Multiply the tool diameter by the rpm, then multiply by 0.262. An even closer approximation would be to multiply by 0.2618. Basically, the formula is $D \text{ (in inches)} \times \text{rpm} \times 0.262 = \text{tip speed in feet per minute}$. In metric, it would be $D \text{ (in mm)} \times \text{rpm} \times 0.0254 = \text{tip speed in mm/sec}$.

Lenny Nederveld
Lafayette, Louisiana

A Table Adjustment

I'm sure many amateur woodworkers save your magazine, hoping the time



and tools will someday be available to start on a project that you've described. With the arrival of my new band saw, that time came for me this past Christmas. The project was "Bowfront Hall Table" by Larry Okrend from the April 2015 issue.

The band saw is an essential tool that is used to resaw the laminated bowfront apron. I was delighted when my new toy (a Laguna 1412) turned out the 1/8"-thick pieces with no trouble at all. I made the 5 1/4" form from four pieces of 2x6 stock instead of the MDF or plywood, and the glue-up went well with no spring-back.

My problem came when, following the procedure in the story, I started cutting out my intended drawer front. The author used a jigsaw for this (the very same model as mine, based on the picture), but, of course, one needs to drill four small holes for the blade. I used the smallest drill bit that the jigsaw blade permitted, but when I was done, the corners were obviously nicked.

[Editor's Note: Bill chose not to use the drawer face called for in the original plan, which would have covered the drawer front.]

A reader's choice to use this table's drawer front as the face also required an adaptation in the techniques used.

After a night of frustration and contemplation, I decided I would need to make a whole new apron and that the only way to cut out the drawer front was to cut completely across the apron along the top line of the drawer, then glue the two pieces back together with wax paper preventing a bond with the intended drawer. Then cut completely across the apron at the bottom line of the drawer. After that, cut crosswise for the two vertical cuts and remove the now freed drawer front and glue the bottom section back onto the apron. This worked perfectly. (I did not joint the sections before gluing). The resulting drawer front needed a couple of passes with a block plane to fit into the apron opening, but that also meant I could keep the gap very small.

I hope my experience helps someone else.

Bill McGeehan
Alexandria, Virginia

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Tips for Saving Shop Dollars



Two-bearing Flush Trimming

While making a cutting board with a router template, I intended to use a bearing-guided flush trim bit. The amount of wood I had to remove from the workpiece next to the template was excessive for one pass. So, I exchanged the bit's original bearing with a larger diameter bearing. This allowed me to "rough cut" with the first pass to remove a more reasonable amount of material. Then I switched back to the bearing that matched the bit's diameter and trimmed the board flush to the template with a second pass.

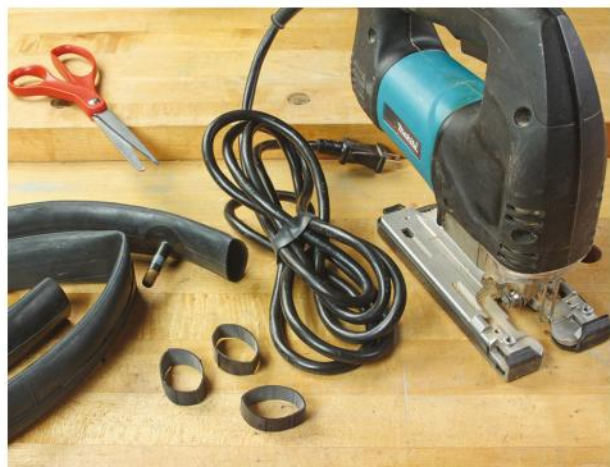
Mel Johansen
Glendale, Arizona



Coffee Can Hose Couplings

Don't discard your metal coffee cans in the 11- to 15-ounce sizes. Here's a simple upcycle for them in the shop! If you cut off their bottoms and inside top flanges with a can opener, they're just the right size to form sturdy and smooth couplings between sections of 4" dust collector hose. They're useful in a pinch or as your whole-shop solution, and you won't spend a penny of your wood-working budget on them.

Phil Hartman
Gunter, Texas



Old Tubes, New Wraps

I cut up old inner tubes into cross sections that make handy, stretchable wraps for power tool cords and lengths of rope. Both bicycle and motorcycle inner tubes of various sizes work well, depending on how large you need the rubber wraps to be.

Tim Wipperfurth
Minocqua, Wisconsin

Drinking Straw Makes Glue Bottles Easy to Fill

I buy my glue by the gallon to save money, but transferring it from the big jug to the squeeze bottle can be slow and messy. Here's how to improve the flow: just tape a length of drinking straw to the side of your funnel so it will extend into the glue bottle. Clip the straw about 1/4" above the bottom of the funnel. The straw serves as a spacer to prevent the base of the funnel from forming an airtight seal around the rim of the bottle, which slows the filling process. Works great for me!

Rich Flynn
Huntington Beach, California



Homemade CA Glue Accelerator

I've discovered that you can make a version of cyanoacrylate (CA) glue accelerator at home. Just mix 1/2 teaspoon of baking soda into 1/4 cup of purified water. Brush it onto the "dry" half of the joint. The soda will neutralize the acid in CA glue, which is there to slow the curing time. At this ratio, your homemade accelerator will still give you several seconds of open time to align the parts. But if you want an immediate cure, increase the soda to 1 teaspoon instead. After trying this on many sample joints made of poplar, I've noticed no loss of bond strength, plus it's odor-free and doesn't stain the wood.

Paul Guncheon
Wahiawa, Hawaii



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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Questions & Answers

Circ Saw Motor Placement: Taking Sides

THIS ISSUE'S EXPERTS

Jason Swanson is vice president of communications and public relations for TTI Power Equipment.

Ian Kirby is the author of *The Complete Dovetail* and the co-star of the *The Way to Woodwork* DVD series.



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with your question.

Q I have finally set up my workshop, now that I am retired, and have recently purchased some battery-operated power tools. One thing that I have noticed, and don't understand, concerns circular saws.

With corded circular saws I've noticed that the motor seems to be on the left hand side of the saw, and (being right-handed) I have to lean over the saw to see where the cut is going to be. I could learn to use my left hand to move the saw along, and I've tried, but I have made a lot of kindling that way. After I received my battery-operated circular saw, I noticed that the motor was on the right-hand side of the saw, which

allowed me to view the cut safely. Do the manufacturers have a reason for doing this? Or with the corded saw, did I purchase a left-handed saw?

Lee Nalley
Ellerslie, Georgia

A Good question. There's no right or wrong answer here. I wish there was an engineering or scientific reason behind it, but there isn't (I've asked some engineers with 30-plus years of experience). Maybe that's why the topic pops up every so often.

Right-blade AC saws date back over 50 years. It's always been done that way for the trade. Easier for the trade folks to train on those saws.

Left-blade saws weren't really that popular until the cordless units came along in the early 90s. These really catapulted during the DIY movement.

— Jason Swanson

Q We always hear about dovetails. Whether they are routed or hand cut,

dovetails seems to be a hot topic. But I feel what is never discussed is:

Which piece of the drawer (front or sides) gets the pins and which gets the tails?

Is there a structural stability as to end grain or side grain?

How do you determine how many dovetails to cut, their size and spacing?

Paul Kohutis
Bridgewater, New Jersey

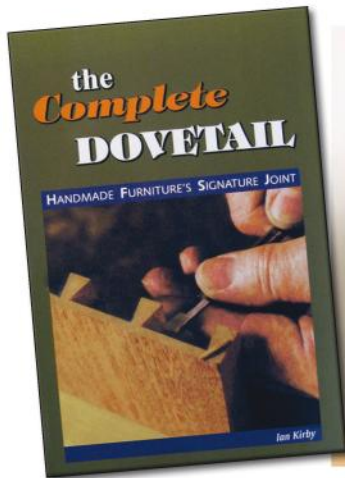
A A small and inexpensive book would answer your dovetail questions and then some. It's called *The Complete Dovetail*. The name of the author escapes me right now ...

In the world of solid wood joinery, the mystique which attends the dovetail joint is, in my opinion, without merit. Here's why.

Making a through dovetail is a repetition of only two types of saw cut. Both are down the grain. The first is at a right angle to the face of the workpiece and at



Is there a reason for the motor on the left versus right side of corded versus cordless circular saws?



Dovetails are not woodworking's most challenging joint, says Ian Kirby — who, literally, wrote the book on the subject.



Winner!

For simply sending in his question about dovetails, Paul Kohutis of Bridgewater, New Jersey, wins a Bora MiterX Angle Duplicator. Each issue we toss new questions into a hat and draw a winner.

a slight angle to the vertical. The second is a vertical cut but at a slight angle to the face of the workpiece. If you are working with 3/4"-thick wood, the length of the cut is 3/4". In other words, a cut somewhat less than 1" square. Two or three half-hour practice sessions focused on sawing the lines, not making joints but just sawing the two types of saw

cut, are what it takes to evaporate the mystique.

Now consider the mortise-and-tenon joint. Each piece is made using entirely different tools, which means different techniques. The mortise is cut first, using a chisel powered by a mallet. The cheeks of the tenon, which are usually five or six times the area of a dovetail, are cut with a tenon saw.

As well, these saw cuts are determined by the outcome of your mortise chisel, not by where you set the mortise gauge to your chisel.

Clearly, the outcome of a through dovetail joint is in plain sight. The outcome of a mortise-and-tenon joint is buried behind a shoulder line. In both cases, mystique is resolved and mastery is achieved by well-directed practice.

Now to your questions.

The reason there is never any discussion as to where the pins and tails go on a drawer is because there is

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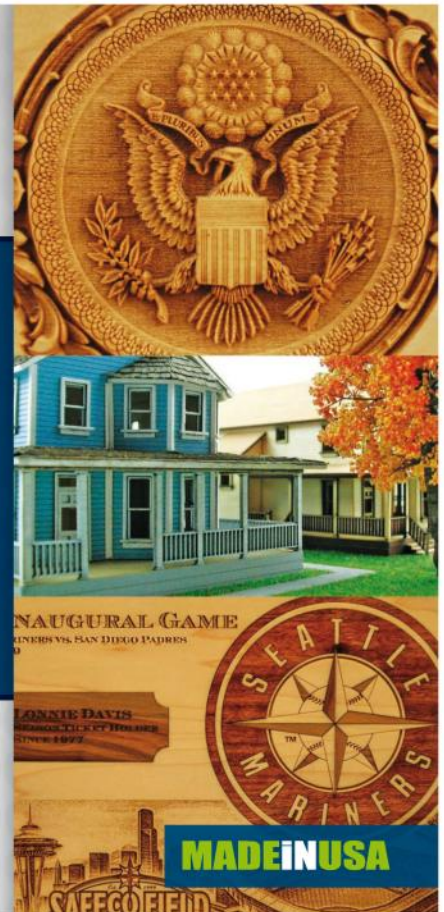


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What's This?

Bill Nedelka of Wilmington, New York, found this item at a garage sale. Do you know what it is? Send your answer to stumpers@woodworkersjournal.com or write to "Stumpers," Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340 for a chance to win a prize!



Woodworker's Journal editor Joanna Werch Takes compiles each issue's Stumpers responses — and reads every one.

The mystery tool from our February issue was submitted by **Doug Clyde** of Colorado Springs, Colorado, who was following a tradition of gifting his brother with unique items — in this case, so unique that he couldn't figure out what it was.

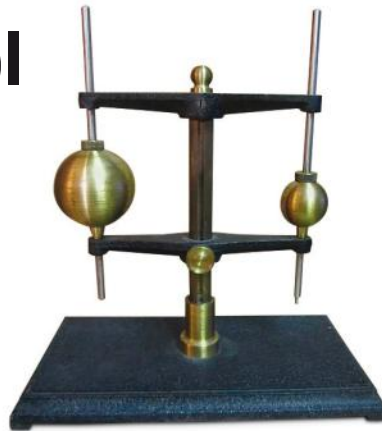
That wasn't a problem for other Stumpers readers.

It is a Gillmore Apparatus. "It is used in the cement industry's laboratories when testing Portland cement, masonry cement, hydraulic hydrated lime and certain mortars," said **Rich Baker** of Jackson, Missouri, who has worked at a cement plant for 26 years.

Civil engineering professor **Ben Mohr** of Cookeville, Tennessee, explained that it's "used to measure the initial and final setting of a cement paste sample in the lab. Setting time is used to determine the transition from fresh to hardened ("liquid" to "solid") in cementitious materials."

"The small ¼ pound sphere is used for the initial set, and the larger one pound for the final set," said **Joseph Jedrychowski** of Lake Oswego, Oregon.

Winner! Joseph Jedrychowski of Lake Oswego, Oregon, wins a **RIDGID GEN5X 18-Volt Jobsite Radio with Bluetooth Wireless Technology (R84087)**. We toss all the Stumpers letters into a hat to select a winner.



Does this apparatus leave you clueless? Several of our readers knew what it was as soon as they saw the picture.

Jim Wells of Paducah, Kentucky, elaborated: "Their weights are adjustable by adding to or subtracting from the lead shot in the hollow spheres. The lab technician would make a 'pat' of cement and water to a normal consistency and place it on a glass plate. The pat would then be placed in a 'moist room.' Periodically, the pat would be removed and placed first under the small sphere and checked until the needle made no appreciable indentation into the cement pat. This was called the initial set. It would be checked later with the large sphere until no appreciable indentation was made in the cement pat: the final set."

As **Barry Drescher** of Allentown, Pennsylvania, concluded: "There is nothing worse than having your cement set up before you are done finishing it."



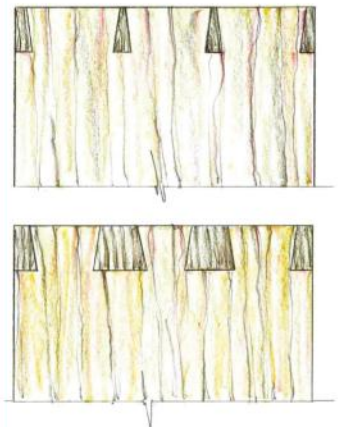
Questions & Answers

continued

no doubt. The tails go on the drawer sides; the pins are on the front and back pieces. In this way, the tails serve well to resist the stress as the drawer is pulled open.

In spite of the excessive difference in the amount of wood between the tail piece and the pin piece, breakage of the joint is extremely rare. I've never seen a broken one!

You determine "how many dovetails to cut, their size and spacing," mainly by aesthetics — the looks of the joint. Whilst the number



The size and spacing of your dovetails are aesthetic choices, as seen here: the same six cuts can look completely different.

to be cut will decide the mechanical strength of the joint as well as the glue area, even with what you might consider a minimum number of "cuts," it's an extraordinarily strong joint. So, unlike designing a mortise-and-tenon joint, which is very much about creating resistance to the stress to which it will be subjected, the dovetail is mainly about what you think looks best.

— Ian Kirby

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Shop Talk

An 18th Century Focus



Photos by Bill Truslow



Furniture maker Jeffrey S. Roberts has been recognized for his work and its focus on 18th century styles, plus carving, with awards like the Society of American Period Furniture Makers' Cartouche, as well as "Best in Traditional Design" award from the League of New Hampshire Craftsmen.

Jeffrey S. Roberts Receives 2017 Award for 18th Century Furniture

It is perhaps not surprising that Jeffrey S. Roberts (jsrobertsfurniture.com) received the 2017 Cartouche award from the Society of American Period Furniture Makers (www.sapfm.org), an

annual award given to recognize excellence in period furniture making.

According to Jeff, "I really think the 18th century furniture makers were at a point where furniture designs were really evolved. They got the lines and proportions just right.

"There's some awesome new stuff, but the traditional stuff can't be beat. I don't think we ever really match what they did back then."

Complex Pieces

You can see that influence, including his particular fondness for the Newport style of furniture created by 18th

century craftsmen like John Goddard and the Townsends, in his own work.

He doesn't shy away from larger, more complex pieces. "I like it when I really have to think, when it gets complex, because your head has to really be in it," he said.

He particularly enjoys the challenges that come with building chairs, which he describes as a sculptural project. "They have to look good from any side, from any angle, because you're looking at the back as much as the front. There's a lot of curves, a lot of spaces in between splats — you have to get the splats right."

Focus on Carving

Jeff also has a particular interest in carving, which influences the woods that he works with. "Because I do a lot of carving, I do enjoy mahogany," he explained, noting that it carves nicely and that tools go through the straight-grained wood with a minimal amount of effort.

This mahogany desk that Jeff built for clients incorporates elements of the 18th century Sheraton style.





The top of this Philadelphia Piecrust Table is carved from a 33"-wide solid piece of mahogany.



Jeff does build some pieces not based on historic antecedents: this mahogany Swooning Sofa was designed to fit a specific spot and need for a client.

He also appreciates walnut. "I love the natural tone of it. It's also nice to carve and will hold a shape well."

"It's fun to work with different woods, too," Jeff added. "I don't think it would be as exciting if it was always the same."

For instance, "if you get good crotch or flame mahogany veneer, that stuff is a blast when you start finishing it. The grain pops out, and it's amazing."

Meditation as a Tool

One of the most important tools for Jeff's woodworking isn't found in a toolbox or on a workbench. It's his meditation practice.

He was originally introduced to the concept of meditation early in his career, when he was self-employed and was working out of a shop in his mother's basement. "She was into meditation," and had several books on the subject. "It just made sense to me," Jeff said. "I got into it and started meditating a lot and read those books."

Although he drifted away from the practice for a number of years, Jeff said he's now back to meditating regularly. "The idea is to focus on your breath. It brings you to

a place in your mind where you pay more attention to whatever comes up. You can develop a little bit better concentration and focus."

What that means for his woodworking is that the concentration helps him to work through problems on a project. Plus, "it clears your mind a little bit, and makes room for what you want to be there." Using the visualizing aspect of meditation, Jeff said, helps him see things in his head, such as seeing through to the next step of a project, without needing to work it all out on paper.

Learning Situations

Overall, "I've been in some good learning situations," with his woodworking, Jeff said. For instance, when he received his woodworking education at North Bennet Street School in Boston (www.nbss.edu), students were not allowed to use a router.

After graduating, Jeff spent a brief time working for others in shops

in Boston. At that point, he learned both to use a router and to make router fixtures. "I learned to work quicker and more efficiently, without sacrificing anything in quality in the end piece," as well as the skills to keep learning.

That's been important over the years as he established his own shop in New Hampshire. "When you work for yourself, you kind of have to figure out everything," Jeff said.

"It's fun for me," Jeff said. "I consider myself lucky because I do enjoy my work. Sometimes, I think of it as a lucky choice," he said.

—Joanna Werch Takes



For chairs like this Newport Corner Chair, it's important to Jeff that they look appealing from any angle.

Intricate carvings on this Philadelphia lowboy highlight one of Jeff's favorite aspects of woodworking.





*"Beast in the Beauty"
by David Walker,
USA (2012). Maple,
padauk, wood veneers
and aluminum.*

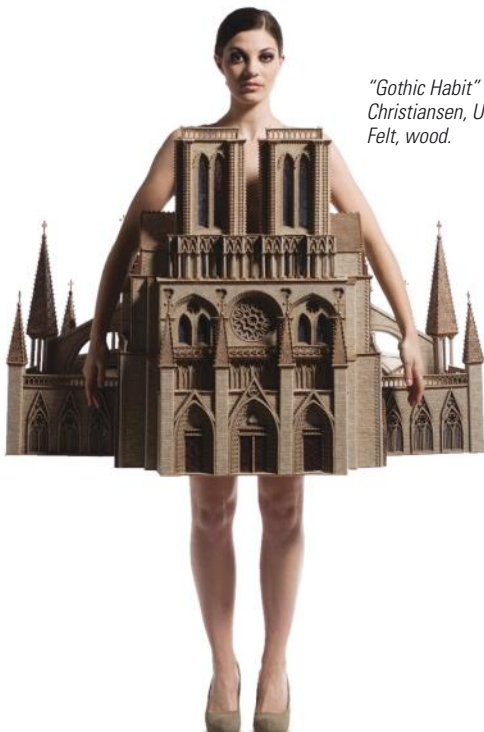
Wearable Wood Featured in Show of Fashions

Through June 11 of this year, the Peabody Essex Museum in Salem, Massachusetts, plays host to the "WOW® World of WearableArt™" exhibition. The exhibition features items from New Zealand's annual WOW design competition. For 30 years, international competitors from a variety of backgrounds have been challenged to explore the boundary between fashion and art. Wood is among the materials used for the fashion pieces (along with aluminum, fiberglass and taxidermy). For more info, visit www.pem.org or call 866-745-1876.

Images courtesy of World of WearableArt Limited



*"Chica Under Glass" by
Peter Wakeman, New
Zealand (2013). Fiberglass
and plywood.*



*"Gothic Habit" by Lynne
Christiansen, USA (2014).
Felt, wood.*



*"Lady of the Wood" by
David Walker, USA (2009).
Mahogany, lacewood,
maple, cedar.*

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Woodturning

Barrel-Shaped Birdhouse

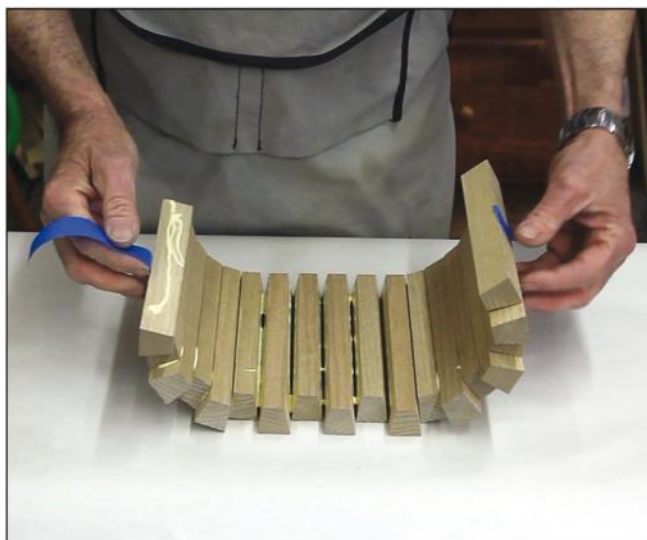
By Ernie Conover

*Learn the barrel-making
coopering technique and
create a home for your
feathered friends.*



Birds have fascinated humankind for as long as we have been orbiting the sun. Perhaps it is the freedom that flight inspires or their beautiful form. Whether you're a birdwatcher looking to attract specimens to fill out your life list, or you just like to decorate your home's interior with flights of fancy, this turned birdhouse can fulfill either function.

The coopered birdhouse is a good lathe workout because it is a nice combination of spindle and faceplate work and, on top of that, does not require a large lathe. (Coopering is using stave construction to produce a hollow wooden vessel or form — like wood-



Here, the author uses masking tape to help control the 18 staves that make up the body of the birdhouse as he glues up the vessel. For outdoor projects, you need a waterproof glue — this project uses Titebond II — to be certain that the glue joints survive the elements. A weather-resistant wood is also a prudent choice.

en casks, barrels, buckets or even butter churns.)

You won't need a lot of wood to make one. Many of mine have come from cutoff ends that would otherwise have been burned in our fireplace. If you use rot-resistant wood (and a moisture-resistant glue), it can be an attractive yard ornament, as well as a comfy abode for your avian friends. If you make use of woods your family finds attractive, and perhaps a lovely paint job, it becomes art to grace your home. You may further enhance paint by adding decorative patterns or drawings with woodburning or archival pens.

I have built quite a few of these birdhouses for gifts, mostly in batches every decade or so. It's a project that lends itself well to production runs, with 10 to 20 being a good batch size. The original birdhouse design was inspired by woodturner Andy Barnum, former teacher of woodturning at Purchase College. For my version, there are six parts to make.

Start with the Staves

The first order of business is to cut and glue up the staves to make the barrel-shaped walls of the house. Nine are cut to 6 $\frac{3}{4}$ " long, and nine are at 7 $\frac{1}{2}$ " to create breathing holes under the eaves that evoke dentils. I rip them in a table saw with the blade tilted to 10°, giving each stave an included angle of 20°. I use masking tape to hold the staves in line so I can wrap them up and clamp them with hose clamps. (See photo above.) Pressing the staves down onto masking tape laid sticky-side-up on the bench allows a trial fit.

I also squirt liberal amounts of waterproof Titebond II between the staves before the final wrapping and clamping. Automotive hose clamps at each end secure all the staves tight. Allow at least 12 hours of drying time.

The Wixey Digital Angle Gauge (see photo, right) helps greatly in obtaining a nearly perfect 20° to each stave. It is nigh impossible to get each stave to be exactly 20° in a table saw. While I have sometimes scoffed at electronic devices in the workshop, I found this one (item 57097 at rockler.com) quite useful. Magnets stick



To form the staves, set the angle of the saw blade at 10°. The two 10° edges of the staves add up to 20°, and 18 staves times 20° equals 360°, the distance around a circle.

Mounting the body of the birdhouse between centers requires a couple of plates with tapered cone tenons. The tenons fit snugly inside the glued-up vessel and hold it firmly as the body is shaped.



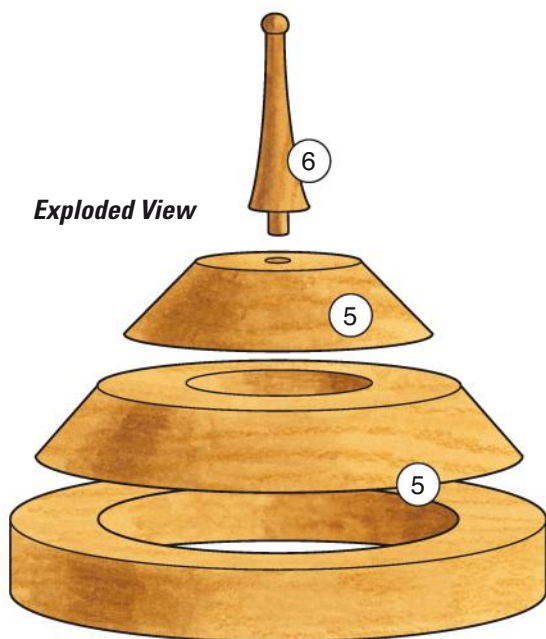
Woodturning continued

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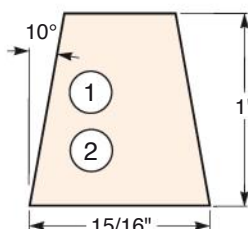
For a video of the author walking you through the steps for turning this birdhouse, or to print full-sized patterns for some of the parts, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

Exploded View



Staves

(End View)



it to the blade and it reads within a tenth of a degree, giving much more accurate miters than the tilt scale on my high-end table saw.

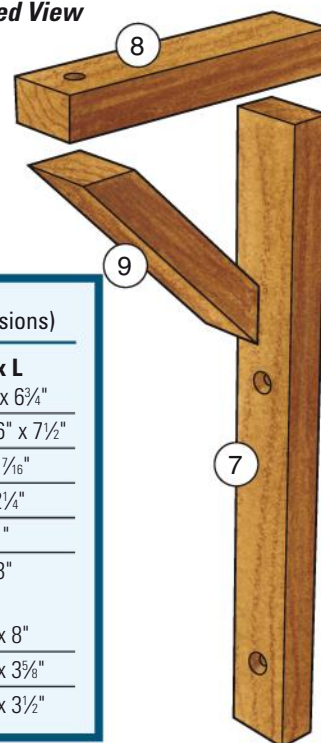
With this many staves, I still seldom get a perfect match between the last two staves, but it is good enough for this project. If you want all the miters to be perfect, the trick is to wrap up all of the staves dry. Look at the angle between the last two and correct with a hand plane or a disk sander. Now apply glue and clamp.

Starting at the Lathe

Once the glue is dry, the outside of the resulting barrel can be spindle turned between shop-made cone-



Exploded View



MATERIAL LIST (Finished Dimensions)

Birdhouse	
	T x W x L
1 Short Staves (9)	1" x 15/16" x 6 3/4"
2 Long Staves (9)	3/4" x 15/16" x 7 1/2"
3 Floor (1)	5 1/8" Dia. x 1 1/16"
4 Acorn (1)	1 3/8" Dia. x 2 1/4"
5 Roof Blank (1)	7 3/4" Dia. x 1"
6 Steeple (1)	7/8" Dia. x 3"
Mounting Bracket	
7 Back Support (1)	1/2" x 7/8" x 8"
8 Top (1)	1/2" x 7/8" x 3 5/8"
9 Angled Support (1)	1/2" x 7/8" x 3 1/2"

shaped plates with a tapered tenon. They center the cylinder and hold it as it's turned. Mount the first cone on a screw chuck, then catch the second one with a live center in the tailstock. This traps the barrel between two cones and makes the outside concentric with the inside. Use moderate speed; I turn mine at about 700 rpm.

I drill the bird's doorway (hole) before turning. The diameter of the hole is important for what kind of bird you want to attract. Bluebirds like a 1¼"-diameter hole, while chickadees prefer 1⅝"-diam-



The floor is turned on a screw chuck. It has a tenon that loosely fits the inside of the walls and sports a 3/8"-wide bead on the outside.

eter. An Internet search will give you the correct diameter for most birds. Unless your birdhouse is to be art, resist the temptation to install a perch below the hole. It will only be a spot for predators to wait for the occupants.

Closing It Up

The floor is turned on a screw chuck. You raise a tenon that loosely fits the inside of the walls and the outside edge sports a 3/8"-wide bead.

Continues on page 28 ...

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Woodturning continued



The three roof rings are parted out of a single piece of wood. The parting tool is guided into the piece at a 45° angle. When their order is reversed, they stack up nicely.



It is made from a 5½" round x 1¼"- to 1½"-thick disk of wood. Turn the tenon 9/16" long, test fitting it inside of the barrel, then shape the 3/8"-wide bead on the outside. The bottom profile is then rounded to meet the bead (see the full-sized *Drawings* on page 30). The end of the tenon is dished to promote water drainage from the drain hole.

For my painted artistic examples, meant for indoor display, I spindle turn a deco-

orative acorn on a 3/8" by 3/8" long tenon that glues in the center hole used for screw chucking. (You could also choose another shape.) This precludes water drainage, so if you want to add this embellishment to an outside house, you will have to drill an angled hole that misses the tenon but comes out near the center on the inside.

The roof rings are made by using a cutoff (parting) tool at a 45° angle to separate two 1¼"-wide bands from a piece of stock band sawed to a 7¾" circle. The resulting three rings are then stacked, with liberal amounts of Titebond

The components of the top are stacked with ample glue between them, then "clamped" by making use of a heavy weight.



Do a final test fit of all the parts before gluing the steeple in place and moving onto finishing. Painting is where your creativity can really come to the fore ... the birds will love it!

The top is turned while mounted to the lathe with a screw chuck. Note the mounting hole for the steeple in the center of the blank.



The steeple is a straightforward spindle turning effort. The same is true of the acorn accent for the bottom of the birdhouse. The entire job can be done with a spindle gouge.

II between, to form the conical roof. Once the glue has dried 12 hours, the outside is faceplate turned to shape on a screw chuck.

I use an extended screw on a set of tower jaws in a Oneway Stronghold Chuck, but you can make this chuck by drilling a slightly under-

size hole for a 3/8" lag screw in an appropriate piece of wood on a faceplate. Turn the wood to fit up into the roof and register against the topmost section. Scrape the end dead flat, cut the hex off the lag, and epoxy it into the hole. You now have a custom screw chuck.



If you decide to include an acorn, this piece is also spindle turned. It is purely decorative, so not a necessary addition — but a fun one. (You could also choose to turn a different shape, if you prefer.)

The Last Details

Finish the job by turning a steeple for the roof and, if desired, the acorn. I keep the steeple short and simple, with another 3/8" x 3/8" long tenon for attachment and a base that matches rooflines.

Continues on page 30 ...

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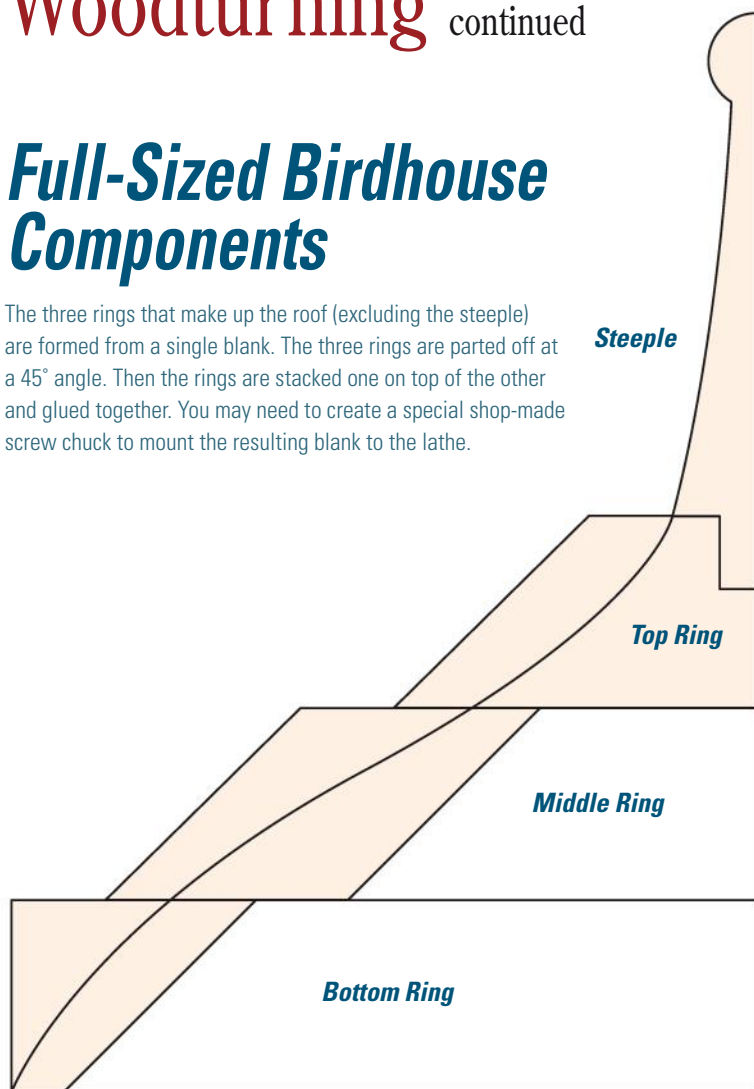
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Woodturning continued

Full-Sized Birdhouse Components

The three rings that make up the roof (excluding the steeple) are formed from a single blank. The three rings are parted off at a 45° angle. Then the rings are stacked one on top of the other and glued together. You may need to create a special shop-made screw chuck to mount the resulting blank to the lathe.

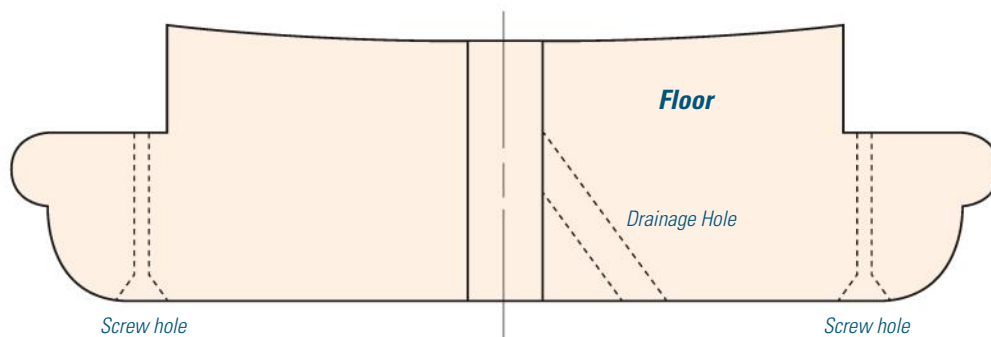


The author shows off his painted birdhouses ... works of art or a home for feathered friends? They can be both!

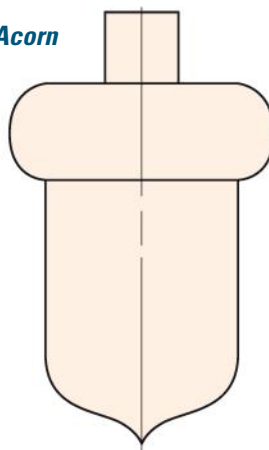
With the pieces turned and sanded, apply the finish of your choice ... paint, exterior poly or even just oil. You can hang it as you deem fit, but we did provide details of a mounting bracket (see *Drawings* on page 26).

Now all that remains is to put your piece of art on display in the family room or mount it outside in May and find the binoculars to watch a pair of birds raise a family.

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



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CAREFREE SUMMER PORCH SWING

By Chris Marshall

A contoured seat and back, plus cup holders on each arm, make this relaxed two-seater a comfortable place to enjoy a cool drink.

Our home's wraparound front porch offers a shady spot on the hottest summer days. It's a perfect location for a contemporary porch swing like this. If you don't have a porch, a sturdy horizontal tree limb could offer another hanging option, or you could build a freestanding framework or arbor to install the swing practically anywhere in your yard or garden. I made my swing out of 4/4 African mahogany; it's a good weather- and insect-resistant wood. But cedar, cypress, white oak or redwood would be other good choices, too. If you've ever built an Adirondack chair or a simple picnic table, you've got the skills you need to make one of these swings for your special outdoor getaway.

Making the Seat Framework

Start by preparing blanks for the three seat supports and seat backs. Cut them to the rough sizes specified in the *Material List*, page 35. The seat supports and backs are connected by an angled half-lap joint at their back corners. It's easiest to make these lap joints before shaping the parts further. Start by angle-cutting one end of the workpieces to 15°, either at a miter saw or at a table saw using a miter gauge.

Mark the seat supports and backs for the lapped areas to be removed — it's the back 4¼" of the seat supports and the bottom 3¾" of the seat backs, measured along their edges. Install a wide dado blade in your table saw, and raise it to 3/8". Test



Cut angled half-lap joints on the back ends of the seat supports and seat backs. A long auxiliary fence attached to your table saw's miter gauge, and a clamped stop block, can help register the inside ends of these joinery cuts.

the blade height on two 3/4"-thick scraps with a few cuts to make sure the workpiece faces will be flush with one another when the lap joints are assembled. Then cut the lap joints on the swing parts with the workpieces backed up against a miter gauge swiveled to 15°.

Once all of the lap joints are cut and test-fitted, follow the gridded *Drawings* on page 35 to plot points and lay out one seat support and one seat back on two workpiece blanks. Use a large French curve or a flexible wood batten to connect the dots with smooth curves to form the two contoured shapes.



On a pair of gridded workpieces, plot points and draw the profiles for a seat support and seat back. A large French curve makes it easy to connect these dots with smooth, flowing lines.

Cut out the seat support and seat back at a band saw or with a jigsaw. Refine the edges as needed at a disc sander and either a spindle sander or sanding drums on a drill press. Now use the shaped workpieces as templates to draw the remaining two sets of seat supports and backs on your other four workpieces. Cut these to shape just outside of your layout lines, then template-route the second and third sets to final shape using the first pieces as the masters. I stuck the parts together with double-sided carpet tape and used a piloted flush-trim bit at the router table for this task.

Assemble the parts into three seat frames with glue and clamps. When the lap joints dry, sand the frames smooth. I also eased the bottom and back edges of the frames with a



Use your "master" seat support and seat back to template-route their shapes onto the other two sets of seat frame parts. A piloted flush-trim bit makes part duplication like this easy.



Glue and clamp the three seat frames together, and sand the joints flush. Ease the bottom sharp edges if you wish. Then reinforce each lap joint with a stainless or galvanized carriage bolt, washer and nut.

1/8" roundover bit in a handheld router. Reinforce the joints with a single 1½" carriage bolt, washer and locknut, centering the hardware on the joints.

Next, rip and crosscut 22 seat slats to width and length. Choose the best face of each slat as the "show" face, and sand these faces smooth. Ease their edges with a 1/8" roundover bit at the router table to help prevent splinters. Touch up the roundovers by hand-sanding to remove any burn marks left from the router bit, and round over the corners of the seat slats if you wish.

Let's get the swing frame assembled! Fasten the front-most and rear-most seat slats to the three seat frames with a single counterbored, 2" deck screw at each seat frame (you'll plug the counterbores to hide the screw heads later). Add the rear slat to the back top end of the seat backs, too. These three slats will hold the seat frames upright. Now lay out the positions of the other seat slats so they're evenly spaced, and



Install the seat slats on the three seat frames to create the swing framework. Dowel pins served as handy spacers. The author tacked each slat in place with 23-gauge pin nails to keep them from shifting before driving counterbored deck screws at each connection point.

attach them to the seat frames with counterbored screws. (I found that, for most of the slats, 1/2"-diameter dowel pins worked ideally as spacers.) Once all the seat slats are in place, repeat the process to attach the seatback slats.

Adding Vertical Supports

Study the *Drawings* on the next page, and you'll see that the porch swing's arms rest on vertical supports in front. These are glued-up laminations of two 3/4" workpieces. Inside the supports, a groove runs from top to bottom, forming a channel to both hide the front chain and to provide an attachment

point for it at the bottom front carriage bolt. To make these vertical supports, first rip and crosscut the four laminations to size. Then mill a 3/8"-deep groove into one face of each lamination, 1/2" in from an edge, using either a 3/4"-diameter straight bit at the router table or with a 3/4"-wide dado blade at the table saw. Glue pairs of laminations together with their grooves aligned to create the two supports.

The vertical supports are located 3" back from the front ends of the seat supports. Mark their locations on the swing frame. Then lay out the vertical supports with holes for a pair of carriage bolts that will attach each of them to the swing (the *Seat Support Pattern* locates these positions). Make sure the front carriage bolt is centered on the inside channel of each support. Drill 5/16"-diameter holes through the supports at your drill press to ensure that these holes are straight and true.

Now set the supports in place on the swing frame and mark their inside edges where the tops of the seat slats cross them. Ease the outer long edges of the supports and the inner edges above the seat slats with a 1/4" roundover bit in a handheld router or at the router table. Sand the faces and roundovers smooth. You still need to extend the carriage bolt holes on the vertical supports through the seat frame. Once that's done, install the supports on the swing frame with bolt hardware.

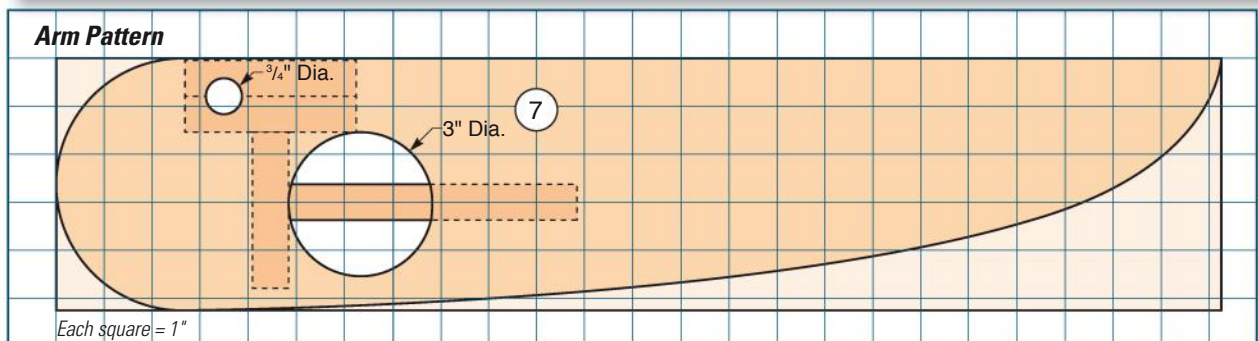
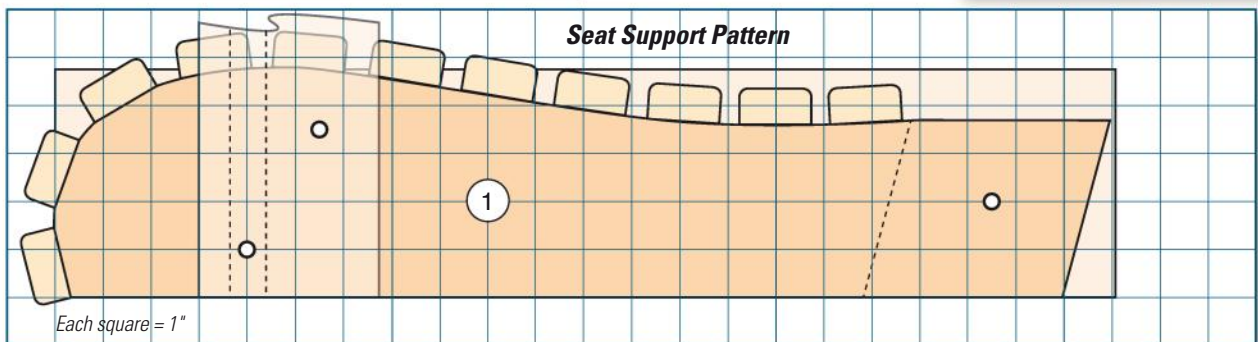
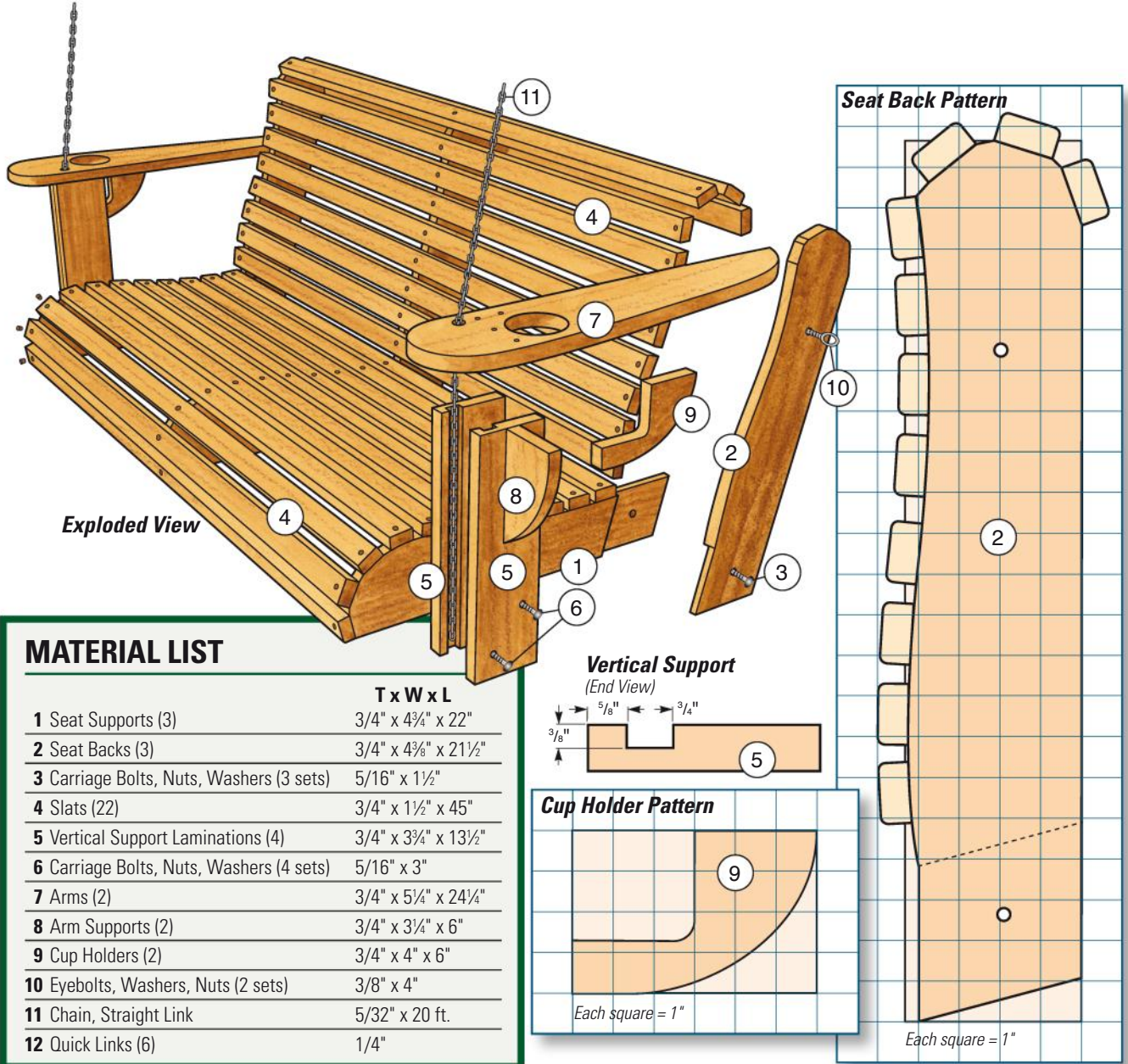


Plow a 3/4"-wide, 3/8"-deep groove into each vertical support lamination from end to end (see inset top left). Then glue and clamp the pairs together to form supports with inner channels. Bore two 5/16"-diameter holes through each vertical support at the drill press for carriage bolts. Position them on the swing, and extend these holes through the swing's outer seat supports (see the inset above). Attach the supports with bolt hardware.

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For a video on choosing a finish for the Porch Swing, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.





Cut a 3"-diameter cup hole through each arm. A hole saw in a drill press works great for this application: it cuts a perfect circle that requires very little sanding.

Completing the Arm Assemblies

With the vertical supports in place, you can add the arms. Start by preparing two blanks for the arms from 3/4" stock. Use the gridded *Arm Pattern* drawing on page 35 to plot and draw the shape of one of the arms onto an arm blank, just as you did for the seat frame parts. Cut out the arm and sand the long curved edge to fair it. Use the first arm as a pattern to draw the second arm's profile, then as master to template-route it to shape after you've cut it out for a perfect match.



The author used cyanoacrylate glue to hold the arm supports under the arms without clamps (see inset). Attach these supports permanently by driving two screws down through the arms and one through the vertical support.



Next, mark the position of the 3/4"-diameter hole in each arm that will allow the front chain to pass up and through from the vertical support channels underneath. Drill these holes with a Forstner bit. There's also a 3"-diameter cup hole to make in both arms. I happened to have a 3" hole saw, so I bored these big holes at the drill press, but a jigsaw, scroll saw or fly cutter would also do the job of cutting these holes out.

Ease the top and bottom edges of both arms with a router and 1/4" roundover, but leave the portion of the bottom edge square where the arms meet the vertical supports. Switch to a 1/8" roundover bit and ease the inside top edges of the chain and cup holes, too. Give the arms a good final sanding to remove any burn marks or rough edges left from routing.

With the arms now completed, you can fasten them to the vertical supports and seat backs with pairs of 2" counterbored deck screws at each joint. Make sure the inside edges of the arms are flush with the inside faces of the supports and that the arms are parallel, front to back, with the bottom edge of the swing. Also make sure that the chain holes in the arms line up with the vertical support channels.



A notched cup holder fits behind each arm support. Install it with counterbored screws so it's centered beneath the arm cup holes.

A small curved arm support fits up underneath each arm, centered on the width of the vertical supports. Cut these supports to size and shape, and round over their curved edges. Once they're sanded smooth, drive 2" screws down through the arms and one 3" screw through the vertical supports to attach them.

The last pieces to cut to shape are the notched cup holders that fit behind the arm supports. Follow the gridded drawing on page 35 to lay out one of these cup holders on a workpiece blank. Cut out the cup holder, and smooth its outer curve on a disc or drum sander. Use it as a template to match and make the second cup holder. Round over the outer curves of the cup holders, give them a good sanding, and install them on the swing with counterbored 2" screws. They should be centered under the cup holes in the arms.



Glue wood plugs into the screw counterbores, then trim them flush with the surrounding wood. If you use a chisel, a piece of scrap metal with a hole in it will prevent the blade from marring the wood. Finish the job with a block plane.

Finishing Up

You've now got lots of screw counterbores to fill with wood plugs! I made my plugs with a plug cutter on the drill press using scrap wood from the project. Trim the plugs flush after they're glued in place. Once those are taken care of, it's time to apply a final topcoat. I suggest going with a semitransparent deck stain and nothing more: it will allow the natural wood grain to show through while also making the swing easy to refinish in the future. I chose an oil-based stain instead of a water-based formula, because this swing has a huge amount of surface area to cover. Oil-based stain dries much more slowly, so you'll have plenty of time to apply it to the whole project, let it soak in and wipe off the excess.

Give the finish at least a day or two to dry. Then mark and drill holes through the seat back for 3/8" threaded eyebolts that provide the back attachment points for hanging chains. Install the eyebolts with a large metal washer on both sides of these connection points. The washers will prevent the bolts from twisting forward under load and marring the wood. Secure the eyebolts with lockwashers and nuts or nylon-insert locknuts.

And with the woodworking now done, it's time to hang your swing! I used stainless-steel straight link chain with 5/32"-thick links. It won't rust, and each link provides a safe working load of 500 lbs. — plenty for two average size adults. You also could use a more economical twisted-link variety of "swingset" style chain. Just make sure it provides adequate working load. Cut two 33" lengths of chain to pass up through the vertical supports and two more 20" lengths to attach to the rear eyebolts. The bottom link of the front chains fits around the front carriage bolt inside the channel. Remove these carriage bolts, slip the chain down through the arm channels, and insert the bolts through the links. Reinstall



Oil-based deck stain is a good choice for topcoating this project: it's easy to apply, dries slowly and can be refinished easily by simply cleaning and re-staining the wood.

the washers and nuts. Attach the back chains to the eyebolts with quick links. Then connect the front and back chains with a quick link to serve as single attachment points for the long chains that suspend the swing from your porch ceiling.

Hang your new swing from long 3/8" eyebolts driven into sturdy ceiling framing on your porch. Space these eyebolts 46" apart. Aim for the seat height to be about 21" up from the porch floor. The chains you've installed already will pitch the front of the swing up slightly higher than the rear, which makes for a comfortable, slightly reclined seated posture. Two 5' lengths of chain got my swing suspended at just the right height.

Remove any extra links with a hacksaw or bolt cutters, if you wish, to wrap this handsome project up. Now mix up a pitcher of lemonade, and take a load off to enjoy the fleeting days of summer!

Chris Marshall is senior editor of Woodworker's Journal.



Pass the front carriage bolt through the bottom link of the front chains to secure them to the swing. It forms a sturdy, hidden connection point.

The author connected the front and back chains with a quick link, then used them as attachment points for hanging the swing from his porch ceiling with two longer chains.



Design and Operation of a Small-Scale Dehumidification Kiln

By Willie Sandry

Saving money by drying your lumber may not be the answer for every woodworker, but the basics shown here demonstrate that it is within the reach and skills of the average person.

Many articles have been dedicated to solar lumber kilns: everything from a simple sheet of Visqueen over a stack of lumber in the sunshine to elaborate enclosures designed for solar gain. The problems with solar kilns include limited control over temperature and limited solar exposure, depending on your region and site location. Additionally, I have been underwhelmed by

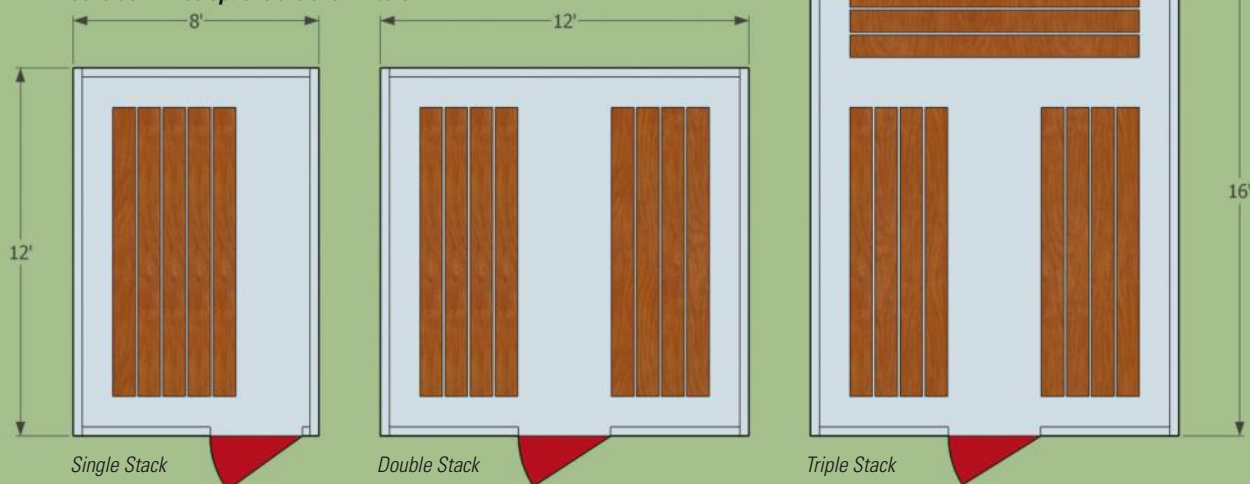
the performance of solar-operated fans.

My aim was to develop a small dehumidification kiln for better control of the three key components of lumber drying: temperature, airflow and humidity. A dehumidification



Kiln Size and Door Placement

When planning your kiln shed, size — which is determined by how much lumber you plan on drying per load — and door location are the first things to consider. Three options are shown below.



kiln makes sense particularly when the lumber is air-dried first. This limits the amount of energy needed to bring lumber to the desired 6% to 8% moisture content. Commercial scale steam kilns consume large amounts of energy. In contrast, a dehumidification kiln uses a sealed chamber, with only enough energy input to maintain the desired temperature. With a well-designed dehumidification kiln, hardwood lumber can be dried for mere pennies per board foot.

A shed kiln is an attractive alternative for a couple of reasons. It can be constructed in any style, with architectural features that match or complement an existing home. Built properly, a shed kiln may even increase the value of a property. I don't think the same could be said for an old reefer truck converted into a kiln (no matter how well it dries lumber). Another reason I like the idea of a shed kiln is the flexibility of future use. Minus the drying equipment, a shed kiln is just an insulated storage space, with a host of possible uses.

Designing a Kiln

The first thing to consider when designing a shed kiln is size. Ideally, a lumber kiln would be large enough to dry multiple stacks of lumber. This lets the

operator sort stacks by lumber species, so they will be easy to retrieve when the drying cycle is complete. Consider not only the space for the lumber stacks, but extra floor space to easily load and monitor the charge of lumber. Additionally, a 12" air plenum is required between the walls and stacks of lumber. This air space is absolutely critical for even airflow, so count on the extra floor space right from the design phase.

Many available kiln designs require a large, heavy door. My number one priority was to build a kiln that was easy to load and easy to monitor. For a single-stack kiln I recommend a minimum shed size of 8' x 12'. This would allow a stack of lumber four feet wide and 10 feet long. The remaining width allows for a 36"-wide door and space for your drying equipment.

For more capacity, consider a two-stack kiln (12' x 12'), or a three-stack kiln (12' x 16'). Regardless of size, allow for a 36" door that opens to a "hallway" of open space. Changing the position of the doorway in various kiln setups helps provide the best access to the stacks of lumber. See the *Drawings* above.

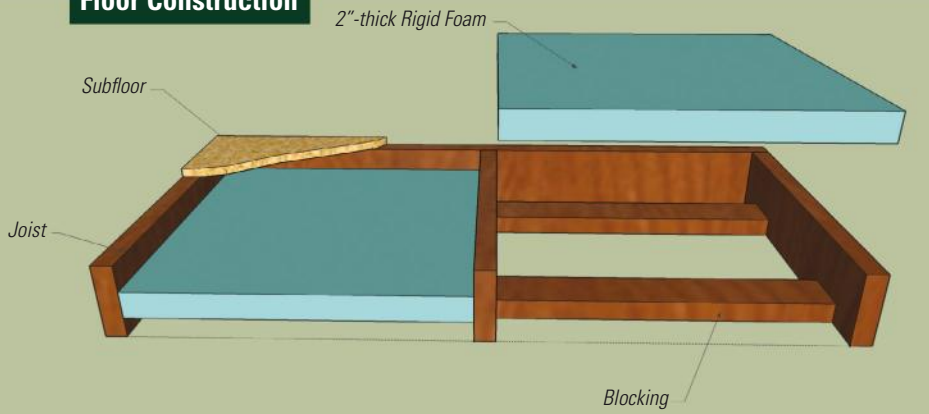
Unlike general shop space, bigger is not always better for kiln design. If the interior volume of a kiln becomes too

large, basic heaters and home dehumidifiers may be inadequate to control the kiln environment. For a small-scale shed kiln, I recommend a maximum footprint of 200 square feet. Many regions have increased the shed and outbuilding maximum allowable size without need for a permit. Check your local building codes for regionally specific requirements and electrical permits.

My shed kiln was stick-built from standard building material, and sized to take advantage of typical 4' x 8' sheet goods. The cost associated with shed construction was similar to buying a prefabricated kit. In exchange for building the shed myself, I wound up with a shed of higher quality, with more features. A typical home center shed's floors are underbuilt for the weight of a load of lumber.

Another great option is to convert an existing shed or outbuilding to a lumber kiln. Any small building could work, as long as it has a minimum of 2" x 4" framing, and will seal out unwanted air. With advances in spray foam insulation, it may be possible to seal older, drafty structures as well. Consider the weight of the lumber that will be placed in the structure and fortify the building accordingly.

Floor Construction



The blocking between joists strengthens the floor and supports the extruded foam insulation. Note the air space between the foam sheets and the subfloor.

Constructing the Chamber

Construction of a kiln chamber is very similar to building a small house. Insulate the floor with 2" rigid foam for convenience and durability. Extruded polystyrene foam (blue or pink rigid foam) in this thickness has an R value of 10. To accommodate the floor insulation, blocking between joists is oriented horizontally instead of the normal vertical position. This serves a dual purpose of supporting the rigid foam insulation as well as stiffening the floor framing. Leave an air space between the rigid foam and subfloor for additional insulating properties (see *Drawing*, above). Insulation for walls and ceilings should be a minimum of R13.

Once the flooring deck is constructed, think about sealing the shed framing at every opportunity. A bead of silicone caulking between the subfloor and sill plate will prevent air infiltration. Lay down the bead of caulking before raising the walls. Corners where walls meet should be sealed with expanding foam sealant. Windows and doors are also sealed, as well as any holes cut for electrical service.

Installing a window in a kiln may seem counterintuitive at first, because windows lose more heat than an insulated wall. However, the natural light and ventilation offered by a small window outweighs any disadvantages. I recommend a 2' x 3' sliding window with bug screen. It should be double-pane, well-insulated with low emissivity (low-E).

Size and placement of the access door are critical as well. I selected a 36" outswinging exterior door. An outswinging door can always be opened, regardless of shed contents. A pre-hung steel exterior door

is ideal in this situation, because it offers weatherstripping and is fully insulated.

Installing sheetrock and fire taping is a good idea for a heated room. The sheetrock also helps to protect the fiberglass insulation. Exterior sheathing and siding type also factors into the heat-holding ability of the structure. I chose "double wall" construction with 1/2" sheathing, and 1/2" T1-11 siding. Each layer adds approximately .81 R value. Staggering the seams between the sheathing and siding layers helps avoid air infiltration.

I also wrapped the shed with Tyvek® HomeWrap®. The membrane was taped and "lapped to the weather" so if the tape ever fails, any rain that gets behind the siding would still be shed down and away by the HomeWrap.

I opted not to install a true vapor barrier between the framing and sheetrock, because of potential condensation and mold issues with sheds constructed this way. This shed will be essentially unheated for much of the year and very hot during the kiln-drying cycles. A shed kiln has minimal venting (usually one or two gable vents) and sealed soffits. For these reasons, I feel it is best to let the shed breathe, and forgo a plastic vapor barrier.

Electrical requirements for a DIY kiln are pretty straightforward, but hiring an electrician is still a good idea. Add up the amp draw on all the equipment you plan to use in the kiln, including a heater, dehumidifier, fans and steam generator. Make sure the total amp draw is well within the limit of your electrical circuit. Don't even think of powering your kiln with an extension cord.

Drying Properties, Kiln Science

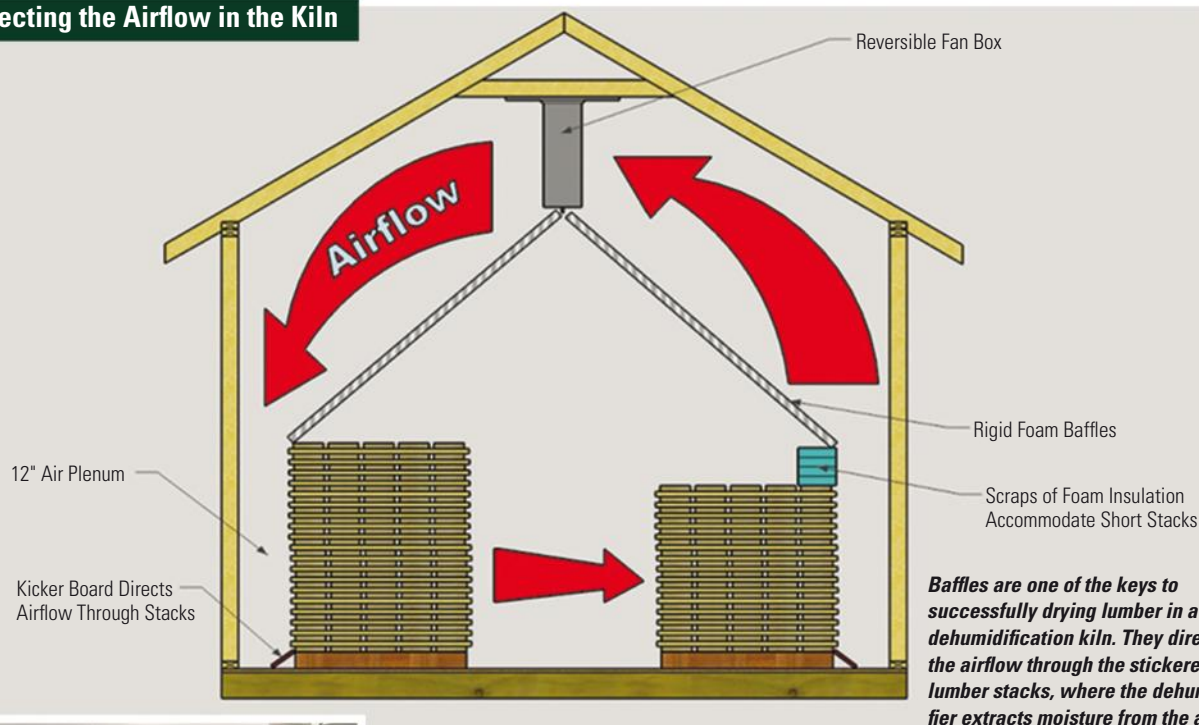
If you intend to kiln dry lumber from a green state, right off the sawmill, you will need to be well-versed in airflow rates and follow a detailed drying schedule. Drying lumber too quickly can lead to deep end checking, warping and case hardening. Case hardening is a defect caused by the outer portion of a board drying quickly, while the inner portion dries more slowly. This can create internal stress in the lumber that is released when sawing. If severe enough, the lumber can develop honeycomb cracks throughout.

However, if you kiln dry hardwood lumber that has already been air dried, the process is much more forgiving. Most species of hardwood lumber can be safely dried this way, once the moisture content is 20% to 25% or less. The fact is, most of my stacks of lumber air dry to 15% moisture content before entering the kiln. I hope that the sawyer coated the ends of the lumber with Anchor-Seal® or oil-based paint when it was green. This slows the end-grain drying and limits the severity of end checking.

Attic fans are a perfect way to provide airflow over the stacks of lumber. They are normally mounted in the gable of household attics, and they are designed to be used in high temperature environments. My kiln uses four ceiling-mounted fans, each rated for 1,600 CFM. For single-stack kilns, stationary fans are adequate. With two-stack and three-stack kilns, it is better to have reversible fans to alter the direction of airflow mid-cycle. This prevents "dead spots" inside the chamber that experience limited airflow.

Instead of using expensive electrically reversible fans designed for commercial kilns, I came up with a simple hardware solution. A lazy Susan with 180° detents mounts the fan box to the ceiling. I then manually rotate the fan boxes halfway through the drying cycle. Also, since

Directing the Airflow in the Kiln



Baffles are one of the keys to successfully drying lumber in a dehumidification kiln. They direct the airflow through the stickered lumber stacks, where the dehumidifier extracts moisture from the air.



The author attached his fans to a lazy Susan to make reversing the airflow easier. Note the vent in the wall and the foam cover for the vent.

heat rises, ceiling-mounted fans have the added benefit of circulating the warmest air over the lumber.

A household dehumidifier (DH) removes moisture from the kiln chamber. By setting the relative humidity (RH) on the dehumidifier, you can control how often it runs. A higher humidity setting will run the unit sporadically to maintain that RH. A lower RH setting will call for the DH to run more often. There are two ways to remove water from the DH unit, and they both work well. The water tray can be removed and emptied manually, or a hole can be drilled through the wall of the shed to pass a drain tube. This will allow the DH to drain automatically without you needing to enter the kiln. I prefer to empty the water tray manually and record the volume of water collected. This gives me a secondary method of tracking the drying process, using both water volume and moisture content (MC) readings.

A small electric heater supplies auxiliary heat to maintain adequate kiln temperature. In smaller kilns, the heat generated by the fans and DH motor is sufficient to maintain temperatures in excess of 100 degrees. In larger kilns, the heater may be needed in the latter part of the drying cycle. For all kiln drying schedules, a heater should be used to sterilize the lumber and kill any insects that may be present. For a kiln temperature of 140° F, sterilization takes three to five hours. With a 130° F kiln temperature, sterilization will take 10 to 12 hours (*Dry Kiln Operators Manual*, 1991). These figures hold true for lumber up to 2" thick. For sterilizing thicker lumber, additional time is required.

Select a heater with an adjustable thermostat and a tip-over shutoff. This

will allow the heater to cycle on and off automatically, according to the kiln operator's setting. A heavy-duty 1,500-watt space heater works fine.

A Typical Cycle in a Shed Kiln

Loading the kiln begins by rousing my sons and letting them know I've planned a day of work. After a short period of grumbling, they join me to lay down wood blocks for the first layer of lumber. I like these "starter blocks" to raise the lumber a few inches off the floor. I either use some cedar 3" x 5", or 4" x 4" stock. The starter blocks should be as long as the stack is wide.

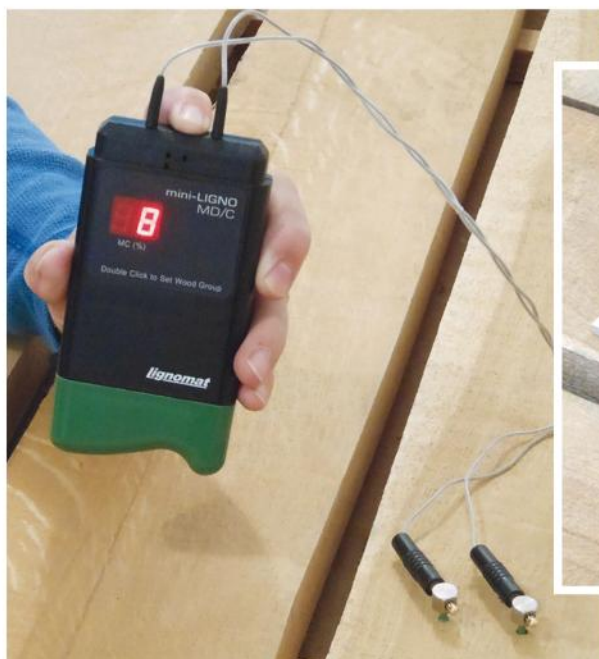
Each layer of lumber is separated from the next by a series of "stickers" or spacer sticks. The stickers are uniform in size and usually 3/4" or 1" square.

Milling the stickers square is advantageous over a rectangular cross-section, because no matter how you place the stickers they will form a level stack. Another common sticker size is 1" x 2", and these work fine as well.

Place a sticker at each end, and every 16" along the stack for 4/4 stock. Sticker spacing can be



A dehumidifier, a 1,500-watt electric heater with a tip-over shutoff switch and a steam generator — very common home center and Rockler supplies — are used to control lumber drying.



You'll need a moisture meter to test moisture content (MC) of the wood as you process the lumber. Here, 8% lumber is good to go.



It is possible to use moisture meter probes that you secure to lumber within the stack, which will give you readings otherwise difficult to get.

increased to 24" apart for 5/4 or thicker hardwood. Align the stickers over the starter blocks on the first course. Then align each subsequent layer of stickers over the last. This helps keep the lumber straight during the drying cycle; in fact, improper placement of stickers can permanently deform lumber. The thinner the stock, the more critical sticker placement becomes.

Place some sample boards in the stack that will be easy to pull out for moisture testing later. Once all the lumber is stacked and stickered, place baffles over the lumber. The baffles direct airflow over and through the stack and prevent the top layers from drying too quickly. My four main baffles consist of sheets of 1" Styrofoam™ insulation. I made a simple frame from plywood strips and attached the insulation sheets to them with screws and fender washers. This makes light-weight baffles that can be easily moved and repositioned.

Apply foil tape to the edges of the main baffles to help protect the Styrofoam™. My baffles hang from T-bar assemblies mounted to the ceiling. The T-bars are made from 1/2" galvanized pipe and are

attached to the rafters with threaded pipe flanges. To hang the baffles, simply attach hooks to the plywood frame. I found that brackets for mounting rigid metal electrical conduit work best. Select 3/4" conduit brackets for hanging baffles on 1/2" galvanized pipe (see the photos below).

If your lumber stack is built on starter blocks, you will need to limit airflow there as well. Place a 1x6 board on the

floor behind the stack, tilted to a 45° angle. This kicker board will help distribute the airflow more evenly through all layers of lumber. Basically, you don't want all of the air rushing out under the stack, so find a way to redirect it. End baffles are also a good idea to prevent airflow from bypassing the stack entirely. For end baffles, I use 2"-thick rigid foam insulation screwed to the main baffles. The baffles do not need insulating properties, and plywood would work just as well.

I cannot stress the importance of baffles enough. Without baffles, the top layers of lumber experience "potato chipping" with cupping, twisting or warping. This problem is magnified if the lumber is thin or flatsawn. Thicker lumber like 5/4 or quartersawn lumber is naturally more stable. In addition, weight on top of the stack can be helpful, but nothing replaces baffles for the best lumber yield. The last thing to do before starting the kiln is to close the gable vent with an insulated cover.



Here the author's kiln is set up with the baffles in place and the electric heater and dehumidifier in the aisle between the wood stacks. A fan is also in place over the conduit baffle frame (inset).

For a detailed breakdown of the energy cost of running this kiln, information on using a WiFi sensor, and a list of the equipment and sources the author used for his shed kiln, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



The kicker board stops airflow from predominantly going under the stack of lumber. The angle of the board helps direct the flow up toward the stacked lumber.

My kiln schedule starts with running all fans and the dehumidifier for two days, measuring and removing water as it accumulates. Initially, I set the DH to 40% RH, because I don't want to remove moisture too quickly. I usually see a large volume of water in the DH each night when I check the kiln.

An anemometer confirms that your effort constructing baffles was worthwhile. Measure airflow over the stacks of lumber in various locations. Air speed of 350 feet per minute is appropriate for common hardwoods such as oak and maple. Also check that air isn't escaping around the side baffles or under the stack of lumber. Adjust the baffles or fan direction to achieve good airflow.

After two days operating only the fans and DH, I take note of the temperature. (I have found that remotely monitoring the temperature and humidity with a WiFi sensor can be very helpful. It's a nice use of technology and adds a measure of safety as well. See "More on the Web" for further info.) If the fans and dehumidifier generate enough heat to maintain a temperature of 100° to 120° F, then I won't use the auxiliary heater. If the temperature is below this range, I start the heater and adjust the

thermostat accordingly. After four days, I decrease the RH setting on the DH to 30% and continue to run the fans. After seven to 10 days, I reverse the fan direction to make sure all stacks of lumber dry evenly. Soon the DH won't show much water collected in the tray. If MC readings still aren't at the desired range, the heat may need to be increased for the remainder of the drying cycle. Remove samples from the stack, and cut an inch or two off one end. Take a moisture reading in the end grain with

a pin-type moisture meter or remote probe. (I use the Mini-Ligno MD/C from Lignomat, www.lignomatusa.com.) Once the core readings are 6% to 8% on a fresh cut, the lumber is dry and ready for sterilization. Omitting the sterilization phase can lead to costly losses from insect damage, so don't skip it.

For the sterilization phase, air temperature needs to be around 140° F, for three to five hours. Take the electronics out of the kiln, and continue operating the heater and fans during this phase. The DH is not needed at this time, as the lumber is already bone-dry. I find that unplugging the DH is helpful during the sterilization phase so I can add a second heater, without overwhelming my electrical circuit.

Once the lumber is sterilized, it is ready for the conditioning phase. To condition the lumber, I introduce steam into the kiln for about two hours. This returns some moisture to the very dry exterior of the lumber, while not affecting the core moisture level. I use a Rockler steam generator, item #42826 (www.rockler.com). During the conditioning process, the only equipment operating are the fans, heater and the steam generator — no dehumidifier.



Here the author measures the airflow and effectiveness of his baffles with an Extech AN100 anemometer. Around 350 feet per minute is a good air speed.



Cost-saving Conclusions

Looking at the cost-benefit analysis of a shed kiln can be enlightening. On the last load of lumber I purchased, I saved \$2.50 per board foot compared to retail prices for kiln-dried lumber. The order was 540 board feet (BF) of 5/4 white oak. On this order alone, I saved over \$1,300 by drying the lumber myself. This, of course, is gross savings; we must calculate electrical costs to determine the net savings: in this case, about \$62. Check out "More On the Web" for my complete calculations to figure savings.

If we revisit the example of a \$1,300 gross savings from a load of 540 BF of white oak lumber, and we subtract the estimated cost of \$62 to kiln dry the lumber, we arrive at a net savings of \$1,238 less than retail. That purchase was an average deal, and one I don't consider a particular bargain. I often buy from sawyers or homeowners at 40% to 50% of retail price. Frequently, the lumber has already air-dried for several years in a barn or outbuilding. When that is the case, I know I'll have usable lumber in just a few weeks.

If you use a lot of lumber, and you're a decent hand at carpentry, a shed kiln will quickly pay for itself. Perhaps the best part: you won't need to calculate your lumber needs down to the board foot. Just walk out to the shed kiln and grab what you need from your custom-dried supply.

Willie Sandry is a furniture maker and a lumber kiln operator in Camas, Washington.

Graceful Bar Cart



By Kimberly McNeelan

This elegant and convenient cart can be used for entertaining your favorite people. Whether you are serving tea, wine, cocktails or cookies, you'll find it helpful. Its top tray is removable for easy serving and cleaning.

My cart's design is inspired by an outdoor bar cart that my grandparents have had on their deck for more than a quarter of a century! We still use it for barbecues and picnics, and I have a flood of wonderful memories when I think about that piece of furniture.

I built this version from maple. The metal holders for the stemware and wine bottles are attached to the supports beneath the removable top tray, and they have a brushed nickel finish; I think it goes well with the light-colored maple. The caster wheels are actually made of walnut. Their metal housings were originally zinc-coated, but I used 400-grit sandpaper to lightly sand the metal down to a silver finish. My cart will live primarily indoors, but if you want to keep yours outside, be sure to use an insect- and rot-resistant wood so it will weather many outdoor seasons to come.

Making the Legs with a Template

Start the leg building process by gluing up two 16"-wide blanks, 37 $\frac{1}{8}$ " long, so that you can "nest" two legs together per blank when laying them out. Then square up the ends of the blanks so that you have reference surfaces for marking dadoes for the top tray supports and the bottom tray sides (see gridded *Drawing*, page 48). The upper dadoes are 1 $\frac{1}{2}$ " wide. Mark them 29" from the bottom end of the leg blanks. Mark the 2 $\frac{1}{2}$ "-wide

bottom dadoes at 2 $\frac{3}{4}$ " from the same end of the leg blanks. Then set up a wide dado blade in the table saw, and cut these 3/8"-deep dadoes carefully across both leg blanks. Make sure the bottoms of the dadoes are flat and square.

I developed the leg shapes from a series of sketches, then moved on to a couple of full-size paper mock-ups. A flexible scrap-and-string curve bow will be a big help in drawing these leg curves when you make a full-size paper template. Use the gridded *Drawing* on page 48 to help you plot points on a full-size grid, then connect the dots to form your leg pattern.

Next, mark the pattern with the dado locations, cut it out, and use it to make a rigid template from 1/4"-thick MDF or plywood. While the tops of the legs will end up curved, keep the top of your leg template flat so you can align it accurately with the dadoes on your leg blanks.

Now, draw the four leg shapes on your blanks and cut them out, but leave their top ends flat. Cut as close as you can to



1 A flexible length of scrap and string formed a helpful curve bow when the author laid out the leg shape from scratch.



2 Position your paper pattern on the MDF using the dado layout lines to register it squarely. Trace the template and cut it out.



3 Use your template, lined up carefully with the ends of the leg blanks, to draw two leg shapes per blank, nested together.



4 Cut out the four legs with a band saw or jigsaw, sawing just to the waste side of your penciled layout lines.



Mill pairs of dadoes across your leg blanks. Clamp the blanks to your miter gauge's fence to keep them from shifting laterally during cutting.



The sharp curves of these legs could chip out if you rout against the grain. Study the grain and mark your template with arrows.



The author did some of her template routing on the legs with the template mounted on top, then taped it underneath to finish up.



Follow your directional arrows (inset) to avoid routing against the grain, and don't rout around the ends of the feet, or they can chip.

your layout lines without crossing the pencil line. Don't leave more than about 1/16" of material next to the line, though, because you will be flush-trimming it away with a router, next.

These curvy legs require that you know how to rout off the remaining waste with respect to the grain. When you are flush-trimming, you will need to study the grain on the legs and rout so that the cutter is combing down the fibers, not ripping them up. I looked at each leg individually, then marked my MDF template with arrows to help guide my routing direction. (Note: you may need to rout away part of the leg waste with the template on top of your workpiece, then remount the template to the bottom face to finish up the routing pass, depending on grain direction issues.) Attach the

template with double-sided carpet tape, and rout the four legs flush to the pattern. Don't try to rout around the end grain of the feet, or the bit might chip out chunks of wood. You'll sand the feet smooth instead, to prevent mishaps here.

Grab your combination square and marking knife or pencil to lay out where the mortises will go for the bar cart handles. Drill out most of the waste in these mortises with a Forstner bit in a drill press. Then square them up with a chisel.

Next, clamp each leg upside down in your bench vise and mark where to drill it for the caster sleeve. I bored these holes with an electric drill that has a level in the end of it, and I set up a speed square next to the leg to help me, too. My casters required 3/8"-diameter, 1 1/4"-deep holes for their posts, which



Mark a 1 1/8" x 1 1/8" mortise on all four legs to house the cart's two handles. Position these mortises 1 1/2" down from the top ends of the legs.



Work carefully when squaring up the mortises, and try to keep your chisel perfectly perpendicular, cutting a tiny bit outward.



When drilling the legs for casters, be mindful of what the grain on the feet is doing. Move their position, if needed, to avoid weak, short grain.

I drilled with a Forstner bit. With that done, you can finally double-stick-tape the legs together and cut and sand their top ends round so they match.

Tray Corner Joints

Follow the *Material List* on page 49 to cut workpieces to size for the top and bottom

tray sides and ends. I connected their corners with simple rabbet-and-dado joints that you can make with a 3/8"-wide dado blade, set to a cutting height of 3/8". I cut the dados into the tray ends first, using a stop block on my miter gauge fence to set their position at exactly 3/8" in from the part ends. And to double check, I just nicked the bottom inside corner of the first cut and verified it against the thickness of one of the tray side pieces (see photos above).

When the dados are finished, use the same blade setting to cut rabbets on both ends of the four upper and lower tray sides. I used my miter gauge fence and stop block to back up these rabbet cuts, too. If the corner joints fit together well, set your curve bow again and draw the arched faces onto the tray ends — but don't cut them out at this point. Instead, it's time to mill grooves along the bottom inside edges of the tray



The author verified the position of her tray dados by nicking the first cut (top) and referencing it against a side piece (inset).



Since the tray bottom grooves are cut face-down and must terminate at the corner joint dados, mark your router fence (top) so you can start and stop them accurately.



A curve bow can set the broad arch shapes you'll cut into the ends of the top and bottom trays — but wait to make these cuts until after you shape the top tray handles into the tray ends.

parts to support the plywood bottoms. While these 1/4"-deep grooves run the full length of the tray sides, they need to stop at the dado locations on the tray ends. So, for this work, head to the router table and install a 1/4" straight bit. Set the fence 1/4" away from the bit's inside edge, and rout the full-length grooves in the sides. After they're done, mark your router table's fence so you'll know where to start and stop the groove cuts in the end pieces without cutting too far (see the inset photo, bottom of this page). Make these "drop cut" style.



The top tray handles begin as large rabbet cutouts in the tray end pieces. Make these with two table saw cuts, and save the waste pieces.



The author used a 1/4"-radius dish-carving bit with a shank-mounted bearing (inset) to form a finger recess in the top end of the rabbeted cutout on the top tray end pieces. Note: these end pieces still have flat faces.

Sculpting the Top Tray Handles

If you take a close look at the *Drawings* on page 49, you'll see that the handles on the top tray aren't separate pieces — they're actually recesses that are cut right into the faces of the tray ends! This is why we didn't cut the arched faces a few steps ago: to make these handles, the parts begin with flat faces. Begin the process by cutting a 7/8" x 1" rabbet along the face of the tray ends with two cuts at your table saw. Once this big piece of waste is removed, install a 1/4"-radius dish-carv-



Tape the offcuts you made from the rabbeted handle cutouts back into place before hand-sawing broad arches into the top tray's end pieces.

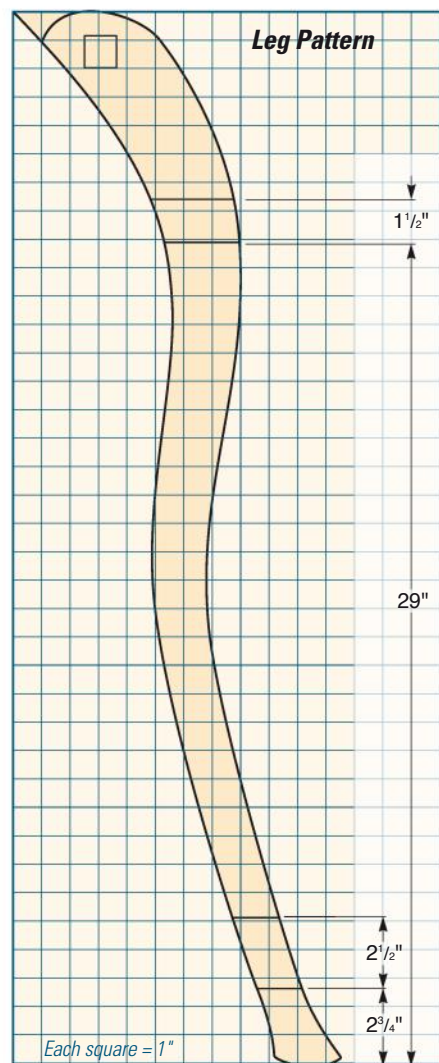
ing bit with a shank-mounted bearing in your router table, and set the fence so the bit will follow the back face of the rabbet with the tray ends in their "upright" position. (If you don't have this bit, a 1/4"-radius core box bit would also work for the operation.) Raise the bit so it cuts slightly higher than the rabbet is tall to form a finger

recess at the top (see top left photo). When this milling is finished, you can cut the broad arches into the four tray faces, and here's a safety tip: tape the square offcuts from the rabbeted areas back into place to support the top tray ends so they won't wobble or tip when you band-saw the curves. For this operation, a 1/8" piece of scrap wood replaces the material removed by the saw blade. Cut the arches, and sand the surfaces smooth. I did this work on a benchtop belt sander.

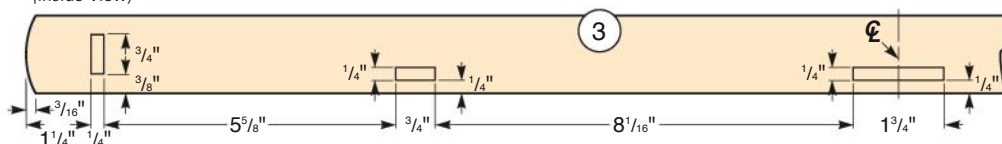
Final Machining Details to Tackle

Set your tray parts aside for now and turn your attention to the rest of the mortises and tenons that remain to be cut. Since you still have the dado blade set up, cut 1/4"-long tenons on the ends of the four top tray support cross bars and the wine bottle holder mount. Dimension these tenons according to the *Top and Side View Drawings* on the next page. Once those were done, I laid out their mortises on the top tray supports by holding the parts in position and scribing around the tenons with my marking knife. Bore those mortises with a 1/4"-diameter Forstner bit in the drill press, and square them up carefully. Then cut 1/2"-long tenons on the ends of the bar cart handles, too, to match their leg mortises.

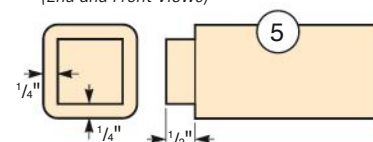
With the mortises done, finish up the long tray supports by cutting and sanding their ends into gentle curves. And while



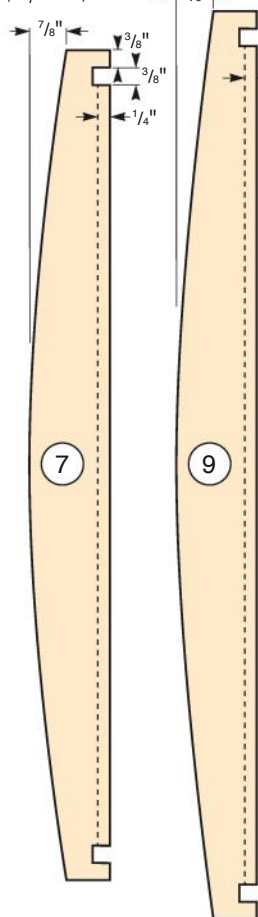
Top Tray Support (Inside View)



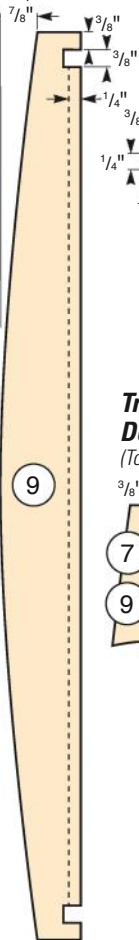
Cart Handle (End and Front Views)



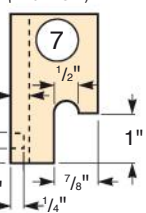
Top Tray Handles/Ends (Top View)



Bottom Tray Ends (Top View)

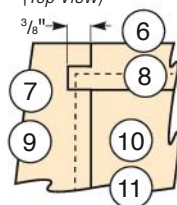


Top Tray Handles/Ends (End View)

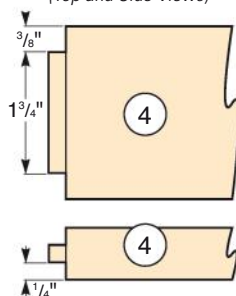


Exploded View

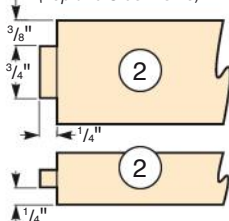
Tray Joinery Detail (Top View)



Wine Bottle Holder Mount (Top and Side Views)



Top Tray Support Cross Bars (Top and Side Views)



Bar Cart Hard-to-Find Hardware

16" Stemware Holder, Satin Nickel (3150-16SN) (2) #1001878 \$7.99 ea.
Double Bottle Rack, Satin Nickel (3250SN) (1) #1001884 \$10.99 ea.
Hardwood Casters, Pack of 4 (1) #43616 \$9.99 ea.
Rockler Table Edge/Handrail Router Bit - 2 3/4" Dia (1) #34525 ... \$74.99 ea.

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MATERIAL LIST

	T x W x L
1 Legs (4)	1 1/8" x 15 1/4" x 37 1/8"
2 Top Tray Support Cross Bars (4)	3/4" x 1 1/2" x 18 5/8"
3 Top Tray Supports (2)	3/4" x 1 1/2" x 33 5/8"
4 Wine Bottle Holder Mount (1)	3/4" x 2 1/2" x 18 5/8"
5 Cart Handles (2)	1 5/8" x 1 5/8" x 19 1/8"
6 Top Tray Sides (2)	3/4" x 3" x 25 1/2"
7 Top Tray Handles/Ends (2)	1 3/4" x 3" x 18"
8 Bottom Tray Sides (2)	3/4" x 2 1/2" x 25 1/2"
9 Bottom Tray Ends (2)	1 3/4" x 2 1/2" x 19 5/8"
10 Top Tray Bottom (1)	1/4" x 17" x 25 1/4"
11 Bottom Tray Bottom (1)	1/4" x 18 5/8" x 25 1/4"



A benchtop sander with a horizontal belt made it easy to smooth the outside curved faces of the top and bottom tray end pieces.

you're at it, carefully sand the top tray handles to make them smooth and to a thickness at the ends that you prefer.

While we've taken care of some of this project's routing steps already, there are still several parts that need their edges shaped before the final glue-up. I used a piloted table edge/handrail bit in my router table to shape the edges of the bar cart handles, ends of the trays and outside faces of the legs. If you do the same, be very careful routing the leg curves using a big profile bit like this, especially in the short-grain areas!



A thorough job of sanding will help your first coat of finish lie down more smoothly. Sand to 220-grit, as a general rule.

Remove only about 1/16" of material at a time, taking several rounds of passes to remove all the waste.

I switched to a 1/8" roundover bit to ease the other sharp edges on the cart, but don't rout the outside edges of the bottom tray or the top tray supports where they will fit into the leg dadoes, or there will be noticeable gaps where the parts come together after assembly.

Then go ahead and thoroughly sand the surfaces of the legs, tray components and tray support pieces. I worked through the grits up to 220, using a 1/4-sheet sander and then a round of hand sanding with the grain. Dry-fit the top and bottom trays together, and take inside measurements across the bottom grooves so you can cut plywood panels for the tray bottoms. Sand those smooth as well.

With all of your cart parts now ready, it's time to get this project assembled! Start by gluing and clamping the two trays together with their bottoms in place. Glue and clamp the four top tray support cross bars and wine bottle holder mount between the two long top tray supports to form a subassembly. When the clamps come off of the trays and the support assembly, glue the cart together with the handles, tray support and bottom tray in place. After waiting adequate time for the glue to dry, smooth any rough or sharp spots that still remain.



The author eased the long, sharp outside edges of the legs at her router table using the Rockler Table Edge/Handrail Router Bit. Be careful of grain direction.



Dry-assemble the top and bottom trays so you can be sure to cut the bottom panels to the correct fit. Quarter-inch plywood was used here.

Finishing Up with Water-based Poly

I decided to use spray-on Minwax® Polycrylic™ finish in a satin sheen. This water-based polyurethane satisfied my criterion for color preservation: I didn't want to use a finish that would eventually turn yellow, in order to keep the maple as blond as possible. However, it ranks about in the middle of the finish options in terms of its water-resistance. So, I may decide to use placemats and trivets on my bar cart for extra protection, just in case.

I sprayed on three coats of finish over a three-hour period. Between each coat, I sanded with 320-grit paper to remove any dust nibs or rough grain. Then, I waited a full 24 hours for the finish to cure all the way, before using #0000 steel wool and furniture paste wax to make the wood feel super-smooth. It's a great buffing step! Just work the wax into the steel wool pad, then apply it in small areas so that you can buff the wax before it dries.

Adding Hardware

All that's left to do at this point is install your hardware. Invert the cart on your workbench, so you can attach the metal stemware and wine bottle holders. Place and mark the hardware. Then drill pilot holes for their screws, using a piece of tape to mark your drilling depth. Install the screws.

I glued the caster sleeves into the leg holes with a bit of two-part epoxy for strength. Be careful to not get epoxy inside the sleeves. Once the epoxy cures, pop the wheels into the sleeves. Then you're ready to load up your cart with all your favorite snacks and drinks. Happy partying!

Kimberly McNeelan is a woodworker, artist and woodworking teacher. Follow her on Instagram at ksm_woodworker.



Glue and clamp together the cart's two trays, then the tray support assembly, before gluing up the rest of the cart.



Attach the cart's stemware and bottle holders to the top tray cross support bars with short screws driven into pilot holes.

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★★★★★

SAVE \$83

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CENTRAL MACHINERY **SUPER COUPON**

10" 12 SPEED BENCHTOP DRILL PRESS
ITEM 63471
60237 shown

Customer Rating
★★★★★

SUPER COUPON
\$109.99
Compare \$139.99
Compare \$232.75

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U.S. GENERAL **SUPER COUPON**

44", 13 DRAWER INDUSTRIAL QUALITY ROLLER CABINET
ITEM 69387
62744/63271
68784 shown

Customer Rating
★★★★★

Weights 245 lbs.

SUPER COUPON
\$349.99
Compare \$369.99
Compare \$679.99

SAVE \$330

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RAPID PUMP® 3 TON HEAVY DUTY STEEL FLOOR JACK
ITEM 69227/62116
62584/68048 shown

Customer Rating
★★★★★

Weights 74 lbs.

SUPER COUPON
\$149.99
Compare \$84.99
Compare \$141.88

SAVE \$66

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CENTRAL MACHINERY **SUPER COUPON**

16" VARIABLE SPEED SCROLL SAW
ITEM 62519/63283/93012 shown

Customer Rating
★★★★★

SUPER COUPON
\$69.99
Compare \$99.99
Compare \$149

SAVE \$79

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PITTSBURGH **SUPER COUPON**

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ITEM 46807/68975
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69222 shown

Customer Rating
★★★★★

SUPER COUPON
\$2.99
Compare \$3.99
Compare \$20.76

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Customer Rating
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Compare \$28.83

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drill master **SUPER COUPON**

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44914 shown

Customer Rating
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SUPER COUPON
\$19.99
Compare \$29.99
Compare \$99

SAVE \$79

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67646 shown

Customer Rating
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Compare \$281.87

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CENTRAL PNEUMATIC **SUPER COUPON**

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69265/62344

Customer Rating
★★★★★

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Compare \$198.45

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3-IN-1 PORTABLE POWER PACK WITH JUMP STARTER
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Customer Rating
★★★★★

SUPER COUPON
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Compare \$49.99
Compare \$64.99

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CENTRAL MACHINERY **SUPER COUPON**

2 HP INDUSTRIAL 5 MICRON DUST COLLECTOR
ITEM 61790/97869 shown

Customer Rating
★★★★★

70 gallon capacity

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Compare \$229.99
Compare \$384.99

SAVE \$205

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62752
62753

Customer Rating
★★★★★

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MEDIUM
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FINE
ITEM 62753

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Compare \$19.99

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Tool Review

Midi and Mini Lathes: What's New

By Ernie Conover

Our woodturning columnist examines the latest offerings in today's benchtop lathes.



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For a video giving you a behind-the-scenes look at this tool review, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

During the last decade of the 20th century, a number of manufacturers brought out versions of their standard 1" x 8 TPI lathes with a short bed. Aimed at the rising tide of pen turners (the first pen kits came out in 1987), they were dubbed "mini lathes." To machinery producers' delight, these small lathes also found great popularity with model makers, teenagers and those just wanting to try turning

without spending a fortune. The first mini lathes sported 8" to 10" swings and 12" to 15" between centers.

During the first 10 years of this century, many manufacturers beefed up the bed of their mini lathes and raised the spindle height to yield a 12" swing. Delta was probably the first to dub these upsized machines "midis," but the terminology of mini as 10" or smaller and midi as 12" and bigger is now part of

the popular lexicon.

Lathe makers have all added bed extensions that take the midi back in the direction of the standard workshop lathes of my youth (which had an 8" to 10" swing and 29" to 36" between centers and were intended to be placed on a workbench or shop-built stand). Typically, adding one extension extends the nose-to-nose distance between the spindles to between 37" and 45". This

COLT SML-350

Motor Size: 1hp (true)

Speed: 80-100 / 170-1,700 / 560-3,700 rpm

Digital RPM Display: Yes

Swing Bed/Banjo: 14" / 10 $\frac{3}{8}$ "

Center to Center Distance: 16 $\frac{1}{2}$ " / 38 $\frac{3}{16}$ " with Extension

Street Price: Lathe \$1,000 / Ext \$250 / Stand \$280 / Total \$1,530

Web/Phone: www.colt-tools.com / 49 (0) 2266 1266



makes midi lathes a good choice for furniture builders who want turning in their repertoire. Additionally, most midis and minis now have variable speed, usually with a DC motor and controller.

Today's midi lathe makers also offer good quality stands with more than adequate height adjustment — a good thing, as putting a modern midi on a workbench may make the spindle too high, especially for a young person. (Ideally, the center of the spindle of a lathe should be at elbow height. Past workbenches, designed for hand tool woodworking and shorter statures, were typically 33". Today's benches, designed more for router use and taller people, have grown to as high as 36".)

Lathe Capacity Factors

For this article, I had a chance to test out eight of today's midi and mini lathes. I took each one for a drive with identically sized spindles from the same plank of wood. This enabled me to experience how each machine feels and behaves, which I believe is more important than raw specifications.

That said, there are some important factors in the capacity of a lathe: the center height, the height of the banjo and the distance between centers. Manufacturers will

list swing as twice the center height: what the machine will swing over the bed. The true swing of a lathe, however, is center height over the banjo, because this base for the tool-rest has to be under all spindles and most faceplate work. Two lathes with the same swing could have different banjo heights.

Likewise, between-center distance is often listed as the spindle nose to tailstock nose distance. The necessary drive and live centers to hold a spindle would lessen this amount. For this tool review, I have provided the distance with the back of the tailstock even with the end of the bed and the same set of low profile centers for all the lathes. (You can usually gain a bit more distance by hanging the tailstock an inch or so off the bed.)

A Word About Speed

Variable speed has become a standard feature in all but budget priced machines, which retain belt and pulley speed adjustment. If you are on a budget, there is nothing wrong with changing pulley grooves to change speeds; it was done that way for centuries.

All manufacturers have gone from V-belt/pulley power transmission to poly-V. Poly-V belts are far superior for steady speed and power delivery, eliminating the surging and slippage common to the V-belt. All variable speed machines in this review retain step poly-V pulleys as part of the control package.

Likened the steps to the gear-shift in a car and the speed controller to the accelerator. Putting the lathe belt on the smallest diameter motor pulley is equivalent to first gear in your car. This gives you more torque at the spindle and more control over that speed range, ameliorating the danger of going too fast in faceplate work. All but one of the lathes had DC motors with DC controllers. Turning a knob clockwise increases speed; counterclockwise slows things down.

COLT SML-350

The COLT lathe had the biggest swing of all the lathes in the test, with 14" over the bed and 10 $\frac{3}{8}$ " over the banjo. It was also the only lathe with a frequency drive, used in tandem with an induction motor. Frequency drives take



The COLT was the only lathe to have a frequency drive and induction motor, instead of a DC motor and controller. It had a full one horsepower at the spindle and robust torque at the slowest of speeds.



The COLT was one of two lathes in this review to have a 1"-diameter tool-rest (larger than the others).

Tool Review continued



The DELTA's stand was well-designed, with all holes lining up perfectly, along with quality paint and fasteners. Our author appreciated the rack for six tools built into the stand.

DELTA 46-460

Motor Size: 1hp
 Speed: 250-750 / 600-1,800 / 1,350-4,000 rpm
 Digital RPM Display: No
 Swing Bed/Banjo: 12" / 9½"
 Center to Center Distance: 16½" / 42" with Extension
 Street Price: Lathe \$580 / Ext \$130 / Stand \$160 / Total \$870
 Web/Phone: www.deltamachinery.com / 800-223-7278



The DELTA DC speed controller had a chart which gave an accurate prediction of speeds at a given number and pulley groove setting, but our author would have liked to have seen a digital readout.

normal, single-phase AC current at 60 cycles/hertz (50 Hz in Europe) and deliver three-phase current at any cycle rate between 2 and 70 Hz. Since cycle rate controls the speed of a three-phase induction motor, this allows a 1,725 rpm motor to run anywhere between 57 and 2,800 rpm with practically no drop in torque at slow speeds. Frequency drives are seldom seen on lathes under 1½hp, so COLT has a first here. The DC motors with a DC controller used in the other lathes have a significant fall-off of the torque curve at lower speeds.

This was also the only user

manual that cautioned on the noise level of the lathe — 79 decibels. All lathes are this noisy; the danger comes not from the lathe itself, but from the work hitting a spindle roughing-out gouge or a bowl gouge during the interrupted cuts involved.

The COLT's digital speed control actually reads the speed of the headstock pulley with an LED sensor. It also has a quality live center, a high level of fit and finish, and is one of only two lathes in the test with a 1" tool-rest stem diameter. It's a dream to turn on, with plenty of power and no vibration.

The COLT stand had a leg that attached to the end of the extension but was not tied to the rest of the stand with a cross-member, which makes removing the extension and leg easy for those wanting to save floor space except when turning long spindles. A lifting handle can be moved to the extension. If you are not going to buy the

stand, this makes lifting the lathe on and off the bench much easier.

The stand could, however, use some slight improvements, such as putting plastic plugs in the ends of the support tressels.

As is, and if price is no object to you, this lathe ties for my overall first pick.

DELTA 46-460

I really appreciated the clean, industrial design of the DELTA 46-460. It's an overall design concept, from the instruction manual to the color choices and logo, with great graphics. The manual, with lots of photos and good information, was the best of the bunch.

To bring safety to reverse direction, most of the lathes have setscrews in the faceplate, which tighten into a groove just ahead of the spindle shoulder to lock the faceplate on the spindle during reverse operations. The JET, along with the COLT and



The JET had the best stand, with very heavy-gauge metal, more than adequate height adjustment and quality fasteners — many plated. All holes lined up perfectly.

JET JWL 1221VS

Motor Size: 1hp

Speed: 60-900 / 110-1,800 / 220-3,600 rpm

Digital RPM Display: Yes

Swing Bed/Banjo: 13" / 9 1/4"

Center to Center Distance: 18 1/2" / 38 1/2" with Extension

Street Price: Lathe \$800 / Ext \$199 / Stand \$518 / Total \$1,517

Web/Phone: www.jettools.com / 800-274-6848

the DELTA, also had Nylok® grub screws, which are akin to using a lock washer with a nut and will not turn without some force being applied to the hex key.

This lathe also has a first-rate fit and finish. The stand was well thought-out, with a built-in tool rack that can hold up to six tools. Area for improvement? I wish it had digital readout.

It's very pleasant to use, with good power and enough center-to-center distance (with the extension) for any furniture spindle.

JET JWL 1221VS

This lathe has a super-heavy construction and a high level of fit and finish. Its very solid stand is absolutely first-rate.

I was very impressed with the stand, which has been redesigned. We received one of the first for this article. All of the bolt holes aligned perfectly with top quality fasteners threading into tapped holes. All of the fasteners on the stand itself are chrome-plated socket head cap screws, while the lathe is affixed to the stand with contrasting black oxide cap screws.

While I still encourage turners to build a wood stand for their lathes, OEM stands in general, and especially the JET's, have gotten so good as to warrant serious consideration. Stands, shop-built or purchased, make the lathe more accessible while preserving precious bench

space. The JET has very clean design, which has been a big thrust of the company. All parts move smoothly and locking handles are stylized and pleasant to use. Many niceties are included, such as metal racks that screw to each end of the bed for Morse taper accessories and the knockout bar. A wire rack holds chucks and faceplates but allows chips to filter through.

The JET JWL 1221VS, exclusive of price consideration, ties for my first pick. If it had a frequency drive and induction motor, at least as an option, it would be my



The JET's DC speed controller was nicely placed, easy to use, and had digital readout. The tool basket allows for storage of chucks and faceplates without collecting chips.

Tool Review continued



NOVA Comet II

Motor Size: 1hp
 Speed: 80-800 / 170-1,700 / 360-3,700 rpm
 Digital RPM Display: No
 Swing Bed/Banjo: 12" / 9 3/8"
 Center to Center Distance: 16 1/2" / 42" with Extension
 Street Price: Lathe \$580 / Ext \$130 / Stand \$160 / Total \$870
 Web/Phone: www.novatoolsusa.com / 866-748-3025

absolute first pick. There is a reason why so many of my students, as well as turning clubs, rely on this machine. They back up the machine with a five-year warranty and long-term replacement part supply.



NOVA was the first company to bring a reliable four-jaw chuck to woodturning. For this review, they supplied a G3 chuck.



With NOVA's VersaTurn coupler, you can mount a properly enclosed grinding wheel to the lathe: sharp tools, with a safety measure.

NOVA Comet II

NOVA is the brand name of Teknatool International Ltd., a New Zealand company that has its own plant in mainland China. NOVA was the first company to bring a reliable and innovative four-jaw chuck to woodturning, and they now make a wide range of chucks and jaws. They supplied a G3 chuck with the lathe for review. DELTA also offers the G3 as an accessory for their lathe.

The NOVA's bed sections are modular, meaning that more than one can be added to get extreme between-center spindle distances. I do feel the stand is incomplete, as there is no leg available for the single extension we requested for this review. That is the reason I did not attach it for the photography. This is a deficiency I would strongly urge Teknatool to correct. The lathe also has no digital readout and no set screws in the faceplate to prevent unscrewing when the lathe is in reverse. Overall, the Comet II is a smooth machine with adequate

power, pleasant controls and clean industrial design.

The Comet II outboard grinder brings back a common user practice of the past: mounting a grinding wheel, either outboard or inboard. The practice was never sanctioned by any manufacturer because of the lack of containment if the wheel exploded. Many did it, however, because of the advantage of low cost and variable speed: you had a low-speed grinder for the price of a grinding wheel.

Installing NOVA's VersaTurn™ Coupler to the outboard side of the headstock allows an enclosed and guarded grinding wheel to be quickly bayonet locked in place. With a street price of \$135 for the two pieces of hardware, this puts the price of sharp tools where it should be. It's a great improvement on an old idea — that now needs a CBN (cubic boron nitride) wheel to match.

Overall, the Comet II is a smooth machine with adequate power.

Continues on page 60 ...

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Tool Review continued



A work lamp is one of the many accessories included with the Turncrafter.



Also included is a live center of much better quality than the others.

Penn State Turncrafter Commander

Motor Size: 1hp
 Speed: 500-1,800 / 1,950-3,800 rpm
 Digital RPM Display: Yes
 Swing Bed/Banjo: 12" / 9½"
 Center to Center Distance: 17½", with extension 44½"
 Street Price: Lathe \$650 / Ext \$160 / Stand \$280/ Total \$1,090
 Web/Phone: www.pennstateind.com / 800-377-7297

Penn State Turncrafter Commander

The Turncrafter Commander is one of only three lathes in this review without reverse (the others are the Rockler Excelsior and the Steelex), a feature I have always considered dubious. The slight, if doubtful, advantage in sanding in the opposite direction is outweighed by the danger of unscrewing a heavily laden faceplate during sanding.

Lifting the midis in this test on and off a bench with a bed extension required two reasonably strong people, which is why my friend and fellow turner Scott Butler helped me with assembling these lathes and their stands. A feature we appreciated on the Turncrafter Commander is that it had handles for easy lifting.



The lifting handles on the Turncrafter Commander made it easier to move on and off a bench.

The Commander is a house brand of Penn State Industries, who, for the most part, sell direct. To allow UPS shipment, the bed is shipped in a separate box from the headstock, tailstock, banjo and tool-rests. This makes some assembly necessary, but even the screwdriver is included. Everything bolts together in a straightforward fashion with clear instructions. The three wiring harnesses for the DC controller are easily plugged to the motor harnesses rolled up inside the headstock.

Once together, the Commander worked well with low vibration and adequate power. I really liked the digital readout having large, easy-to-read numerals and placements on the upper face of the headstock where the turner only needs to glance over to see the speed. Also included with this lathe are a quality live center, a rack for accessories and a work lamp — an unbelievable number

of features for the price. With a bed extension, the Commander makes a great spindle lathe for the furniture maker with occasional turning needs.

RIKON 70-220VSR

Except for the RIKON, lining up the extensions for any of the lathes in this review with the main bed is niggling, especially if working alone. An old trick is to get the bolts just shy of tight and align things as best as possible, then slide the tailstock until its hold-down (under the ways) equally straddles the junction between the beds. Tightening the tailstock brings both parts into perfect alignment, and the bolts joining the two parts can be brought to full torque.

RIKON's lathe eliminates the need for this trick with two grub screws in the extension bed that can now be brought tight against a ledge

Continues on page 62 ...

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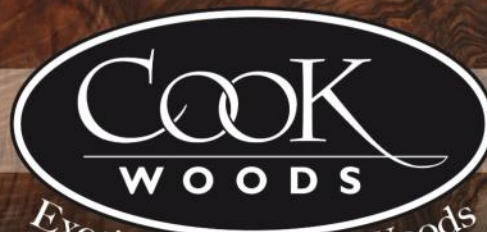
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Tool Review continued



Like many of the lathes, the RIKON's exterior sports a spindle speed chart.

RIKON 70-220VSR

Motor Size: 1hp
 Speed: 200-750 / 550-1,500 / 1,300-3,850 rpm
 Digital RPM Display: Yes
 Swing Bed/Banjo: 12½" / 9⅝"
 Center to Center Distance: 20" / 45⅝" with Extension
 Street Price: Lathe \$650 / Ext \$160 / Stand \$280 / Total \$1,090
 Web/Phone: www.rikontools.com / 877-884-5167



Two grub screws in RIKON's extension bed allow for easy alignment.



RIKON's 1"-diameter tool-rest stem provides greater strength and stability than the common 5/8" stem.

milled in the end of the main bed, guaranteeing no-hassle perfect alignment. This is a nice feature for furniture builders who may want to only install the extension bed when needed and save the space at other times.

The RIKON is also one of two lathes in this review with a 1"-diameter tool-rest (as opposed to 5/8" for most). This adds a huge amount of strength and stability to this most important lathe component. It also meant that I could use the tool-rests from my full-size ONEWAY and Powermatic lathes in these machines.

It had a very nice fit and finish with a surface-ground

bed, 3½" quill travel and a center-to-center distance of 20" (45⅝" with extension) that has me over the moon. Furniture makers can turn the back posts for rocking chairs with room left over. With good power and easy controls that make this lathe a pleasure to use, if price is a key factor for you, this lathe would be my first pick.

Rockler Excelsior

This is a 10" mini lathe true to the original concept of a mini lathe — a simple, portable lathe that works well and does not take up much space. It has all the basics: good fit and finish, decent controls and an induction motor

with five-step pulley speed control, for a very affordable price point. The banjo, tool-rest and tailstock levers worked easily.

Its small size and modest weight give it great portability and the ability to store easily when not in use. I know an avid woodturner who keeps an Excelsior in his motor home to turn at campgrounds. Like the Penn State Turncrafter Commander and the Steelex, it does not have reverse — which, again, in my opinion, is not very important.

With five speeds, anything within its capacity can be safely and efficiently turned. One advantage of step pulley speed control is that there is great low speed

Continues on page 64 ...

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Tool Review continued



Rockler Excelsior

Motor Size: 1/2hp
 Speed: 760 / 1,100 / 1,600 / 2,200 / 3,200rpm
 Digital RPM Display: No
 Swing Bed/Banjo: 10" / 7 1/4"
 Center to Center Distance: 17 1/4" / 37 3/4"
 Street Price: Lathe \$470 / Ext \$90 / Stand \$60 / Total \$620
 Web/Phone: www.rockler.com / 800-279-4441



The Steelex's surface-ground bed shows attention to quality.

torque, which is not the case with DC motor/controller equipped lathes. If your turning will be confined to miniatures or pens, you will be doing most of your work in the 1,600, 2,200 and 3,200 rpm belt steps.

Adding the \$90 bed extension would turn the Excelsior into an adequate lathe for all but the largest furniture spindles. The \$60 stand would make it accessible at any time. The Excelsior is a great lathe for a young aspiring turner or anyone wanting to turn miniatures or pens.

Steelex ST1008

Grizzly supplied this lathe from their Woodstock International brand as their Grizzly and Shop Fox brand models were sold out and unavailable at the time of the test. They wholesale the Steelex brand to woodworking resellers. It, along with the RIKON, is one of two that had surface-ground beds, rather than rotary ground, which can exhibit varying degrees of smoothness. It's doubtful that surface grinding makes a great deal of difference on a mini or

midi lathe, but it does show an interest in quality. Surface grinding made sliding the tailstock and banjo very smooth and pleasing. The rest of the construction of this lathe is very solid as well; it's got a nice fit and finish for its price range.

My two gripes about it: there is no scale on the quill, and the locking handles on the banjo hit either the bed or the tool-rest, so they need to be moved occasionally as situations change.

One of two mini lathes at an affordable price point included in this review, the Steelex is a great pen lathe or for a furniture builder with occasional turning needs.

Continues on page 66 ...

Steelex ST1008

Motor Size: 1/2hp
 Speed: 480 / 1,270 / 1,960 / 2,730 / 3,327 / 4,023rpm
 Digital RPM Display: No
 Swing Bed/Banjo: 10" / 7 1/2"
 Center to Center Distance: 15 13/16" / 38 1/16"
 Street Price: Lathe \$330 / Ext \$120 / Total \$450
 Web/Phone: www.woodstockint.com / 800-840-8420





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Tool Review continued



All of the lathes in this review had a sharp edge on the bottom corner of the bed ways. The author used a file to smooth this out.

Overall Gripes

A few gripes applied to all the lathes in the review. In the past, machinery from both Taiwan and the People's Republic of China typically had sharp edges that had to be filed off. While this is, in general, no longer the case, the exception on all of these lathes was a sharp edge on the bottom corner of the bed ways. Not only could this cut you, it often impeded smooth sliding of the tailstock. It was quickly corrected by a couple of licks from a smooth, single-cut mill file.

Also, all of the banjos had commercially available steel locking levers that screwed directly against the tool-rest stem. This results in Brinelling (denting/work hardening of the stem's surface) of

the stem, which, over time, results in constant slipping of the rest if extreme torque is not applied to the lever. A cam lock would be more expensive, but a much better option.

And, sadly, none of the lathes exhibited packaging that in any way could be termed green. Excessive plastic bags and crumbling molded Styrofoam™ were par for the course. I would urge all of these manufacturers to improve the greenness of their packaging.

Place of Manufacture

All the lathes reviewed were manufactured in Taiwan or mainland China. The lathes manufactured in Taiwan showed a discernible uptick in quality, but not so much as to make the Chinese machines at all unacceptable.

The centers supplied with all of the lathes except the COLT and the Turncrafter were nearly identical, leading me to think that they came from just two manufacturers, likely one factory in each country. The standard live center in this duo is clunky

and warrants immediate replacement. The live centers supplied with the COLT and the Turncrafter were of much better design and quality.

Conclusion

I am spoiled with having turned on big lathes for most of my life. While wonderful for large bowls or big spindles, it is a chore to move the big banjos when turning small items. It has been liberating to turn on smaller machines once again. You can literally flick the banjo and tool-rest to a new position with one hand. The experience has made me totally rethink big lathe snobbery.

Mini and midi lathes are commodities, and you get what you pay for. In Chevrolet versus Ford fashion, you get about the same quality between manufacturers at a given price point, and spending more usually gets you more. It is up to the buyer to parlay specific needs against machine features. The pen turner, bowl turner and furniture maker all have different needs and will want to trick out their lathe accordingly. The pen turner can buy a basic mini, the bowl turner will want a stout midi, and the furniture maker will want a mini or midi with a bed extension for generous between-center distances.

Ernie Conover is the author of The Lathe Book and The Frugal Woodturner.



Almost all of the live centers supplied with the lathes in this review were nearly identical, indicating that the components likely came from the same manufacturers (a common industry practice).

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Weekend Projects

Hanging Herb Garden

By Sandor Nagyszalanczy



My solution was to design a hanging herb garden comprised of seven half-octagon-shaped wooden planter boxes attached to a framework that can be hung from a deck railing, fence or even the sunny wall of a house or outbuilding (anywhere that gets six to eight hours of sunlight a day). The boxes are large enough to accommodate most kinds of common herbs (thyme, sage, basil, etc.) as well as other small plants or flowers; they're not really large enough for big,

You don't have to be a gourmet chef to know what tastes good. If you've used nothing but dry store-bought herbs to spice up your cooking, you'll be astonished at how much better foods taste when seasoned

with fresh, garden-grown herbs. But if you have a "brown thumb" like me, you're probably reluctant to plant a garden, lest you forget to water for a few days and find your formerly lush plants shriveled and dying.

shrubby plants. To prevent accidental "herbicide" (pun intended), I fitted a drip irrigation system complete with a programmable timer that waters the plants automatically — no more dead plants due to forgetfulness!

Getting Started

I fitted my hanging garden with seven planter boxes, but it's basically a modular design: You may choose to have more or fewer as per your available space and planting needs. You could also scale up the size of the boxes and framework, to accommodate larger plants or even vegetables. I built my project entirely from kiln-dried Western cedar, but you may substitute any wood you choose; preferably one that weathers well outdoors (redwood, white oak, black locust, cypress, ipe, etc.).

Building Jigs

Once I determined the overall dimensions of my seven half-octagon-shaped hanging planters, I used a free online compound angle calculator (jansson.us/jcompound.html) to determine table saw settings needed to cut the planter's tapered, beveled staves. Using the "N-Sided Box" option, I plugged in the desired number of



Use an electronic protractor or any precise angle gauge to set a bevel gauge to 96.1°: the required taper of the staves.



A spray-on CA accelerator quickly sets the glue applied to the "fence" strip on the first tapered stave cutting jig.



The tall fence strip on the second stave cutting jig (left) angles in the opposite direction than the fence on the first jig (right).



The third stave jig, which is used to cut staves in half, has a handle to make guiding the jig past the saw blade a safer process.

sides (8) and the planter's side angle, or degree of taper (15°), and the calculator showed the necessary blade tilt angle (21.7°) and miter angle (6.1°).

To cut the staves, I built three dedicated jigs. One jig is used to cut the beveled miter on one edge of a stave, and a second is used to miter/bevel the other edge. The third jig is used to split staves perfectly in half (these are used at the back edge of the planter). (Note that all my jigs and cutting processes are meant to be used on table saws with left-tilting blades; for right-tilt saws, you must reverse the slant of the fences on the jigs and cut the staves with the rip fence set to the left of the blade.)

To make the jigs, I first cut three pieces of $1/4"$ ply into $15" \times 6\frac{1}{2}"$ rectangles, making sure that all sides were square

to one another. To make the jig used for the first taper cut on each stave, I set a bevel gauge to 96.1° (the stave miter angle plus 90°). I use the bevel gauge to align a $1/4" \times 1/2" \times 12"$ straight wood strip lengthwise on one of the plywood pieces; this acts like a fence to align the stave blank during cutting. Cyanoacrylate (CA) glue on the back of the strip holds it in place. I then glued on a short stop strip, set square to the long strip and positioned about $2"$ up from the bottom end of the jig.

The jig used for the second cut on the staves is made just like the first, only the fence on this one is a $1/4" \times 7/8" \times 12"$ wood strip set up on edge (this taller fence is necessary because it must align the edge of the blank that's been mitered using the first jig). I aligned this

strip with my bevel gauge set to 111.7° and angled the strip in the opposite direction as the first jig's fence. This jig also has a short stop strip glued on at a 96.1° angle, relative to the fence strip.

Then the third jig, used for cutting staves in half, has a $1/4" \times 1/2" \times 12"$ straight fence strip glued on, aligned with the bevel gauge set to 96.1° and angled just as on the first jig. A $2\frac{3}{4}" \times 6\frac{1}{2}"$ piece of $1/2"$ plywood glued to the $1/4"$ plywood, located as shown in the photo (above, right), reinforces the jig. With a nod to safety, I used a handle attached to the lower left corner of the $1/2"$ plywood to make this jig safer and easier to use.

I cut all the staves from 1×6 stock (which is actually $3/4" \times 5\frac{1}{2}"$), as described in the sidebar below.

Cutting the Tapered Staves

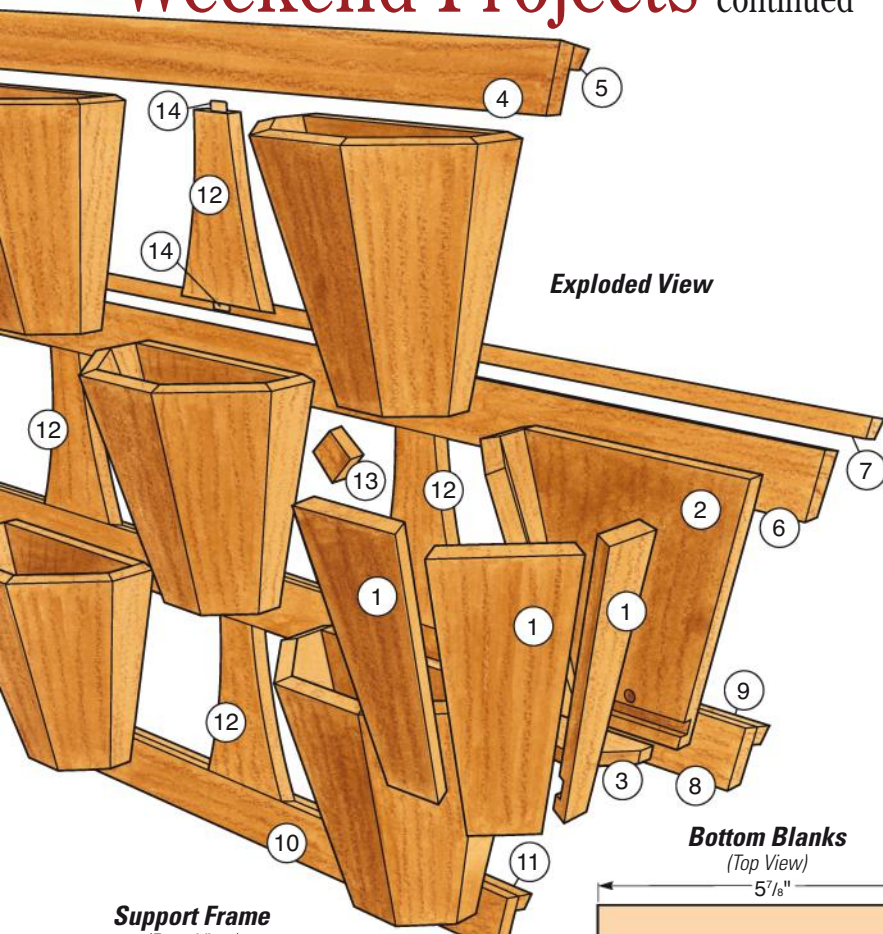


Start by cutting 28 stave blanks, each $11\frac{3}{8}"$ long. Tilt the blade on your table saw to the necessary 21.7° bevel angle, and set the saw fence so that the blade will just cut into the edge of the first stave jig. Now hold the blank firmly against the jig's fence and end stop, and cut the edge of the blank (left photo). Repeat this with all the other blanks.

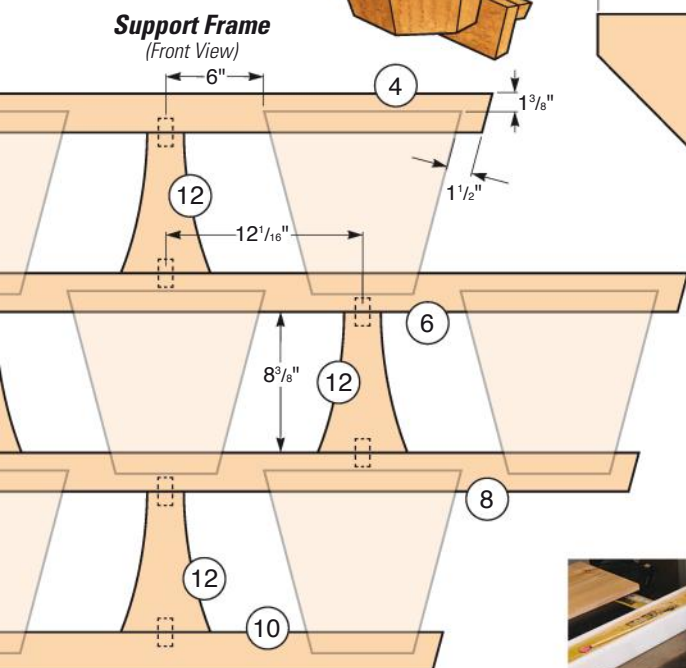
With the blade still tilted to 21.7° , set the saw's rip fence so that the blade just cuts into the edge of the second stave jig. Set one of the stave blanks into the jig, with the previously cut edge against the jig's fence and wider end against the end stop. Take a cut and then measure the top surface of the wider end of the stave. Reposition the fence, cut, and re-measure the stave. Repeat this until the stave's wide end is exactly $5"$ wide. Now cut the second edge of all the stave blanks (center photo).

Select seven staves to cut into half staves. Using the third jig, position a stave with its wider outside face placed down in the jig and its edge and end set against the fence and end stop. Secure the stave by taping the stave to the fence strip. Mount a thin-kerf saw blade in the table saw. Set the blade square and position the rip fence so that the blade is exactly centered on the stave. Carefully cut all seven staves in half in this fashion (right photo).

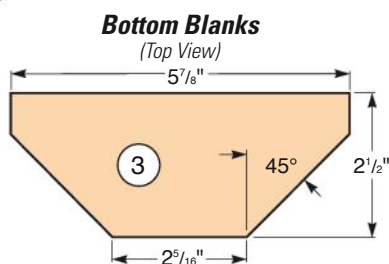
Weekend Projects continued



Exploded View

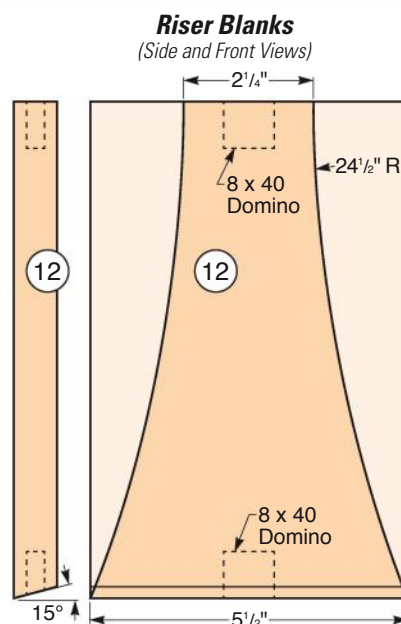
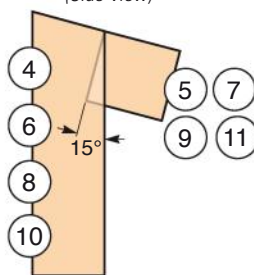


Support Frame
(Front View)



Bottom Blanks
(Top View)

Rails and Rail Cutoffs
(Side View)



Riser Blanks
(Side and Front Views)

Backs; Planter Glue-up

I made the planter backs out of 1x12 stock ($3/4" \times 11\frac{1}{2}"$), cutting seven blanks 11" long by $10\frac{5}{8}"$ wide. With the saw blade set square, miter both long edges of each blank at a 15° angle. Be sure to keep the wedge-shape cutoffs; you'll need them later.



Since the planter backs are larger workpieces, a cutting jig isn't necessary; use a miter gauge on the table saw set to 15° off square. Here the author has already completed the cut.

MATERIAL LIST

	T x W x L
1 Container Stave Blanks (28)	$3/4" \times 5" \times 11\frac{3}{8}"$
2 Container Back Blanks (7)	$3/4" \times 10\frac{5}{8}" \times 11"$
3 Container Bottom Blanks (7)	$1/2" \times 2\frac{1}{2}" \times 5\frac{1}{8}"$
4 Top Rail (1)	$3/4" \times 2\frac{3}{4}" \times 40"$
5 Top Rail Cutoff (1)	$3/4" \times 13/16" \times 40"$
6 Second Rail (1)	$3/4" \times 2\frac{3}{4}" \times 64"$
7 Second Cutoff (1)	$3/4" \times 13/16" \times 64"$
8 Third Rail (1)	$3/4" \times 2\frac{3}{4}" \times 58"$
9 Third Rail Cutoff (1)	$3/4" \times 13/16" \times 58"$
10 Bottom Rail (1)	$3/4" \times 2\frac{3}{4}" \times 34"$
11 Bottom Rail Cutoff (1)	$3/4" \times 13/16" \times 34"$
12 Riser Blanks (4)	$3/4" \times 5\frac{1}{2}" \times 8\frac{5}{8}"$
13 Spacer Block (1)	$3/4" \times 2\frac{1}{4}" \times 2\frac{1}{4}"$
14 Domino Loose Tenons (8)	8 mm x 40 mm

To assure the complete water-proof-ness of the planters, I glued them up using polyurethane adhesive. Start by placing three full staves, flanked by a pair of half staves outside-face-up, on a bench top covered with kraft paper or cardboard (to keep the glue off). After aligning the ends of adjacent staves, butt all the pieces together, then apply a length of $1\frac{1}{2}"$ -wide masking tape over each joint. Press the tape strips down firmly, then carefully flip the assembly over.

For polyurethane glue to set correctly, one half of each mating edge must first be dampened with water. Apply a thin bead of glue on the undampened edge of each joint, then flip the assembly over



1 With all three full staves and two flanking half staves butted together, press strips of wide masking tape down over each joint.



2 For polyurethane glue to set correctly, one half of each mating edge must first be moistened with a damp sponge.



3 Apply a thin bead of polyurethane glue to the unmoistened half of each joint, taking care not to apply too much, to reduce foaming.



4 After folding the taped assembly closed, clamp the planter around the tapered back, but don't glue it on at this time.

and fold the planter into its half-octagonal shape. Without applying any glue to it, slip one of the backs into place, set a pair of 15° cutoff wedges alongside the edges of the planter, and clamp the assembly together. To prevent the glue — which tends to expand into a foamy bead as it dries — from running down onto the back, flip the assembly over and set it aside to dry overnight.

Creating the Bottoms

The trapezoid-shaped planter bottoms are cut from 1/2" x 2 1/2" x 5/8" blanks. After planing some 1x stock down to 1/2", set your table saw's miter gauge to 45°. Clamp a stop to the gauge's head (or fence) so that a triangular piece will be cut off the corner of the blank. Flip the blank over and cut the other corner off the same edge. The resulting flat left between the cutoff corners should be

2 5/16" long (see the *Drawing*). After cutting all seven bottoms, round over the four corners (formed during triangle cutting) with a disc sander or rasp.

Next, I cut the dado that houses the planter's bottom into both the partially glued-up planter and its back. For this task, you'll need a router slot cutter set with a 1/2" diameter arbor and cutters wide enough to produce a 1/2"-wide dado. The pilot bearing mounted atop the arbor should be sized so the bit produces a 3/8" deep cut. With the bit chucked in the router table, set the bit's height so that its lower cutting edge is 1/2" above the table.

To help make the routing process safer and more controllable, I built a



To make cutting the trapezoid-shaped planter bottoms safer, the author holds the workpiece with a long dowel fitted with a pencil eraser.



A cradle fixture, built from three 15° wedges (top) and a few sticks, is spring-clamped to the planter assembly, to support and guide it as the slot for the bottom is routed with a slot cutting bit on the router table (right).

support cradle for the planter assembly. Take three of the 15° wedges (offcuts from the backs) and position them as shown in the photo below and clamp them to the planter with spring clamps. Now take three wood strips 3/8" thick and 2" wide and cut them to length so that they form a U-shaped skirt as shown, and nail and/or glue them to the wedges.

When you're ready to rout the bottom slots, clamp the planter into the cradle, making sure that the bottom lies flat on the router table. Rout carefully, working around the inside of the planter in a clockwise direction. Before routing the dados in the planter backs, reset the cutter's height to 3/8" (from bottom of bit to table) and position the fence face flush with the bit's pilot bearing. Run the backs, narrow end down, vertically past the bit.

With routing complete, press the bottoms into the dados in the planters and glue on the backs, using polyurethane glue as before. Apply glue to the tapered edges of each back as well as the back dado; it's unnecessary to glue the bottom



Weekend Projects continued

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MORE ON THE WEB



For videos on cutting tapered staves and installing drip irrigation, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



Once the small bottom piece is set into its slot in the planter staves, glue and clamp the back in place, using a pair of wedges as cauls.

into the dadoes in the staves. Clamp each planter as before, once again using the 15° wedges as cauls. Scrape or sand off the excess glue foam once the adhesive is completely dry.

Building the Support Frame

The next task is to build the frame that supports all seven of the planter boxes. Start by cutting the four horizontal rails from 1x4 stock (that's 3/4" by 3 1/2"), crosscutting each about 1" longer than the lengths shown in the *Material List* on page 72. Tilt your table saw's blade to 15° and rip a 2 3/4"-wide piece from each rail. Now take each rail's narrow cutoff, flip it around and glue it to the upper back edge of the wider piece using polyurethane glue (see the *Drawing*). This angled "L" shape gives the rails more strength as well as helping to shed rain and hide the drip irrigation lines. Trim each rail to final length, mitering each end at 15°.

Make the risers that join the rails next, by first cutting four 8 5/8"-long blanks from 1x6 stock. Bevel one end of each riser blank at 15° using either a

Festool Domino machine; if you prefer, you can use dowels or other joinery instead. Cut one mortise into both ends of each blank, centering it both widthwise and thickness-wise. Then cut matching mortises in the rails, locating them as shown in the *Drawing* on page 72. Now transfer the riser's curved shape onto each blank using the *Drawing* shown on page 72. Cut them out with a band saw or jigsaw and sand the curved edges smooth.

Assembly and Finishing

To assemble the support frame, apply polyurethane glue to all the mortises and loose tenons, slip each riser into place, and apply clamps, as seen in the photo below. Before leaving the assembly to dry, clamp a couple of long, straight boards perpendicularly across the front faces of all four rails, to assure that the entire frame is dead flat.

When you're ready to mount

the planter boxes, set the frame face-up on a bench or work table, making sure that all the rails are well supported. Set each box in place, spacing its top edge 1 3/8" from the top of the rail. Position the boxes horizontally as shown in the *Drawing*. Using a long 1/8"-dia.

drill bit (aka "aircraft" bit) chucked in a portable drill, bore two holes through each box's back near the upper corners, spaced about 3/4" down from the box's top edge. Secure each box with two #8 x 1 1/4" exterior-grade washerhead screws, which are preferable since they hold better in soft woods.

When all seven boxes are screwed on, flip the assembly over and secure the lower end of each box: Drill a pair of angled pilot holes and drive two screws



Stainless steel (the author's choice), brass or bronze screws are good options for this project; avoid regular zinc-plated screws, as they will rust.



Washerhead screws driven through the back of the frame rails secure both the bottom and top of each planter box.

through the rail into the planter's back. For additional strength, drive three more screws through the rails into the upper part of each box. To provide water drainage for the planters, drill a 1/2" hole through the rail and back of each box at the bottom. Finally, glue the spacer block that will support the main irrigation line to the back of the center planter box.

Continues on page 76 ...



The author used loose tenons, secured with polyurethane glue, to join the planter box frame's risers and rails together.

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Maple (Hard)	4/4...Select (N)	3.00	Select (W)	3.65	8/4	Select	4.50
Maple (Soft)	4/4	Select	2.60	8/4	Select	3.00	
Oak (Red)	4/4...1C	2.10	Select	2.80	8/4	Select	3.95
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Poplar	4/4...1C	1.30	Select	1.80	8/4	Select	2.00
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Western Red Cedar	4/4...2C+Btr	2.20			8/4	2C+Btr	2.50

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Installing Drip Irrigation



ONLINE
VIDEO!

With the hanging garden front-side-down on the bench, use a small backsaw or dovetail saw to cut a 3/4"-wide notch into the short angled portion of the bottom rail and the two rails above it. The notches, which are for the main irrigation line, should be horizontally centered on each rail.

Cut a 3½'-long piece of 1/2" irrigation tubing and seal off one end using a hose end clamp. Secure this main line to the center of the frame, sealed end at the top, using several 1/2" tubing support clamps. Add a fitting at the open end of the line for connecting to a garden hose or other water supply.

Next, using a special drip irrigation hole punch, punch holes in the main line. Insert a 1/4" double barbed connector into each of these holes, then press a length of 1/4" tubing into each connector. Now, fit the necessary barbed elbows onto the tubing. Drill seven 9/32" holes through the rails, one for each planter box. Feed 1/4" lines through these holes and fit each with 1/2-gallon-per-hour pressure compensating drippers on the end. Secure all the 1/4" lines to the back of the rails with 1/4" tubing support clamps.



For easier connecting, place the end of your tubing into hot water for about 10 seconds before pressing it into the connector (elbow, dripper, etc.).



Holes drilled through the frame rails allow tubing to pass through and feed individual drippers, each positioned slightly above the rim of the planter box.

Drip Irrigation Supplies

4 ft. 1/2" tubing	(8) 1/4" tubing support clamps
(5) 1/2" tubing support clamps	(7) 1/4" barbed connector fittings
(1) 1/2" hose end clamp	(6) 1/4" barbed elbow fittings
(1) 1/2" to garden hose (or tubing) connector fitting.	(7) 1/4" 1/2-gallon-per-hour pressure compensating drippers
20 ft. 1/4" tubing	(1) 1/4" drip irrigation hose punch

To protect the hanging garden from the ravages of sun and weather, I applied a coat of Thompson's Water-Seal® to all wood surfaces, including the frame backs and insides of the planter boxes. To even up the color of the cedar,



You can find basic instructions for installing drip irrigation in the sidebar above; for more complete instructions, see my online video.

To use the drip irrigation system after install, hook the hanging garden's main line to an outdoor water faucet with either a garden hose or 1/2" tubing (you may need to install a pressure regulator and/or anti-siphon device on the water line as well; consult your local garden center or drip irrigation literature for more information). In lieu of manually turning the water on and off, it's advisable to use a drip irrigation

I chose an amber-tinted transparent sealer, but any good outdoor wood finish will do just fine.

Installing Drip Irrigation

A complete drip irrigation system in his hanging herb garden gives the author confidence that the herbs and flowers he's planted will always be properly watered.

water timer. Most models allow you to set the length of time the water will be turned on as well as how many times a week to water.

Installation and Planting

Once you've chosen a location for your hanging herb garden, screw the top rail to a sturdy member, such as the top rail of a deck or fence, using stainless steel, brass or bronze screws. Also secure the bottom and/or middle rails, using spacer blocks, if necessary.

Once screwed in place, you're ready to plant your herbs. Put a handful of pea gravel in the bottom of each planter, to provide a drainage layer, then fill the planters with potting soil and add the plants of your choice.

One last suggestion: Save your jigs, support cradle and other supplies from this project. I predict that once your family and friends see your hanging herb garden, they're going to want one, too.

Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and contributing editor to Woodworker's Journal. His books are available at Amazon.com.



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Rockler's *Dust Right® Shop Vacuum Hose Reel* mounts to the wall and holds up to 40' of standard 1½"-diameter shop vacuum hose (enough to reach all corners of a two-car garage). It fixes the problem, according to vice president of product development Steve Krohmer, of "maneuvering a shop vacuum around obstacles in your shop or garage. The vacuum or the cord gets caught, and if you give it a yank, the vac tips over or the cord comes unplugged." With the Hose Reel, "you can reach your entire area without having to wrestle with your hose vacuum." Connect to a 2½" hose with the port on the outside of the Hose Reel, or to 1½" hose with the port on the interior of the reel. A tensioning knob allows the user to control the rate of unwinding, while mounting holes on top and bottom let you attach it to the wall with the handle for rewinding on whichever side you prefer. A retainer strap prevents the hose from disconnecting once it's fully unwound. The Dust Right Shop Vacuum Hose Reel (item 52542) is priced at \$149.99.

JET's new *JWDS-1836 Drum Sander* is a mirror of the previously released JWDS-1632 open-ended Drum Sander, but with more capacity: the new JWDS-1836 can handle workpieces up to 36" wide. Features include a tool-less



Rockler Dust Right Shop Vacuum Hose Reel

conveyor belt, parallelism adjustment, a depth scale on the drum height adjustment handwheel and an advanced dust hood design. Infinite variable control produces conveyor feed rates of 0 to 10 fpm. The sander's open-ended design allows the JET JWDS-1836 to sand workpieces up to 36" wide by making two passes. The machine sands material from 1/32" to 3" thick and can safely handle pieces as short as 2¾". Measuring 5" in diameter, the extruded-aluminum drum is self-cooling to prevent heat damage to the workpiece or abrasive. A 1¾hp (15 amp), TEFC single-phase motor turns the sanding drum at 1,720 rpm.

The conveyor belt is driven separately by a direct-drive, DC motor. This combination provides both consistent sanding power and fine control of conveyor speed. There's also a redesigned dust collection hood with an integrated channel that mirrors the shape of the drum. It directs dust, chips and debris to the 4"-diameter dust port on top of the sander's hinged hood. The steel stand has a 20" x 37" footprint. JET's JWDS-1836 Drum Sander with Stand (model 723530K) is priced at \$1,397.

JET JWDS-1836
Drum Sander





BLACK+DECKER 20V
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MOUSE Sander

BLACK+DECKER's MOUSE is now cordless, their first-ever cordless sander. The 20V MAX* Lithium Ion MOUSE® Sander has a speed of 12,000 orbits per minute for quick debris removal. A two-position grip allows for ease of use, while the compact 6½" height and 9" length provide maneuverability in tight spaces. For sanding hard-to-reach spaces, a detail finger attachment is included with the 2.59-pound tool. Dust collection is also included. The 20V MAX* Lithium Ion MOUSE Sander has a suggested price of \$59.99.

Freud has introduced a new series of *CNC router bits* specifically designed for smaller CNC machines. "We recognized the fast-growing trend of CNC usage among both woodworkers and makers, and that there weren't any application-specific router bits for them," said Russell Kohl, Freud



Freud CNC
Router Bits

president and CEO. Included in the new line are seven new bits and two new sets, a general purpose set and a signmaking set. V-groove bits are carbide-tipped, while ball-nose up-cut spiral, tapered ball-tip, up-spiral, down-spiral, engraving V-groove and O-flute straight bits are solid carbide, using Freud's TiCo™ material. The bits also feature Perma-SHIELD® non-stick coating. Pricing for the general purpose set is approximately \$150 and for the signmaking set \$200; individual bit prices range from \$22 to \$45.

A new product from **WD-40**, the *Specialist Spray & Stay Gel Lubricant*, is a gel-like formula engineered with self-healing technology that softens to lubricate when there is friction. When the friction stops, it solidifies again to prevent rust and corrosion for up to one year. The no-drip, no-mess lubricant is designed for vertical surfaces and moving parts like chains and cables where lubrication needs to stay put. According to WD-40 Company vice president of research and development Dr. Ernest Bernarducci, the Spray & Stay Gel Lubricant provides 12 times

longer-lasting protection than the familiar WD-40 Multi-Use Product. The company is confident enough in the product, VOC compliant in all 50 states, that they are offering a 100% money-back guarantee. The 10 oz. can sells for \$10 or less.

The *Table Saw Small Parts Sled* from **Rockler Woodworking and Hardware** solves the problem of small pieces being nicked and flung across the shop by a spinning saw blade. Instead, a drop-off ramp allows cut pieces to gently fall away from the blade onto the sled's melamine-coated MDF platform. The platform also includes front and rear fences with universal T-tracks running the length of the fences for attaching stops and the clear blade guard. A T-track perpendicular to the fences secures hold-downs. A safety stop with expandable miter bar is included; when positioned at the front of the saw, it prevents the sled from being pushed far enough that the blade would extend beyond the blade guard. The Rockler Table Saw Small Parts sled (item 55916) is priced at \$69.99.



WD-40 Specialist Spray
& Stay Gel Lubricant

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MORE ON THE WEB
For videos demonstrating featured tools, plus .tap files for a table project using the Freud CNC router bits, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

Rockler Table Saw Small Parts Sled



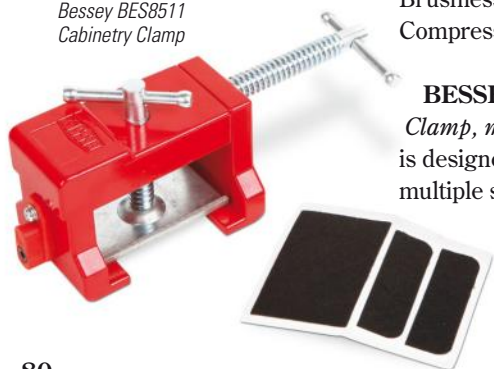
What's In Store continued



RIDGID R0230 18-Volt Brushless Compressor

RIDGID has introduced an industry-first *Brushless 18-Volt Compressor, the R0230*. The compressor has a dual power draw that allows it to run off either one or two RIDGID 18-volt batteries for an extended runtime, driving up to 1,200 brad nails on two 5 amp-hour batteries. The one-gallon tank size makes the compressor portable, while a locking regulator knob prevents unwanted pressure changes. The R0230 18V 1 Gallon Air Compressor has a maximum psi of 120, a decibel rating of 77 dBA and oil-free lubrication. A 1/4-turn ball valve allows the tank to be drained quickly with one turn, and two universal push-to-connect couplers accept both 1/4" automotive and industrial plus with a single-hand connection. Suggested price for the R0230 Brushless 18V 1 Gallon Air Compressor is \$199.

Bessey BES8511 Cabinetry Clamp



BESSEY's new *Cabinetry Clamp, model BES8511*, is designed to combine the multiple steps of face frame installation into one process. The clamp works on

Infinity Cutting Tools Precision Setup Blocks



stiles 1½" to 2" and up to 1¼" thick, allowing you to tighten, align, pre-drill and fasten the stiles while the clamp is held in place. An integrated pilot-hole drilling guide on one end flips out of the way so you can drive screws to connect the cabinets without removing or repositioning the clamp. Non-marring felt pads for the clamp faces and alignment plate protect and cushion points of contact. The clamp has a 2" jaw width, 2" throat depth and maximum opening of 4". Clamping strength is 300 to 600 pounds. Suggested pricing for the BES8511 Face Frame Cabinetry Clamp is \$24.99. Clamps are sold singly.

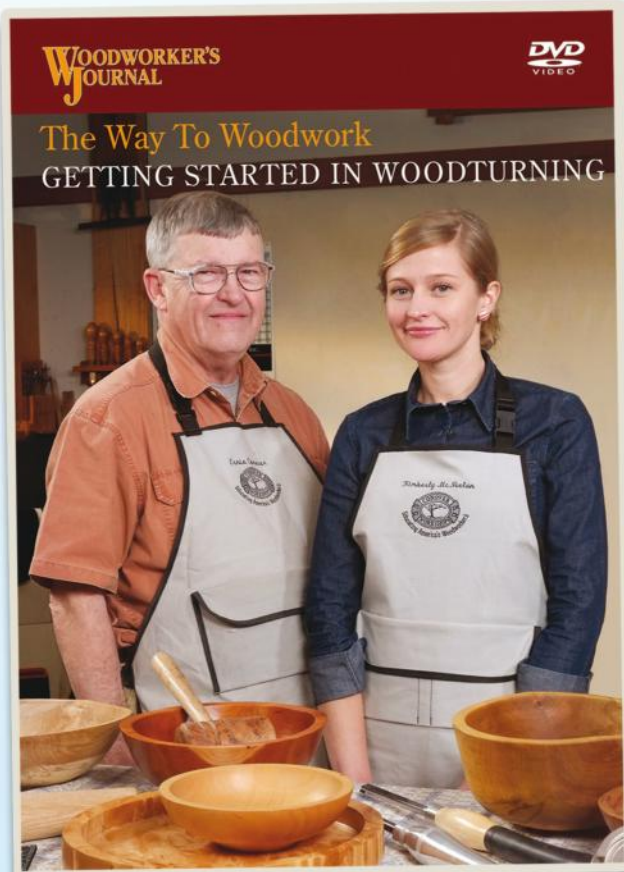
The *Precision Setup Blocks* from **Infinity Cutting Tools** are a set of seven ¾" x 4" long blocks in 1/16", 3/32", 1/8", 3/16", 1/4", 1/2" and 3/4" thicknesses, plus a "1-2-3" block. The idea is to use the blocks when setting bit and blade heights or fence locations: the first seven blocks provide a range of measurements from 1/16" through 1¾", with the "1-2-3" block adding additional 1", 2" or 3" capacity for tool setups. Block thicknesses are accurate to +/-0.002". A chart



included with the set helps you select the correct block combinations for specific measurements. The blocks have a black finish with white, laser-etched scales and an inch scale along one edge and end to allow each setup block to be used as a 4" rule with 1/32" markings. The 8-Piece Precision Tool and Project Setup Blocks set (item 100-075) has a suggested price of \$99.90.

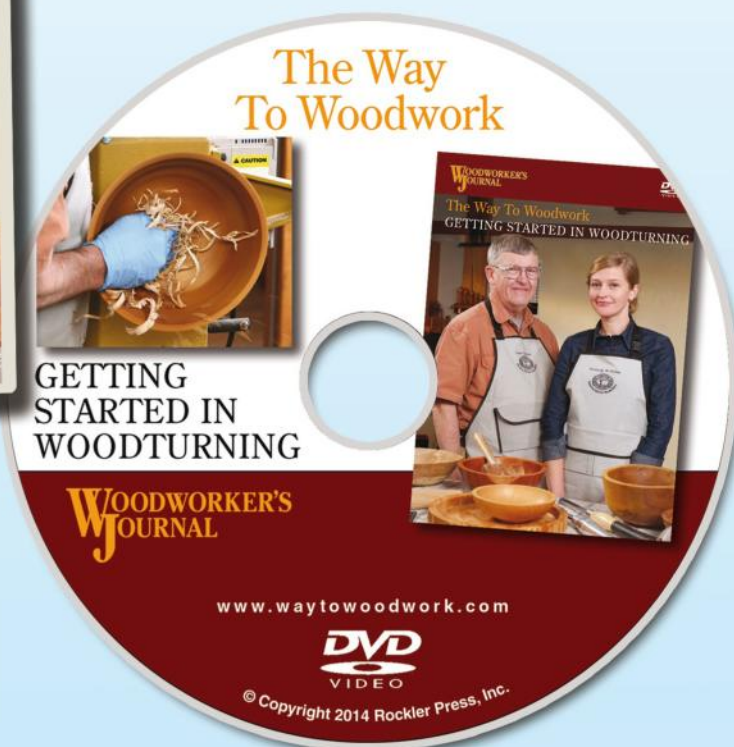
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Finishing Thoughts

Lingering Questions

By Michael Dresdner

Our expert tackles some of the questions raised by readers in response to previous articles on finishing topics.



Paraffin wax, available in the canning section of your grocery store, is a great sealer for end grain cutting boards.



Michael Dresdner

is a nationally known finishing expert. He shares his expertise on the DVD *The Way to Woodwork: Step-by-Step to a Perfect Finish*, available through the store at woodworkersjournal.com.

We're heading into summer, when many of us start spending more time in the shop. Before we launch into new projects, it's a good idea to clean up any lingering finishing questions. Here are a few that came in recently regarding previously published information on finishing.

Questions on "Kitchenware Coatings" Finishing Thoughts from November/December 2016:

QI've been treating end grain walnut cutting boards with mineral oil. Twenty-four hours later, I seal the boards with a 4:1 hot mineral oil/beeswax mix and let it dry 24 hrs. What do you think if I soak the

end grain with linseed oil and, in 48 hours, seal it with the hot mineral oil/beeswax mixture?

Mike Dziedzic
Sonoma, California

AI'd bypass the mineral oil altogether, and instead go with paraffin, which is the traditional method of sealing end grain butcher block. Here's why:

Mineral oil is a non-drying oil; it will never dry. Mix it with wax, and you create a gooey wax that will never harden well.

While boiled linseed oil will cure to a solid, it would take many applications and a lot of drying time to seal the end grain enough to keep food juices from seeping in. Adding a gooey wax

mixture atop it will make matters worse.

Instead, use a vegetable peeler to make shavings from blocks of paraffin, which you'll find in the canning section of the supermarket.

Melt the shavings, then brush the hot liquid wax liberally onto all surfaces. When the wax cools and solidifies, remove the excess by scraping it with a dull card scraper or a plastic credit card. The paraffin remaining in the end grain pores will block food juices and will make the board easy to clean.

QI switched from tung oil finishes to pure tung oil for bowls and kitchen utensils. I diluted the first two coats with 25% mineral spirits and went full strength on subsequent coats, but the finish does not go on evenly. Should I add something to the mixture, or change my technique?

Marty Mandelbaum
Mount Sinai, New York



Tung oil is a good choice for finishing kitchen utensils, and it will absorb more evenly when applied liberally with a nylon pad at full strength.

Let the tung oil soak in for about 10 minutes, then wipe it all off and let the piece you've applied it to dry for a few days before putting it to use. Dispose of the rags properly.

A Tung oil, like linseed oil, penetrates superbly without thinning. Soak wood with it full strength, and it will absorb more evenly and be saturated in one application.

Using a nylon pad, scrub undiluted oil into the wood liberally, let it sit and soak in for 10 minutes or so, then wipe it all off and let it dry for

a few days before putting the parts into service.

Questions on "Nearly Natural" Finishing Thoughts from January/February 2017:

Q About 40 years ago, I stained birch paneled doors using "acid base stain," which was available both pre-

mixed and as a water-soluble powder. I can't seem to find it in paint stores. Where can I get these dyes?

Lanny Zwan
Belfair, Washington

A Though it is not a standard industry term,

Continues on page 84 ...

Contact us

with your finishing questions by writing to Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340, or by emailing us at:

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Please include your address, phone number and email address (if you have one)

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Finishing Thoughts continued



Today's dye options are an improvement over the past. Available in a wide range of colors, they can be mixed to create even more options.

my guess is that these were aniline dyes, most of which, except for the blue tints, were slightly acidic when mixed. Today we have much better dyes. I'd suggest the Homestead TransFast® powdered dyes, or their Trans-Tint liquid concentrates. Most Rockler stores carry them, or you can get them at homesteadfinishingproducts.com.

They are ready to mix with water to whatever intensity you desire, and they come in a wide range of colors, which you can intermix to create even more colors.

Q In your February 2017 article on "Nearly Natural," you recommended boiled linseed oil on curly maple to enhance the grain. I put linseed oil on maple and burl veneer test pieces and let them dry for four days. On one test, I added General Finishes top coat, but after four more days it remains sticky and tacky. What should I do?

Fred Stone
Livonia Michigan

A First, check that you have boiled linseed oil, not raw linseed oil. Boiled linseed oil, flooded on and wiped off, should dry com-

pletely in two or three days. Raw linseed oil will take one to two weeks. If the can says "boiled linseed oil" but the oil is not drying, buy a new container.

Second, if you add a top coat, which is optional, use an oil-based one (Danish oil, oil-based-polyurethane) and not a water-based one. General Finishes makes both, and you did not specify which you used. Also, make sure the oil is fully cured before going over it with something else and that your top coat is not out of date.

Third, look to your environment. Very cold or wet air will substantially extend cure time in drying oils and oil-based varnishes. They are like cats; they prefer a warm, dry place.

Question on "Inlaid Picture Frames" from Weekend Projects, November/December 2016.

Q In your December 2016 issue, there is an article about mixing dyes with two-part epoxy to create inlays. It does not specify either water-based or solvent-based. Which should I use?

Jeff Kelly
Worcester, Massachusetts

A People have gotten away with coloring epoxy with both water- and solvent-based dye, but the manufacturers disagree on how wise that is.

System Three® Epoxy suggests using their "epoxy paste pigments," available online for about \$12, as the best way to color epoxy. www.systemthree.com/blogs/



Replacing some of System Three's Part A with color paste is one way to color epoxy.



The next step is to add an equal amount of Part B to the colored Part A. A scale helps you be exact.

epoxy-files/83510596-epoxy-paste-pigments.

These colorants are made of the same material as Part A of the epoxy. That means you can replace any amount of Part A with color paste, then add Part B based on the total amount of your Part A mixture (clear plus color). Use more for opaque colors, or a tiny amount for translucent colors.

That's the best choice, since anything else can result in unpredictable or uneven color, and can weaken the epoxy. However, I've added both solvent and water-soluble dye powders, gel coat pigments (available at marine supply stores), and finely ground pigment powders, such as Mohawk Blendal® touchup powders, all with more or less acceptable results. If you go that route, keep the added colorants below 5% by volume, and test the mixture first for curing and color consistency, since not all epoxies will do well with these additives.



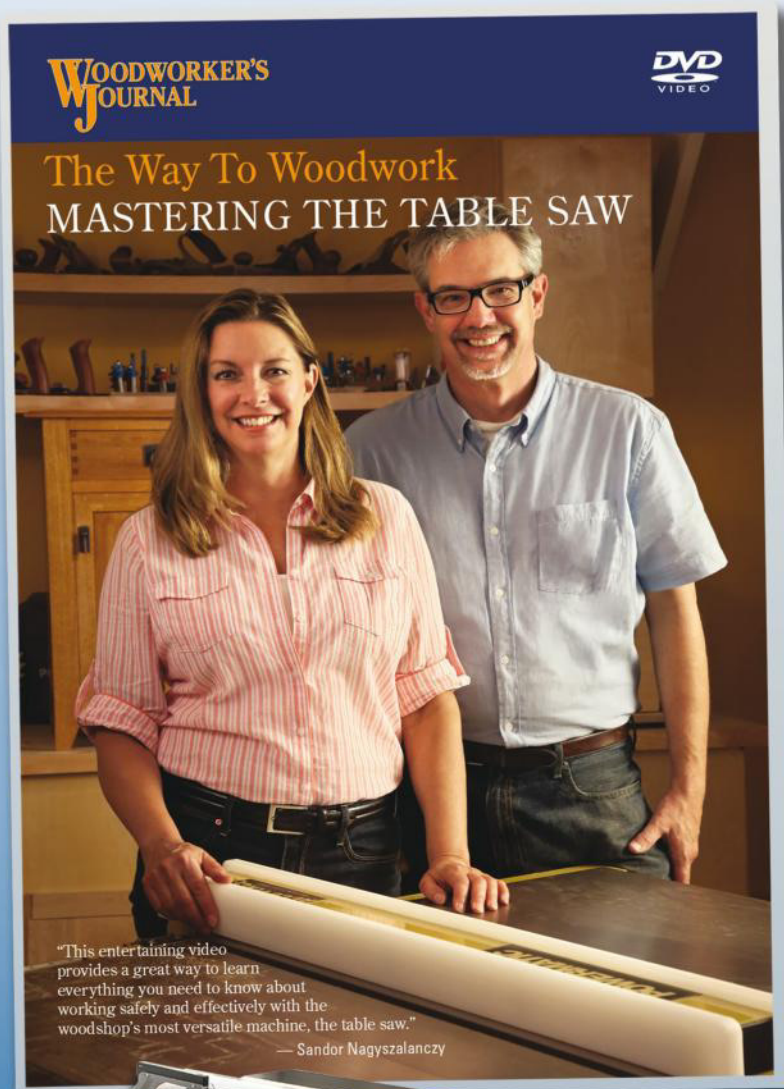
Boiled linseed oil takes two or three days to dry. Raw linseed oil can take one or two weeks.



A thermometer and hygrometer indicate if the area is warm and dry — the way oil finishes like it.

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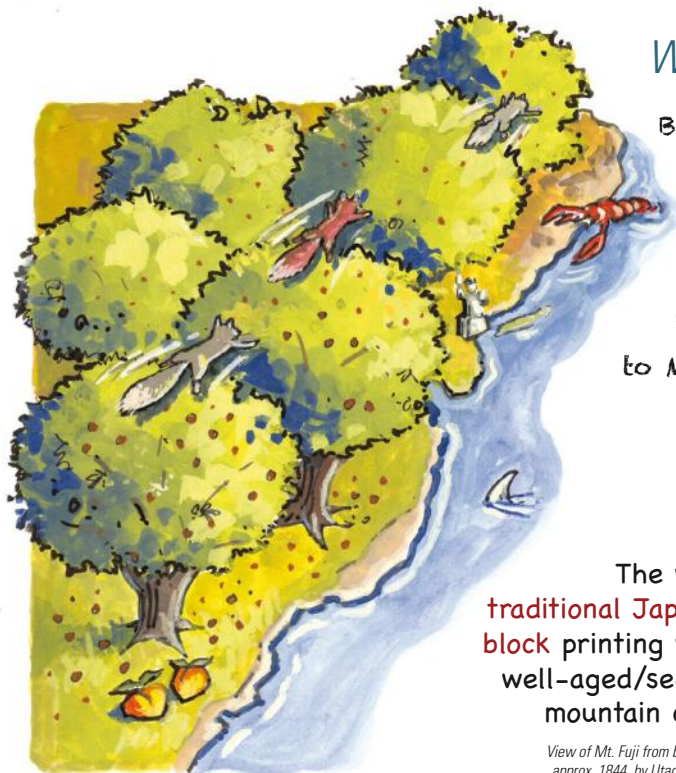
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HEY Did You Know?



Woodworking trivia: jumping-off points

Before the devastation of the American chestnut (*Castanea dentata*) due to the chestnut blight discovered in 1904, the **species dominated the Appalachian forest canopy**. According to legend, a squirrel could travel from Georgia to Maine jumping between chestnut trees, without ever touching the ground.

The wood used in traditional **Japanese wood-block** printing was typically well-aged/seasoned white mountain cherry wood.

View of Mt. Fuji from beneath the Shin Ohashi Bridge, approx. 1844, by Utagawa Kuniyoshi. Photograph © Asian Art Museum of San Francisco.



What Does It All Mean?

A quick guide to terms from the world of woodworking.

Bullnose: The rounded-over edge of a piece of material used as a finish detail; also, a hand plane or router bit used to create such an edge in wood

Face frame: The front of a cabinet consisting of vertical stiles and horizontal rails, to which the doors and drawers are attached

Coated abrasives: Products such as sandpaper in which gritty material is adhered to a flexible backing

Sister Lillian Barlow was the last of the Shaker chairmakers. She ran the Mount Lebanon Woodworking Company along with Brother William Perkins. After her death in 1942, the Shaker chairmaking industry ceased.



Shaker Museum / Mount Lebanon, Old Chatham and New Lebanon, New York

Submit your own trivia ...

Send in a curious fact about your favorite topic and ours: woodworking. If it is selected for use, you will win an awesome prize!

Submit your Trivia to Woodworker's Journal, Dept. Trivia, 4365 Willow Drive, Medina, MN 55340. Or send us an email: trivia@woodworkersjournal.com

Your Trivia Test:

QPlace the various types of shellac in order by level of refinement.

Answer The order (from least to most refined) is: stick (branch) shellac, seedlac, 'button lac, flake shellac, dewaxed shellac, bleached shellac.



Tracee Imai of Wexford, Pennsylvania, will receive a **BESSEY K BODY REVO Parallel Clamp Kit** for having a contribution selected for the Trivia page.

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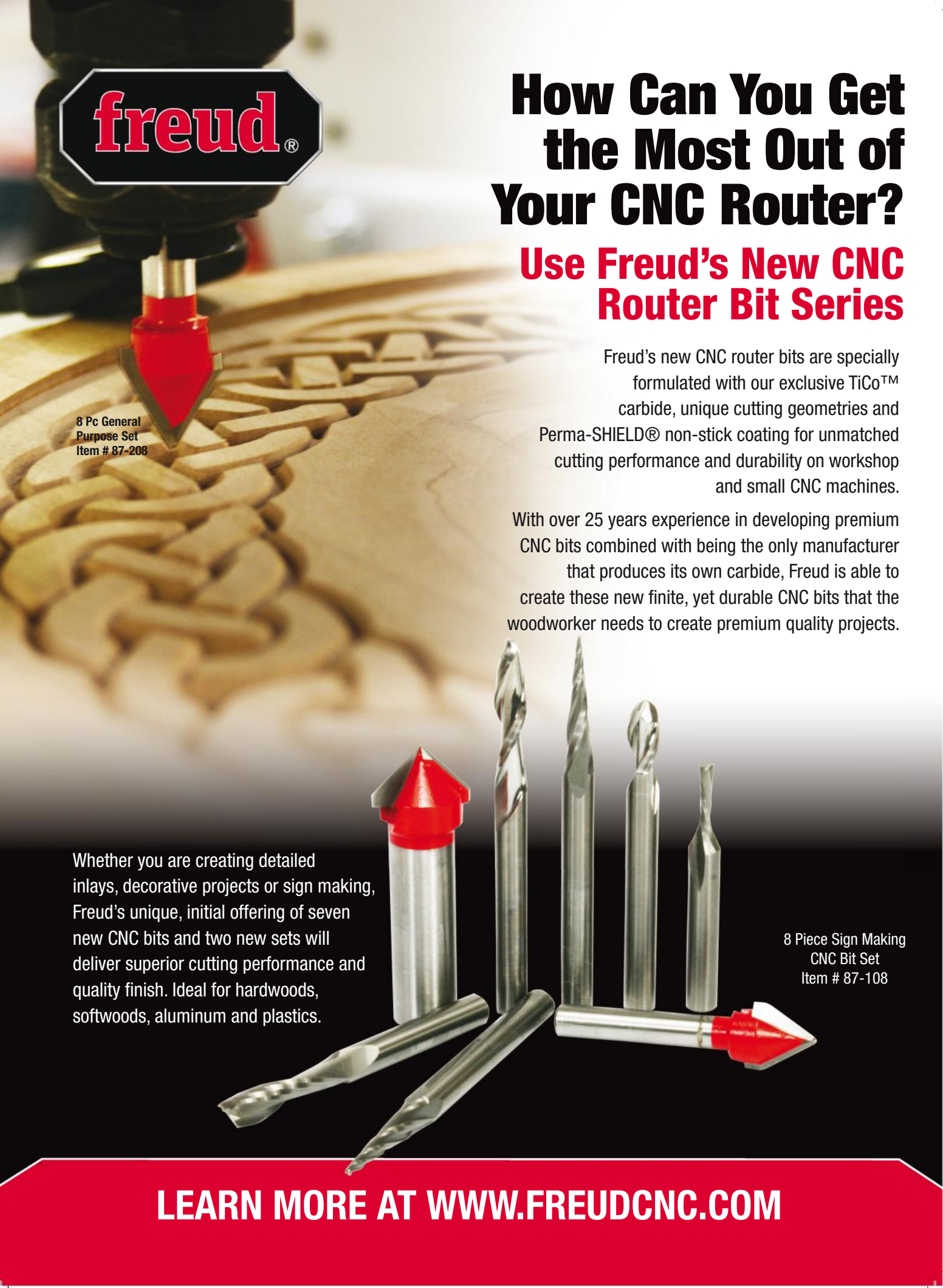
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