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WOODWORKER'S JOURNAL

CONTENTS

FEBRUARY 2020

VOLUME 44, NUMBER 1

PROJECTS



Raised Panel Cabinet

By WJ Staff

Here's a handsome case goods project offering a practical refresher in basic cabinet construction.

Page 36



Folding Shop Desk

By Jeff Jacobson

If workshop counter space is in short supply, this tip-up desk provides a landing pad for your laptop or shop notes and, of course, your favorite beverage.

Page 30



Making Dominoes with a CNC Router

By Rob Johnstone

Fire up your CNC router and download our free .tap files — or use a template and a drill — to make custom domino sets from lumber scraps and veneer.

Page 58



Tool Chest

By WJ Staff

Follow through on your 2020 resolution to get the shop better organized: this two-drawer tool chest with interlocking drawer inserts and trays can help.

Page 42

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DEPARTMENTS



8 From Our Readers/Stumpers
Auger bit workaround; live-edge lumber survey. Plus, the likely frequency of October's mystery tool.

16 Tricks of the Trade
Sticky advice for setting band saw blade guides and insulating card scrapers. Hardware marking tip.

18 Shop Talk
Women's Woodshop creates a maker space for all. Rockler's IG bent wood contest results.

22 Woodturning
Turning tall hollow forms is safe and fun with the correct lathe accessories and some expert advice.



48 Tool Preview
Laguna launches new Fusion F2 hybrid table saw. Our publisher shares first impressions.

52 Tool Tutorial
A look at today's router dovetail jigs — the powered alternative to sawing and chiseling.

62 What's In Store
Compact options for drum sanding and a DVR drill press; more vac adapters for small power tools.

64 Six Simple Finishes
Two easy wipe-on solutions and a recipe that capitalizes on the beauty of highly figured wood.



66 Hardworking Woods
Spotlight on black cherry: a North American lumber hero for cabinets, carving, turning and more.



You have questions ... and we (probably) have the answers

When you combine all the woodworking-based publishing experience mastered by art director Jeff Jacobson, senior editor Chris Marshall and publisher Rob Johnstone, it comes to more than 80 years (plus that awesome facial hair!).

Why does that matter? The answer is that when we publish a story, answer a question or design a project, you can trust that we know what we are talking about. While it might be fun to see folks online trying to figure out how to build a cabinet or learn a technique, we can demonstrate those skills with confidence, seasoned with fun and a bit of humility. And with that woodworking knowledge, we can also communicate those skills with clarity and respect. We're here for you ... let us know what you need.



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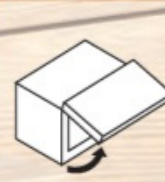
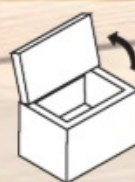
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FROM OUR READERS

New Year's Greetings



THANK YOU FOR YOUR READERSHIP

Without a doubt, this new turn of the calendar is not my first rodeo. In fact, I am clearly competing in the senior division now. Even so, that does not diminish my appreciation for all of you who read *Woodworker's Journal*. It is our privilege to be invited into your homes and to be given the grace to share our love of the craft of woodworking with you. It is a blessing and a challenge that we take seriously.

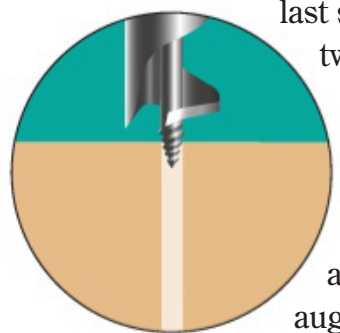
With that in mind, I want to draw your attention to a few "inside baseball" changes to our magazine for 2020. We have gently reconfigured what we refer to as "the front of the book" and combined a few departments together into what we now will be calling "From Our Readers." You'll still find reader letters, questions answered and things like our Stumpers content; it will just flow together a little bit. But you will also find some reader-supplied trivia and survey responses. We now will be featuring a recurring page on different wood species at "the back of the book" as well, and we've tweaked our finishing department, too. If I had not pointed all of this out, you may not have noticed — but even if that is true, let us know what you think.

— Rob Johnstone

LETTERS

Auger Bit Improvisation

In the August 2019 issue's *Letters*, Ernie Conover responded to Dean Shipley about the lack of a source for brad point auger bits. I would like to add another resolution to the problem: use a brad point bit that is a size smaller than the largest part of the screw point to drill a pilot hole for the auger bit. Then, maybe just allowing the



last screw thread or two of the auger bit to follow the pilot hole, it would actually be as efficient as a brad point auger bit without the full pull of the complete screw point. I hope that this also could be an alternative to removing or damaging the bit's screw point.

Jim Sholtis
St. Louis, Missouri

Perfect Square Corner on Ply?

How do I cut an absolutely square corner on a piece of 36" x 36" Baltic birch plywood? I want the corner to not be "good enough" or "close" but rather as perfect as humanly possible to 90-degree square. I have a sliding compound miter saw and a table saw. Suggestions?

Rich Flynn
Huntington Beach, California

Rob Johnstone Responds: Rich, my friend, at first blush this sounds like more of a philosophical question than a woodworking query. When you think about it, the term "as perfect as humanly possible" is so key regarding the answer. As I am often told, I am far from perfect. And getting back to my first point, how "square" is square? (The first step in any philosophical discussion is to challenge the premise!)

Continues on page 10 ...

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FEBRUARY 2020

Volume 44, Number 1

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

Woodworker's Journal (ISSN: 0199-1892), is published in February, April, June, August, October and December by Rockler Press Inc., 4365 Willow Dr., Medina, MN 55340. Periodical postage paid at Medina, Minnesota and additional mailing offices. Postmaster: Send all address changes to *Woodworker's Journal*, P.O. Box 6211, Harlan, IA 51593-1711. Subscription Rates: One-year, \$19.95 (U.S.); \$28.95 U.S. funds (Canada and other countries). Single copy price, \$7.99. Reproduction without permission prohibited. Publications Mail Agreement Number 0861065. Canadian Publication Agreement #40009401.

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February 2020 *Woodworker's Journal*

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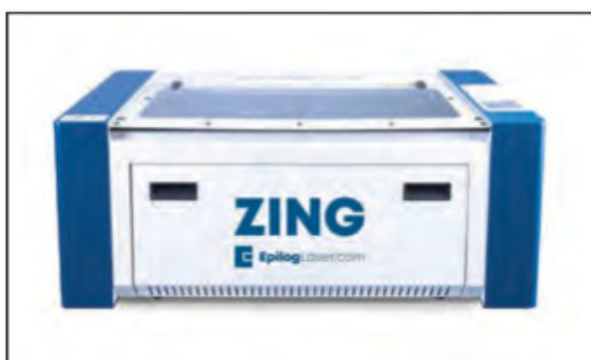
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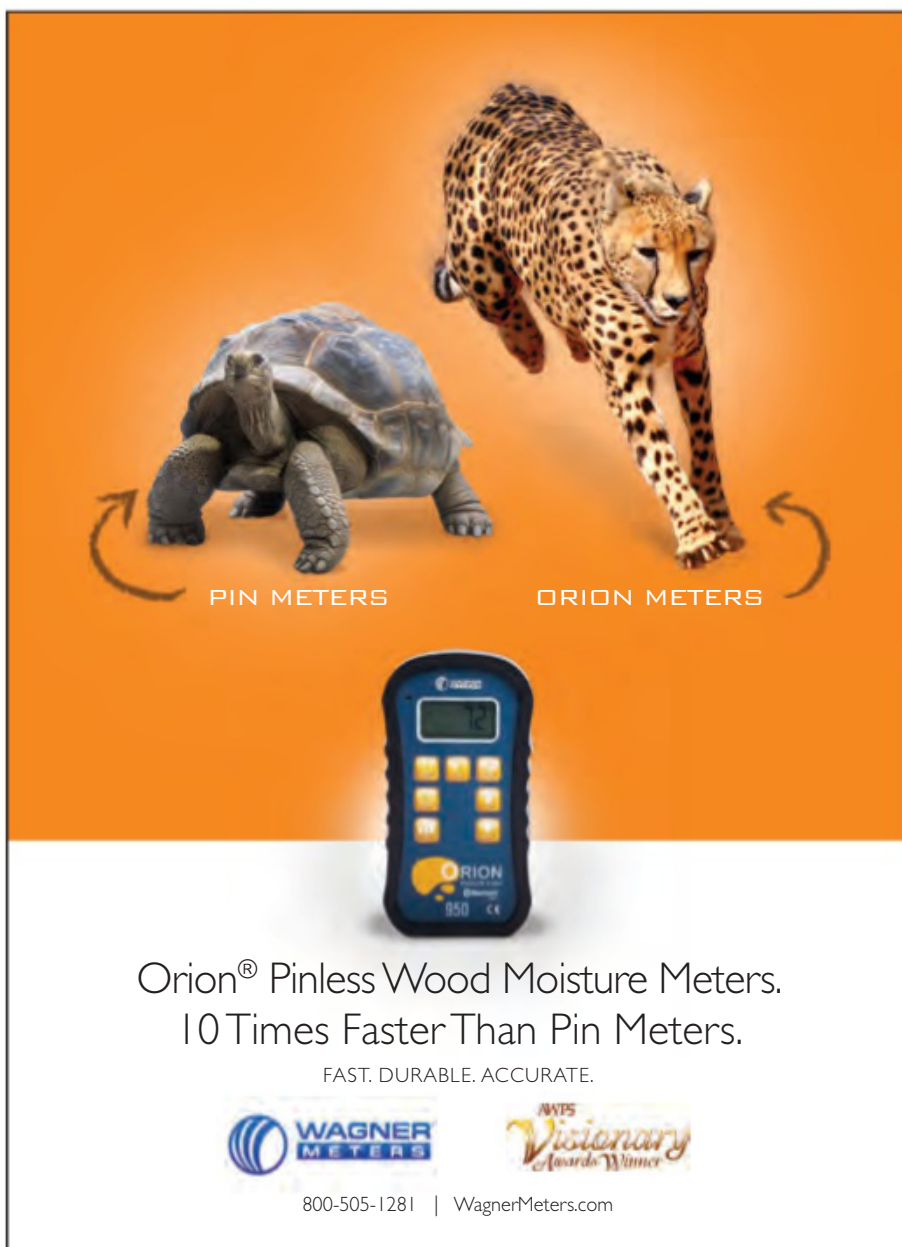
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If you subscribe to the theory that a tool only needs to be as good as its function, then you likely also agree that a bookshelf need be nothing more than cinderblocks and 2 x 12s.

—John Economaki

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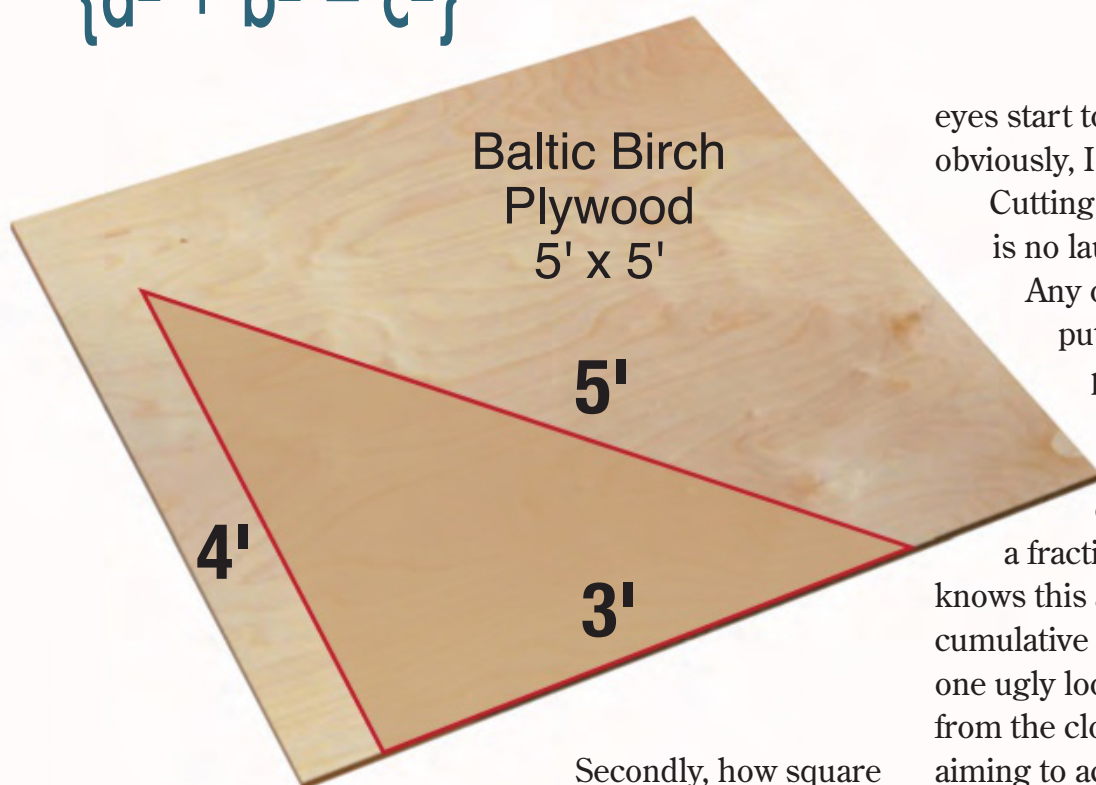
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$$\{a^2 + b^2 = c^2\}$$



A perfect 90-degree corner: is it possible? Is it desirable? Is it required? We offer advice — both germane and geometric — regarding this very subject.

Baltic Birch Plywood
5' x 5'

5'

4'

3'

Secondly, how square does something need to be? I've been a woodworker for over 40 years now, and generally when someone starts talking to me about measuring something to a 32nd or a 64th of an inch, my

eyes start to glaze over. But obviously, I digress.

Cutting accurate angles is no laughing matter.

Any of us who have put together a picture frame and discovered that the 45-degree cut was off by a fraction of a degree knows this all too well. The cumulative error adds up to one ugly look and a far cry from the closed shape we're aiming to achieve.

A square corner is one that measures exactly 90 degrees. Over the span of 36", a corner that is machined at 91 degrees will, at the opposite corner, stray nearly 5/8" off the mark when compared to

a 90-degree corner.

The challenge of your question is also complicated by the cutting tools at hand. A sliding miter saw is not able to make a cut 36" long, so that one is out. A table saw can be dialed in to cut precisely parallel to its rip fence, but cutting the second leg of the 90-degree cut perfectly would require a datum (fence or guide) perfectly square to the rip fence and able to manipulate the plywood accurately. Think of a miter gauge or crosscut sled the size of Brooklyn. Some big-dollar table saws with sliding tables can take this task on, but most of us don't own one of those machines.

Continues on page 12 ...

READER PROJECTS



Stave Candle Holder

I enjoyed the "Whiskey Barrel Candle Holder" gift project idea in the December 2019 issue. I ordered my set of three staves from Rockler and found out that they were in three different widths. The thinnest stave was too

narrow for the tea lights, the middle one was perfect and the third would have to be cut to make a perfect one and a second thin one. Since the thin one was too narrow for the tea lights, I decided to make it into a tapered candle

holder (see above). To further stabilize the candle holder, I added two 2½" oval feet perpendicular to the stave. This prevents the candle holder from falling over.

Bill Miller
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Check online for more content covering the articles below:

Woodturning (page 22):
Turning tall hollow forms (video)

Raised Panel Cabinet (page 36): *Making a raised panel door using the table saw (video)*

Tool Chest (page 42):
Demonstrating the Lock-Align drawer organization system (video)

Tool Tutorial (page 52):
Cutting half-blind dovetails with Rockler's dovetail jig and a handheld router (video)

Making Dominoes with a CNC Router (page 58):
Using a CNC Router to machine dominoes. Free downloadable CNC files (video/files).

What's in Store (page 62):
Featured tools in action (videos)

Finishing (page 64):
Demonstrating the technique of applying dye to highly figured hardwood (video)

So I am going to punt, Rich, and have you use both your table saw and a hand-held router. Put a straight bit in the chuck.

Slice one fresh, straight edge on the plywood with your dialed-in table saw. Then mark the second leg of the 90-degree angle onto the plywood. Use a square to get started, then verify by using the "3-4-5 rule" or the Pythagorean theorem ($a^2+b^2=c^2$, meaning $3^2+4^2=5^2$). In our example, 36" squared is 1,296, so adding a^2 and b^2 will get you 3,600"; its square root is 60". (My eyes just glazed over ...) Measure diagonally (the " c^2 " hypotenuse of the

triangle) and mark where it intersects your line. If it measures 60" to that mark, you have an exact 90-degree corner. (If not, adjust the second leg line.)

With that line marked perfectly, use the router and a straightedge to cut the 90-degree leg. Now you have a 90-degree square corner and a perfect datum to put against your dialed-in table saw fence to cut the third and fourth sides of the square.

A simpler way is the aforementioned 3-4-5 method. (And because Baltic Birch plywood is often sold in 5' x 5' sizes, this works great.)

It is essentially the same as the Pythagorean method, using measurements based off of the number three. So ... strike that fresh edge on the plywood at 36" (3 feet). Lay a 4-ft.-long straightedge perpendicular to the first edge. Measure a diagonal angle from the 3-ft. leg to the 4-ft. leg, and adjust the straight edge leg until the diagonal hypotenuse measures 5 ft. Mark a line with the straight edge, because it is perfectly square. Now use the straight edge to guide the router and jump back to the table saw.

It is as simple as that.

Continues on page 14 ...

SURVEY

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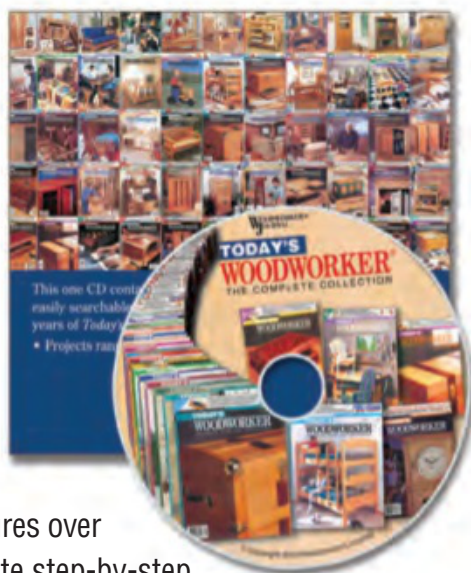
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STUMPERS

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What's This?



Ernest Mitchell's mystery tool has 13"-long handles that swivel about 350 degrees around a bent center point. There's a pointed tip on the right handle and a knife edge on the left. Both of these slide along the arms, and the left one can be locked with a set screw. "Hake Safety/Patented" is etched on one arm. Can you identify it? Email your answer to stumpers@woodworkersjournal.com or write to "Stumpers," Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340.

Honk if you like car radios!

Our October Stumper has garnered some extremely sound responses, while others frankly added a degree of bafflement to the question. Ordinarily, we at the *Journal* hold to the maxim, "Brevity is golden." In his very specific response, our reader **John W. Kennedy** of Texarkana, Texas, proved that every rule has its exception. His answer, "It's a shorting tool," left us short of context and understanding. Diligent searching on the interwebs indicated that it may have been used in shorting out a spark plug when doing engine repair — a shocking suggestion.

The person who submitted this mystery tool provided a clue that many readers took to heart in their guesses — that it was once used in auto repair. We were stopped dead in our lane when **Alan Schiebel**, who resides on the Internet (*Readers, kindly include your city and state, please*), suggested that it was a gauge to keep brake pads at their proper distance from the drum during installation. **James Hoops**, also from the Internet, smoothly suggested that the slender sections of the tool would be used to

align pistons as they were being inserted into their cylinders, "to avoid scratching the freshly honed walls."

Despite the described geographic origin of the tool, not everyone drove down the automotive road. **John Bultsma** of Sioux Falls, South Dakota, thought it looked like a replaceable electric soldering gun tip. Also not to be limited, another reader postulated a woodworking origin: "[It] appears to be a table extension or support arm, if you will, for an older Craftsman miter saw." This from **Bruce Aaseby** of Olympia, Washington.

Back in the auto shop, **Don Littlefield** had one of the longest explanations. "I think the item in the Stumpers column is probably a tool used to hold the brushes in the pulled back position in an AC Delco alternator. I still have one in my tool box that I made out of a paper clip ..." We confess the paper clip comment gave us pause.

But it became clear that there was a consensus of a sort that was broadcast from the majority of replies.

"If I am not mistaken, there should be a mate to this tool. It appears to be a radio removal tool for Fords (and their corporate cousins). The pair of these would be inserted into two holes on each side of the radio and pushed in, thus releasing the locking ears on the radio, allowing it to be pulled free from its mounting." This seeming-



While the Journal has not been able to confirm what this tool does with 100 percent certainty, our readers have come to a consensus!

ly informed answer came from **Denny Mandeville** of Canyon Automotive, Sedona, Arizona.

Denny's claim was reinforced by **Doug Williams**: "Using two of these items, inserted into holes in the face plate of the dash mounted radio of my 1996 Ford pickup, allows the radio to be pulled easily from its dash for servicing or whatever."

The evidence mounted, with even more brand-specific information offered: "[It's]... used mostly on Fords," offered **Billy Lukesh**. "[It's] used to remove the radio from 1980s-vintage Ford automobiles/light trucks," agreed **Brian Creegan** from Tyngsboro, Massachusetts. And Barry Metcalf's past career adds credence: "As a Ford dealer, I used them quite often."

So there we have it. A "radio active" tool to help remove radios from Fords, vintage 1980s to the 1990s.

Bench height varies: Are you 5'2 or 6'5"?

Equation to Calculate Workbench Height?

When it comes to determining a workbench's height, obviously a person who is 5'2" wouldn't be comfortable working at the same height bench as a person who is 6'5" would be. Is there a rule of thumb, an equation or a point on one's body that gives a comfortable working height for a personal workbench?

Ned DuBeck
via Internet

WJ Responds:

You are correct that workbench height should be adjusted to the person's stature. Most people think that the top should be waist height or just a little higher. That will certainly get you in the ballpark, but the "best" height will vary from person to person. Whatever works best for you is exactly right for you.

— Rob Johnstone

Outdoor Red Oak Finish?

I'm having two large slabs of red oak installed as tables in an outdoor living area in Arkansas (see photo). I want to keep a somewhat rustic appearance but also would like to protect them from the elements. They will be sanded, but I'm not sure how



best to treat them. I don't want a shiny surface and am thinking some type of marine sealer may be best.

Mark Holzer
via the Internet

Are slabs of red oak a good choice for outdoor use? Why or why not? If they are used in the wild, how should they be finished? Our senior editor offers his opinion.

WJ Responds:

An oil-based finish, such as General Finishes Outdoor Oil, would be an easy-to-apply option that would soak into the wood and help you achieve the rustic, non-shiny surface you're after. But, a word to the wise: red oak isn't the best choice for an outdoor project. It lacks tyloses, which plugs up the open pores, so it will be more prone to rotting unless it stays dry most of the time. If you like the look of oak, tyloses-rich white oak would be a much more durable choice for an outdoor application.

— Chris Marshall

Red Oak in the Wild ...



TRIVIA

Tricky Family Trees

In his book, *With the Grain: A Craftsman's Guide to Understanding Wood* (Lost Art Press; ISBN 0985077747), Christian Becksvoort reveals that some of our common North American tree species have curious pedigrees. For instance, tulip poplars aren't actually poplars but magnolias. Butternuts are in the walnut family, and hornbeams are kin with the birches. Sweet gum trees aren't related to other gum trees, but are instead a form of witch hazel. Douglas fir, in truth, is not a fir but a fake hemlock. And ash trees share a family lineage with the olives.



TRICKS OF THE TRADE

Simple Solutions for Spacers, Storage



Taming My Shop Snake

A long shop vac hose can be handy for extending your reach, but it quickly becomes a nuisance when you try to store it or move the vac to a new location. It becomes a reluctant serpent slithering wherever it can and finding something to snag. But I finally built a solution to this aggravation. I made four L-shaped brackets from 3/4" plywood, shaped to fit the sides of my shop vac and with enough standoff and height to accommodate the hose's diameter and length. I fastened them to the tank with screws. Now, my vacuum "snake" is effectively tamed.

Bruce Wedlock
Peabody, Massachusetts



PVC Wing-nut Wrench

The wing-nuts that hold the blades on my scroll saw can be painful to loosen sometimes, and the lower one is hard to reach. I eliminated the problem by cutting a 3/16"-wide slit into the end of a piece of 3/4" PVC pipe. It fits right onto these nuts and makes a handy wrench.

Leon Winters
Sheridan, Wyoming



Kitchen Magnets for Scraper Spacers

To prevent damaging the hooks of my card scrapers when they're stacked together in a drawer, I store them with a kitchen sheet magnet in between each scraper. Then, if I just leave the magnet on the scraper during scraping, it acts like an insulator to prevent burning my thumbs when the scraper heats up.

Charles Mak
Calgary, Alberta

Clean Swipe Solution for Hardware Marking

I've tried various ways to mark furniture or cabinet doors and drawers for hardware locations before installing it, but this is my favorite method. I use a fine-tip marker that's made to be erasable. Either a "wet-erase" or "dry-erase" marker will work well. The beauty of the marker is that the color shows up on a finished or painted surface, but you can simply wipe it off if you make a mistake or need to reposition your marking holes for other reasons. Of course, the markers only work on furniture parts or cabinets that already have a finish applied. The ink won't wipe off of raw wood.

Andrew Sensenig
Penn Yan, New York

PICK OF THE TRICKS

Set Gaps for Band Saw Guides with Tape

Setting the gaps between my band saw's blade and the side guides using a folded dollar bill is awkward and obstructs the view — especially with a narrow blade. Instead, I've found that using green painter's tape makes the job so much easier. I place the tape just behind the teeth gullets and trim it flush with the back of the blade. A few tape layers produces the desired gap. The bright tape makes it easy to see just where the guides need to be positioned, and when I'm done, I just strip off the tape.

Richard Krehnovi
Mansfield, Ohio



In addition to our standard payment (below), Richard Krehnovi of Mansfield, Ohio, will also receive a **Milwaukee M18 FUEL™ 12" Dual Bevel Sliding Compound Miter Saw** for being selected as the "Pick of the Tricks" winner.

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SHOP TALK

School's In: Women's Woodshop

By Teresa Audet

Minneapolis studio offers a welcoming and supportive environment for women and other makers.



Founded four years ago by Minneapolis-based artist Jess Hirsch, Women's Woodshop seeks to empower those who often are marginalized in woodworking — a traditionally male-dominated craft and business.



Located in an unexpected south Minneapolis storefront, the Women's Woodshop is a cozy space stocked with beautiful lathes, a SawStop table saw and a few other stationary tools tucked into the corner. Here's a "move the band saw to use the drill press" type of space. In back is the hand

tool room, at times set up with an eclectic assortment of benches for furniture-making class and other times with an intimate circle of chairs for spoon carving.

Founded in 2016 by Minneapolis-based artist Jess Hirsch, the Women's Woodshop offers a welcoming and supportive environment for

women and gender-non-conforming makers. Raised in Minnesota, Hirsch studied fine art at Lewis and Clark College in Portland, Oregon, then returned to receive her MFA in sculpture from the University of Minnesota. After several years of teaching spoon carving at local galleries and workshop spaces, she decided to create a permanent space for craft education.

Although women have practiced woodworking for centuries, we still represent a very small percent of this field. By creating a space for those marginalized in woodworking to feel encouraged to learn and grow, the Women's Woodshop hopes to empower more women and non-binary craftspeople with the knowledge and confidence to build a woodworking practice. Men are also welcomed to attend classes.

Recent offerings have included several "101" style courses on furniture, power tools and bowl turning. Others classes focused on axe-handling skills, building a Shaker style table, spoon carving, wood block printing and weaving baskets from wood. Class sizes are capped



Basics courses in bowl turning, furniture design and power tool use are regularly offered at the Women's Woodshop, along with carving and a variety of other woodworking topics.



at six to 10 students to ensure that participants receive maximum one-on-one help from instructors.

Education at the Women's Woodshop goes beyond the class. During Tuesday night open studio sessions, students can work on their own projects with the guidance of a faculty instructor. There is a sense of community and togetherness at the shop, shown through cheering when a fellow student finishes a project. Many students take multiple classes and develop a sense of ownership of the shop space.

The Women's Woodshop has scholarships available, based on financial need. Hirsch offers private bowl turning lessons, and the shop hosts guest instructor classes as well. There is also a fledgling residency program in which artists get access to the shop and its resources in order to further their career while participating in the local community.

For more information and to learn about upcoming classes, visit WomensWoodshop.com or Instagram at [@WomensWoodshop](https://www.instagram.com/WomensWoodshop).



This box-making class, and all other courses at the school, limit class sizes to six to 10 students. Small groups enable participants to receive maximum one-on-one help from instructors.



To see the other two winning entries as well as more contest projects, visit Instagram and use the hashtag #RocklerBentWoodChallenge.

Rockler Bent Wood IG Contest

Komar wooden bike wins first-place honors.

Last fall, Rockler teamed up with The Modern Maker Podcast and challenged makers to build something with bent wood as part of its #Rockler-



BentWoodChallenge. The call to action was simple: build a project that uses some form of bent wood, such as bent lamination, steam bending, kerf bending and so forth. Then, post that project's progress and final photos on Instagram. The contest, which was judged by The Modern Maker Podcast's Mike Montgomery, Chris Salomone and Ben Uyeda, offered \$500, \$250 and \$125 Rockler gift card prizes for first, second and third place accolades.

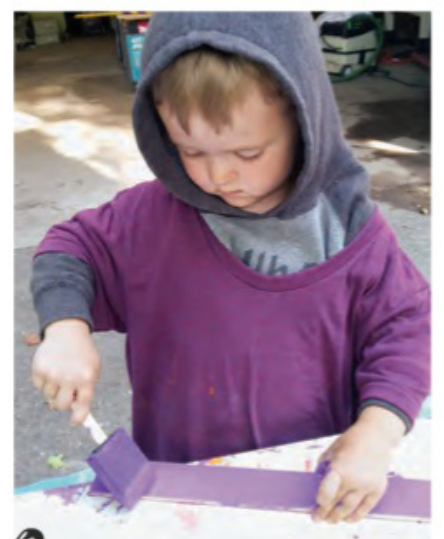
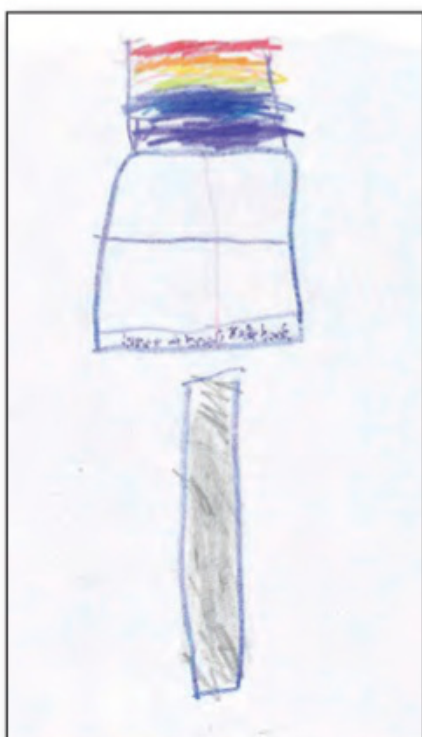
More than 250 makers entered a project, and judging took place in mid-November. First-place honors went to Bart Komar (@komarproject) for his low rider bicycle. Kris Crawford's (@mortgage-andmitre) walnut and maple office chair won second place, and Brian Klein's (@bikecitywoodworks) cherry kumiko lamp nabbed third. #RocklerBentWoodChallenge was the company's second sponsored contest with The Modern Maker Podcast.

Design Delivered

After Grandma Mary and Holden Kronquist decided that a little lending library would be their summer project, the question of its design was paramount. Any good design concept starts with paper and pencil ... or perhaps crayon.

The working drawings (left) were completed after his discussion with the prima-

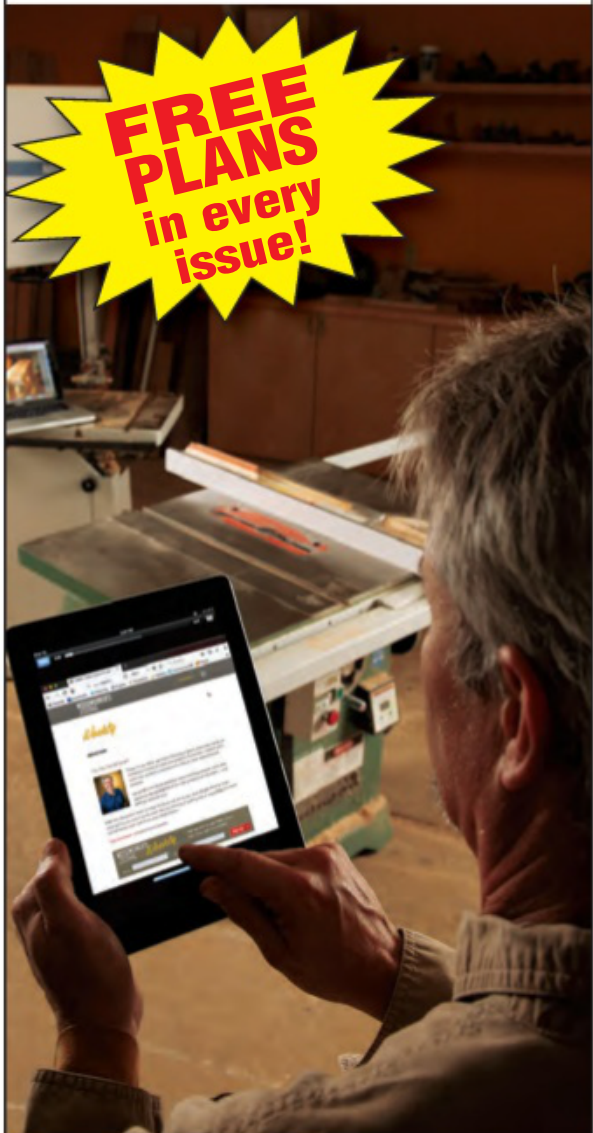
ry builder (lower left). But Holden was not just a corner office designer. He got busy with painting the roof slats, whose colors mimicked Grandma Mary's flowers. With the design delivered and the library installed, the neighborhood now has a new source of free books!



Executing a design from concept to completion is not child's play. But in this case, planning, drawing and construction all went very well. The new library was installed in August 2019.

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Lengths and widths are random. Add 15% to price of bundle if you specify particular lengths and widths. Lumber is surfaced two sides (13/16" on 1" stock • 1 3/4" on 2" stock) or rough. Some of the heavy woods are skinned to meet the 70 lb. limit even though rough lumber is specified. Prices include delivery prepaid in the Continental U.S. Sap wood in walnut and cherry is no defect. Please Specify Rough or Surfaced Stock. *Add \$5 if Rough. (Shipped in 2 bundles) Add \$5 if over 5' Long.
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WOODTURNING

Accessories for Excavating Tall Hollow Forms

By Ernie Conover

Deep hollowing is made safer and easier with boring bars and turner's gates.



The most common wooden vessels are bowls that are faceplate turned for reasons of strength. But when the height of a vessel surpasses more than a couple of times the diameter, it becomes stronger to switch to spindle orientation instead. Therefore, hollow forms are generally lidded and unlidded boxes or tall, slender (for their diameter) vessels. I

have expounded before on small hollow forms, which can be easily excavated with a spindle gouge and some scrapers. Any hollow form that can be made in a mini lathe can be turned with these tools.

Deep Hollowing Challenges

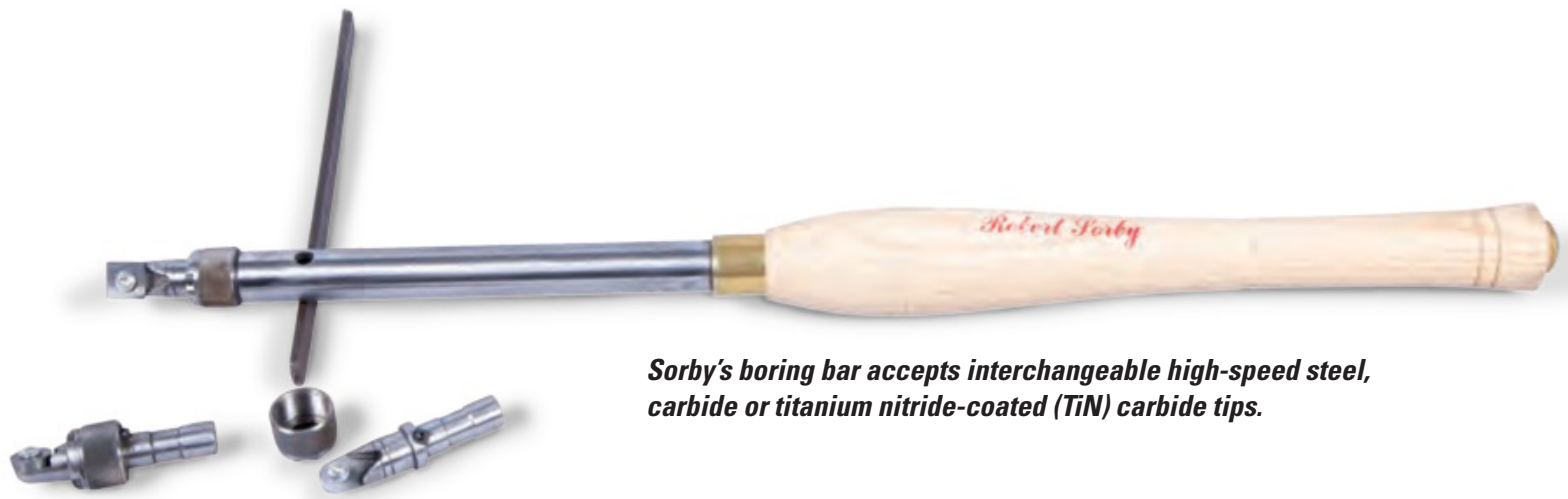
Since tall (in proportion to their diameter), slender hollow forms are generally made with a small mouth

opening, the tool-rest cannot be placed inside of them. The extension of the tool from the rest ultimately will be slightly greater than the depth of the vessel. If you want to turn the inside of a hollow form deeper than about three inches, a spindle gouge becomes problematic. The shaft of the tool starts to flex, and controlling the tool becomes progressively more difficult. At some extension from the tool-rest,

www.woodworkersjournal.com
MORE ON THE WEB



For a video on turning tall hollow forms, visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



Sorby's boring bar accepts interchangeable high-speed steel, carbide or titanium nitride-coated (TiN) carbide tips.



Carter Products Axe boring bars have flat-sided handles — similar to an axe — to help provide a more secure, comfortable grip. Their shafts accept replaceable carbide inserts.

control becomes impossible. One solution is to go to a larger-diameter gouge, since resistance to flexing increases by a power of four as the diameter increases. Going from a 3/8" gouge to a 1/2" gouge would make a big difference because the latter is four times stiffer.

Boring Bars

While this math is interesting, it is time to switch to a different tool — a large scraper, often called a boring bar. Boring bars are small scrapers mounted on the end of a stout bar. They are intended to work parallel to the lathe bed with the tool's edge on the centerline at all times. They can be mounted in a handle and used conventionally or with a turner's gate, which is a device that will ensure that the bar stays level, never rotates and that the scraper is always on the centerline of the lathe.

Most boring bars have a flat surface milled on the bottom to help the turner resist rotational forces that are trying to spin the tool when working without a gate.

Turner's Gates

A turner's gate is a set of parallel bars or rollers that keep a boring bar level with the cutting edge on (or very slightly above) the centerline of the lathe. The tool can be moved laterally but it cannot move up or down or rotate. The gate is clamped to the lathe bed where the tailstock would normally reside. Most

gates offer a range of boring bars, often with movable tips that allow for deeper boring as well as removing material from the side wall or undercutting the mouth opening. Most manufacturers offer carbide tips for their boring bars, and some are even TiN (titanium nitride) coated. Some brands also offer tips made of high-speed steel.

Here the author employs a boring bar in tandem with a turner's gate mounted to his Oneway lathe. In this application, he's also using a bowl steady rest, equipped with a pair of wheels, to help support the hollow form being excavated.





This blue Carter Products Hollow Roller Vessel Turning System is mounted to a Robust Scout benchtop lathe.

An overarm laser pointer on Oneway's Complete Laser Hollowing System provides easy visual reference for wall thickness: when the laser beam drops off the edge of the workpiece, the user knows the correct wall thickness has been reached.

While TiN coating does wonders when cutting metal because chips will not stick to the tool, it is of questionable value to woodworkers other than to give the tip a pretty gold color.

There are a number of turner's gates on the market. The most popular is the Carter® Products Hollow

Roller™ Vessel Turning System (shown above). It costs about \$360 and will fit most benchtop and full-size lathes. My students find this hollowing system easy to understand and use.

Oneway offers three sizes of their Complete Laser Hollowing System (shown below). The smallest size fits

benchtop and full-size lathes that have 10" to 12" of swing capacity. The medium size fits 13" to 19" lathes, and the largest model is for full-size lathes with between 20" and 24" of swing. This is the model I am using on my Oneway 2436 lathe throughout this article. All three options are priced at just under \$600.

Laser Pointers

A standard feature of turner's gates is the ability to add a laser pointer mounted on a movable arm that places it about a foot or so above the workpiece and shining downward. The pointer is adjusted to shine at a distance from the cutting edge that is the desired wall thickness. As you remove material from the inside wall, you have a constant idea of how thick the wall is. When the laser beam drops off of the workpiece, the desired thickness has been obtained. It is a splendid idea!

Hollow Forms Workflow

The order of workflow is important when hollowing a tall, slender form. Here's a brief overview of the process:

First, a suitable billet (either dry wood or green) is mounted between centers and turned round. A tenon is turned on one end for grabbing with an external hold in a four-jaw scroll chuck or for



mounting in a glue block.

Once the tenon is in place, you can transfer the work to a chuck or glue block in order to turn the outside shape of the vessel.

Start the opening with a spindle gouge and/or a drill. The idea is to get a cavity large enough to get your boring bar inside. It's also time to set the laser to the desired wall thickness from the tip, then begin to excavate the vessel's interior.

As the work progresses, you'll need to frequently stop the lathe to blow out accumulating chips and debris until you achieve the proper wall thickness everywhere. It is usually best to keep the base area a bit thick for several reasons. For one, the base will be stronger. Some extra mass in the bottom will also provide extra weight, given that hollow turnings otherwise often end up very light.

Because of the small mouth opening in most hollow forms, getting the chips and debris (swarf) out is an often-needed operation that is akin to clearing a drill. For small hollow forms, blowing through a length of plastic hose or even a soda straw works fine, but at some size this scheme fails. Most seasoned hollow form turners use a blow nozzle on an air hose to quickly remove swarf. Be sure to use



The laser beam's offset from the edge of the boring bar (reflected on the author's hand) indicates the wall thickness the setup will cut. The laser can be adjusted left or right as desired for turning thinner or thicker walls.



A blow nozzle with a cross hole is a safe way to clear accumulated swarf from inside a hollow form.

an approved nozzle that has a cross hole to prevent problems if this tip is blocked.

Do this operation with the lathe stopped and always wear safety glasses with side shields and a face mask. I run the blow nozzle with my right hand and deflect the chips away from me with my left as an additional precaution (see photo, above).

All this said, give larger hollow forms a try! They can be great fun. You can further embellish a hollow form by cutting embroidery-like designs into the wall with a rotary tool or through pyrography (wood burning).

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



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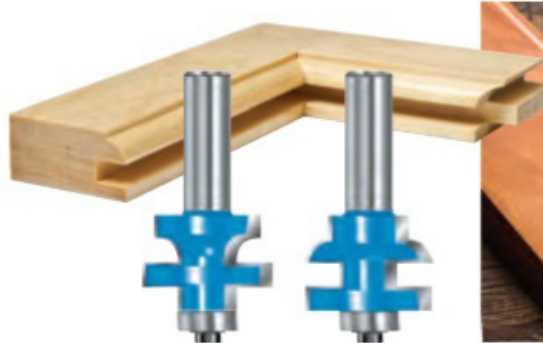
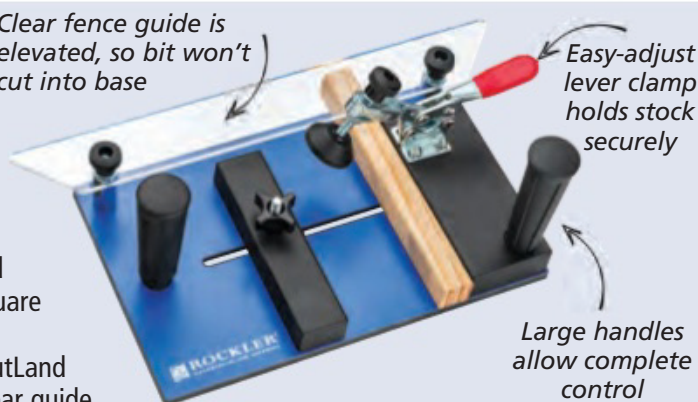
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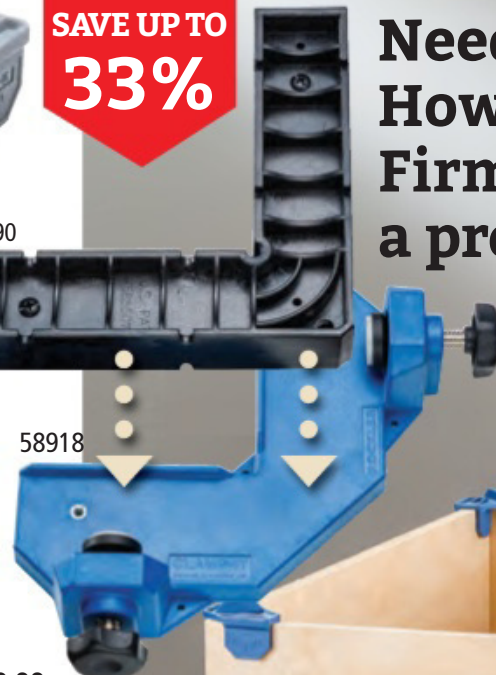
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Y-adapter inlet for multiple hoses



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flow rate and 3/4 HP motor. Includes 30-micron bag. Motor has sealed shaft and bearings for quiet, long-lasting operation. Accepts 4" hose. 14" W x 20" D x 48" H overall.

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56783 4" and 2 1/2" Set ~~\$69.99~~ **\$39.99**

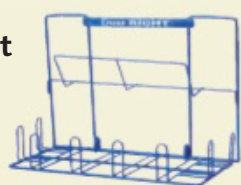


NEW

Dust Right Shop Vacuum Accessory Organizer

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50705 \$34.99



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Before



After

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*Built-in
blast gate*

Folding Shop Desk



By Jeff Jacobson

One problem with small shops is that there's never enough floor space. The same often goes for counter space. This fold-down desk project provides a simple, sturdy solution.

No matter how much I continue to dream about having a dedicated shop space, the fact of the matter is, I do my woodworking in a cramped garage that also stores two cars. So for me, every bit of usable, horizontal work space counts!

This shop desk project came about when I ran across Rockler's Folding Shelf Brackets on *rockler.com* recently. They close by squeezing a release latch on the upper leg and lowering them. It didn't take much daydreaming or time in SketchUp for me to create the plans that now give me the occasional desk space I need. I'm finding it to be a useful landing pad for my laptop when I'm watching a how-to video online. It's also a handy place to spread out project plans or to stage small parts and tools as I work. And then, when I'm done using the desk, I can fold it down and out of the way until the next time I need it. But, while my desk is out in the garage, the range of alternative uses for it is truly wide open, so don't limit your options to just woodworking (see *sidebar*, page 35).

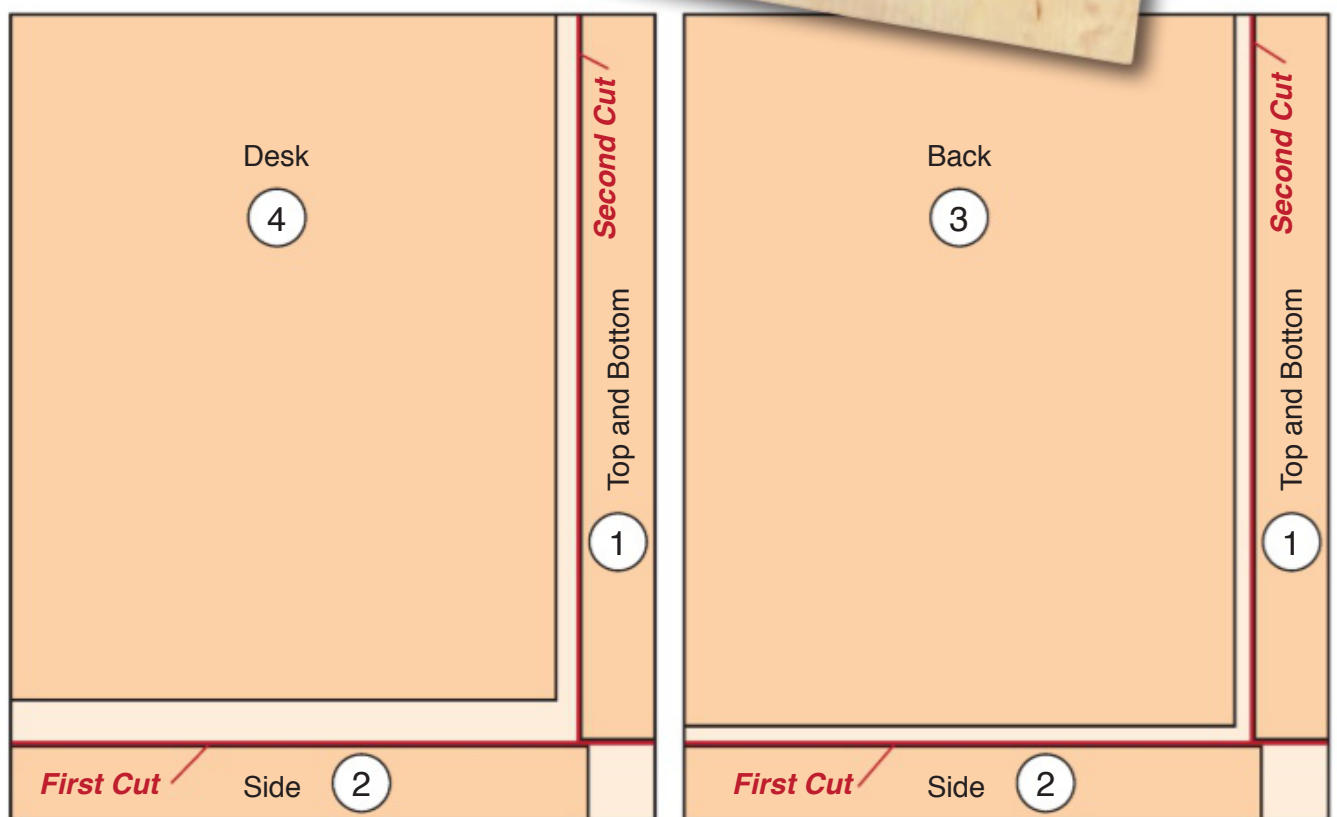
Parting Out a Pair of Panels

I ordered a couple of 24" x 30" Baltic birch panels from Rockler, which will provide just enough material for all the desk components if you cut them carefully. The *Panel Cutting Diagram* above shows the sequence of steps to harvest the parts efficiently. Start by crosscutting a 2 3/4"-wide strip off of one

end of each panel for the two side pieces of the desk's case. Then turn the panels longways and rip a second strip to the same width for the case's top and bottom. Trim down what's left of the panels to form the desk surface, and crosscut the top, bottom and side strips to their final lengths, according to the *Material List* on page 33. Leave the back panel slightly large for now.

If you haven't worked with Baltic birch before, be advised that the surface veneer can splinter if you use a dull or dirty blade. Use your best blade, just to play it safe.

Panel Cutting Diagram
(Top View)



Crosscut a 2 3/4"-wide strip off the end of each panel first, following the Plywood Cutting Diagram, above. These become the sides of the case. Then rip a long strip for the case's top and bottom pieces.



Plow 3/8" dados across one face of each of the case's side pieces on both ends. Locate these dados 3/8" in from the part ends. Back up the cuts with a larger scrap piece to guide these narrow workpieces past the bit; it will also help minimize tearout when the bit exits the cuts.



Using the same bit and fence settings, cut a groove along the length of the case's top and bottom pieces. These will house the rabbets of the back panel. Make sure to keep the workpieces pressed down firmly against the router table to ensure that the groove depths remain consistent.



Reset the fence so the bit's full 3/8" diameter is exposed. With the grooves of the top and bottom workpieces facing up, mill a rabbet on both ends of the parts. Test these cuts on a scrap of the same thickness first, so you can adjust the rabbet proportions accordingly.

Adding Corner Joinery

When you study the *Exploded View* drawing on the next page, you'll see that the top, bottom and sides of the desk's case interlock at the corners with rabbet-and-dado joints — they're easy to machine and very strong. The case's back panel has rabbets along its wide ends that fit into grooves in the top and bottom pieces to lock it in place.

I opted to cut the corner joints at my router table using a 3/8"-dia. straight bit. If you decide to do the same (you could also cut the joinery with a dado blade at the table saw, if you prefer), raise the bit to 3/8" and lock your router table fence 3/8" away from it.

Plow a dado across the end of each side piece and into the same face of the parts. Because these side pieces are so narrow, be sure to back up the cuts with a scrap piece to prevent the workpieces from skewing away from the fence as you push them over the bit. A backup piece will also prevent the plywood from blowing out along the back edge as the router bit exits the cut.

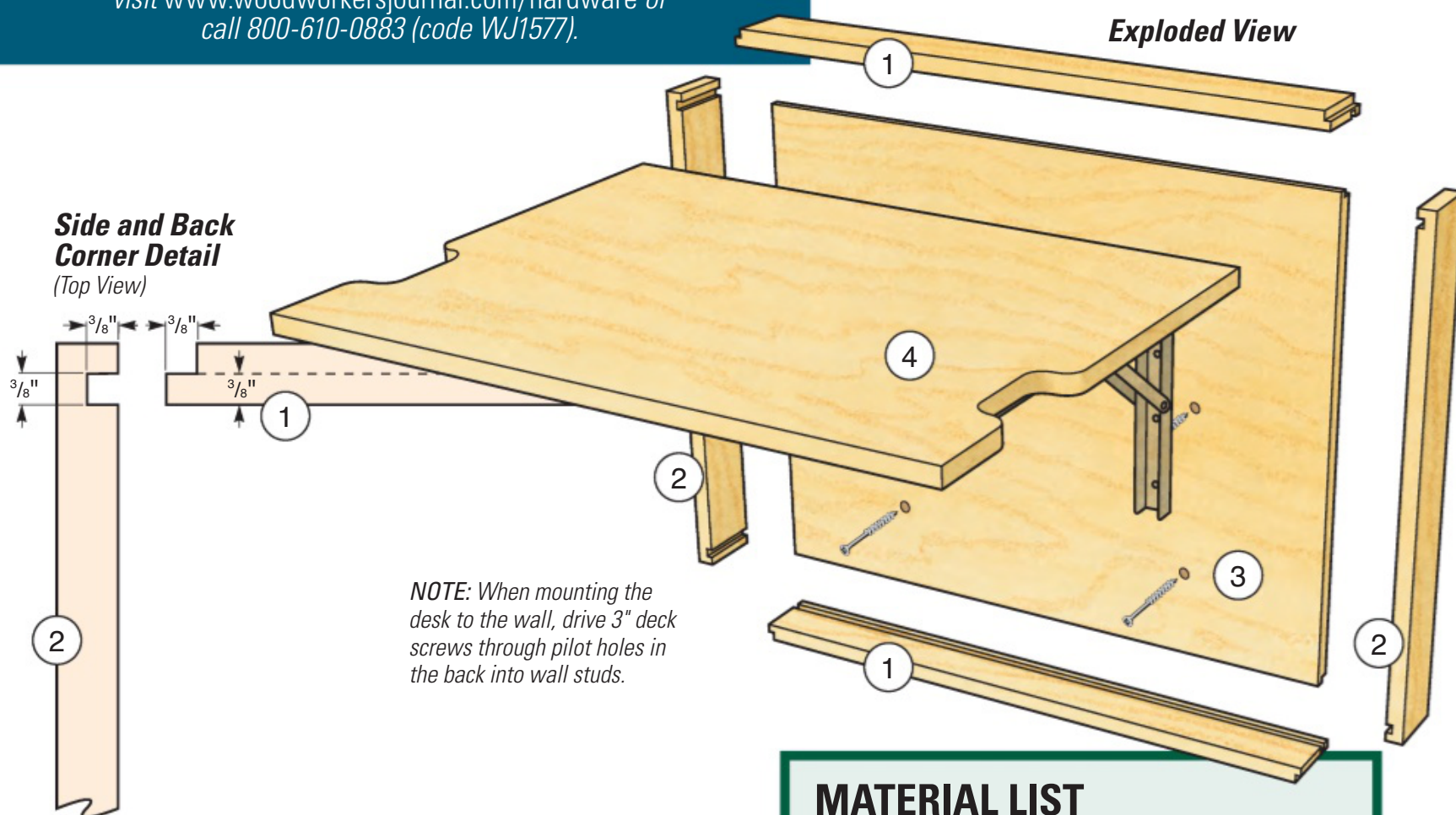
Once those dados are milled, it's time to rout a 3/8" x 3/8" groove into the top and bottom pieces of the case. These grooves are inset 3/8" from the part edges, so your router table is already set to go from the previous dado cuts. Plow a groove into each part, keeping the workpieces pressed tightly against the fence and pushed down firmly so the grooves will have a consistent depth all along their length.

The top and bottom pieces require rabbets on their ends to fit the dados you first cut on the side pieces. Here's where the router table fence needs to be adjusted and, quite possibly, your bit height, too. Shift the fence forward so the bit has a full 3/8" exposure but no more. Make a test cut on some scrap of the same thickness as your plywood, and see if the test rabbet fits the case's side dados. If the joint is too tight, raise

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3/4" Baltic Birch Plywood, 24"W X 30"L, 2-pk (1) #68236 \$39.99 pk.

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MATERIAL LIST

	T x W x L
1 Top and Bottom (2)	3/4" x 23/4" x 27"
2 Sides (2)	3/4" x 23/4" x 213/8"
3 Back (1)	3/4" x 205/8" x 261/4"
4 Desk (1)	3/4" x 187/8" x 261/8"

the bit a tad. If it's loose, lower the bit instead. Once that's dialed in, mill the rabbets on the top and bottom pieces. Again, back up these cuts with a scrap that stabilizes them and prevents blowout.

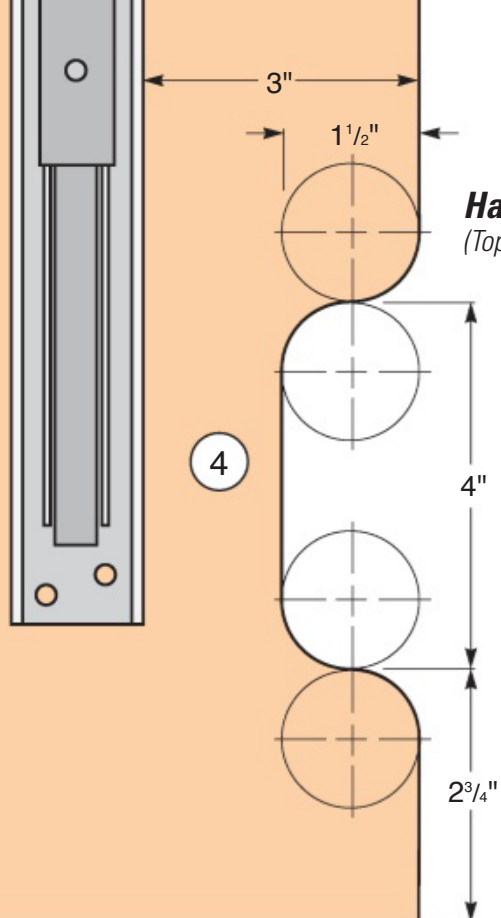
Dry-fit the corner joints, and take an inside measurement of the frame's width and height to verify the final dimensions of the back panel. Cut the panel to size, then head back to the router table to mill a rabbet along its top and bottom ends using the same router table settings. When that's done, carry out



Cut rabbets into the wide edges of the back panel to fit the grooves of the case's top and bottom pieces. But be sure to first trim this panel so it will fit the actual opening of your case when dry assembled.



Final-sand all the parts of the desk's case, then glue and clamp the pieces together. If you plan to paint the project, 120-grit sandpaper is sufficient. For a clear finish, sand up to 180-grit instead.



Handle Cutouts

(TopView)

Laying out the handle cutouts is really just a matter of joining pairs of 1 1/2"-dia. circles on each end of the shape: a quarter of one circle's circumference forms the outer curve of the cutout, and one quarter of the adjacent circle forms the inner curve. Make these handle cutouts at least 4" wide or as needed to suit your hand size.

another dry assembly of all the parts. If the joints close well and the back fits its grooves properly, give the pieces a final sanding to 120-grit (for painting) or 180-grit (for a clear finish) and glue and clamp the case together.

Forming Handle Cutouts

Two cutouts along the edges of the desk surface enable you to simply reach in and lift up to lock the desk into place for use. Lay out these handles 2 3/4" in from the front edge of the desk surface, using the *Drawing* at left and photo 1, below, as your guides.

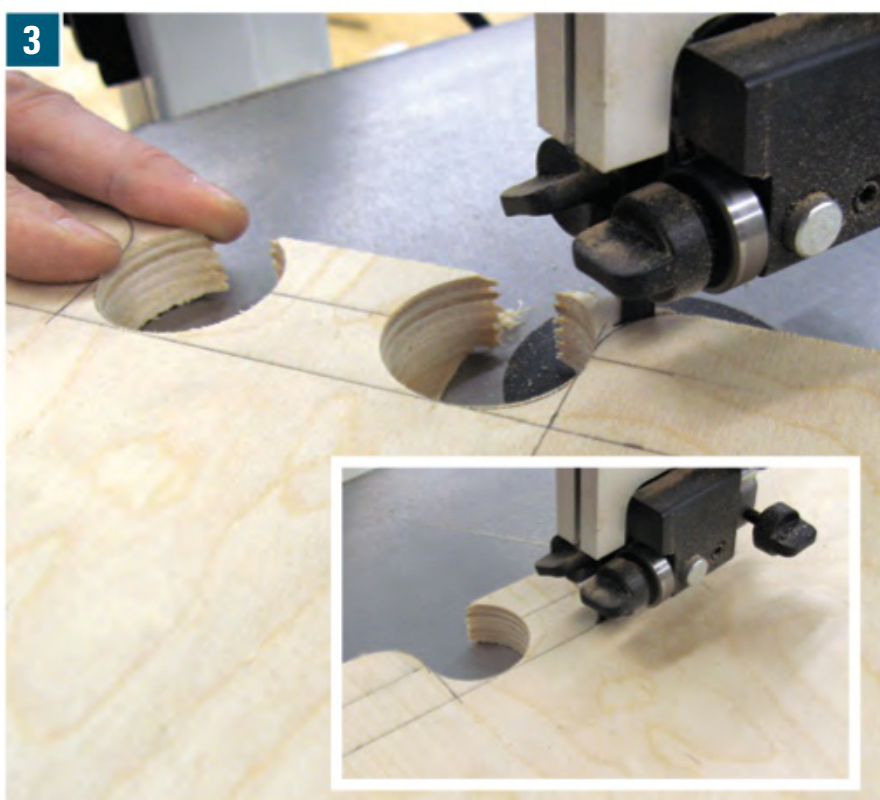
I cut the handles to shape, starting at my drill press with a 1 1/2"-dia. Forstner bit, to form the two inside curves (see



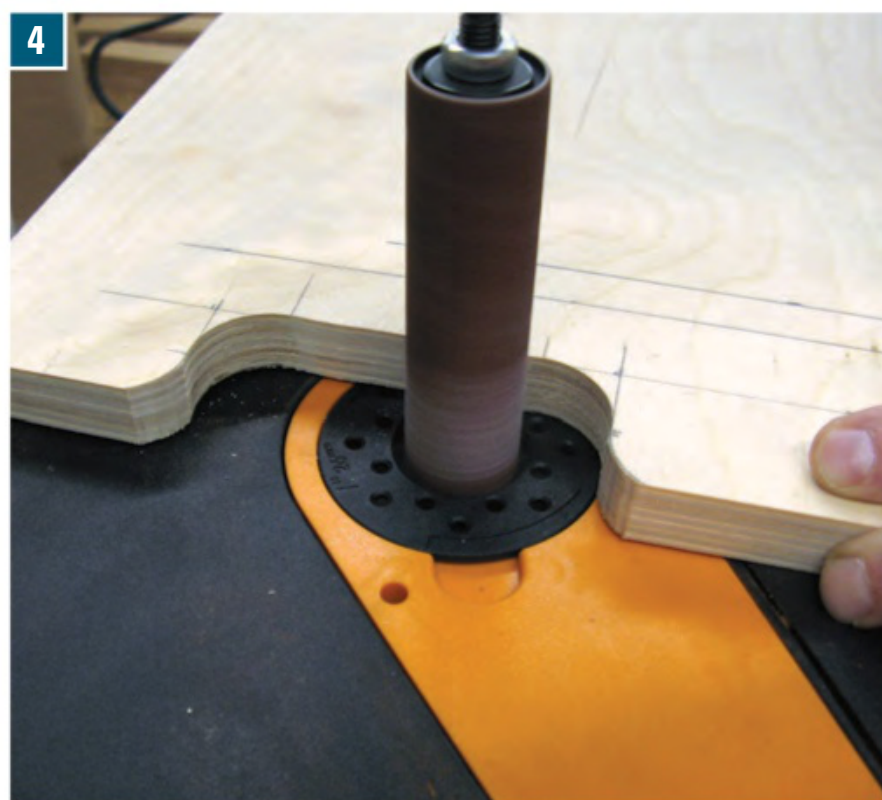
With a compass set to a 3/4" radius, draw pairs of opposite-facing arcs to form the "S"-curves of the handle cutouts on the desktop panel. The centerpoints for scribing these arcs are 3/4" in from the ends of the panel.



Bore the inside curves of each handle with a 1 1/2"-dia. Forstner bit at the drill press. Since the bit intersects the ends of the panel, use a scrap spacer between the panel and the fence to protect the fence from the bit.



Trim the handles' outer curves to shape at the band saw or with a jigsaw. Then, remove the inner waste piece (inset) to form the rough handle cutout.



Shape and smooth the handle cutouts using a spindle sander or with sanding drums on a drill press. In lieu of either of these options, you could also wrap sandpaper around a 3/4" dowel and sand them by hand.

photo 2). Once those were bored, I trimmed the outside curves and removed the inner waste piece at my band saw (see photo 3). Then, I fired up my benchtop spindle sander and gave the cutouts a final sanding to blend and smooth the curves (see photo 4).

Mounting the Brackets

Attaching the shelf brackets to the back of the case isn't hard, but what's critical here is that these brackets are exactly parallel to one another and to the sides of the case. If they aren't, they can bind when they are closed. I first positioned the wider (release latch) legs of the brackets 3" in from the narrow ends of the desktop and attached them to it with short screws driven into pilot holes. Then, with the brackets opened, I set the desktop into the case, pushed it up against the case top and adjusted it side to side for even clearance. I drew layout lines to mark the brackets' narrower leg locations and attached the legs to the back with more screws. Test the up-and-down action of the desk, and make any



Carefully lay out locations for the shelf brackets on the case back and desktop panel. What's most important here is that the brackets are parallel, so their mechanisms will raise and lower without binding. Attach the hardware with screws driven into pilot holes.

adjustments to the brackets until they articulate smoothly. With that done, remove them so you can prime and paint the wooden parts. Or topcoat them with your favorite clear finish.

When the paint or finish dries, reinstall the hardware. Now, call a buddy over to help you mount this project to a wall. Of course, the right approach is to anchor the back to two wall studs, so locate their spacing with a pair of parallel layout lines on the inside face of the

case back. Have your helper hold the project in place on the wall so you can lift the desk surface up and decide on a working height that's most comfortable for you. Mark six installation screw locations on your stud layout lines in the case. Drill pilot holes, and drive 3" deck screws into the wall to mount the desk. Then, put this handy desk to work!

Jeff Jacobson is senior art director of Woodworker's Journal.

Think Outside the Shop for Other Uses

There's no reason why a practical, space-saving project like this needs to be pigeonholed to a shop setting! If you add one of these folding desks to your garden shed, you'll have a work surface for amending potting soil in a planter, changing the chain-saw spark plug or whatever task can be made easier by working at standing height. Same goes for the laundry room: a prop-up counter could serve as a place to set the iron while it cools or to fold socks. If the hunting shack is short on counter space, here could be a place to refill the lantern, dismantle a hand gun for cleaning or sort your tackle box lures. And don't overlook the ways you could customize the design further: the shallow space behind the desk could store a clipboard and drawing pad, your measuring and marking tools or a rack of chisels. Add a groove or a simple pencil tray along the front edge of the desk, and you'll never have pencils rolling off. For even more durability, cover the desktop with a scrap of plastic laminate so it won't absorb stains or other chemicals while you're mixing or pouring them. And an additional point of note: these brackets have three locking positions from partially to fully raised (see photos, right). Here's a project with many possibilities!



Raised Panel Cabinet



By WJ Staff

Practice your basic cabinetry skills when you build this sweet little project. It's a good refresher for carcass construction, panel raising and installing hardware.

Recently, one of our co-workers had a chance to build a bank of kitchen cabinets to help out a friend. The experience reminded him that even relatively basic woodworking, such as bread-and-butter cabinetry, requires a skill set that can get rusty if you don't practice it now and again. And that's where this handsome little cabinet can help: it'll give you good reason to brush up on several core techniques while also producing a base cabinet that can find a spot in any home for numerous useful purposes.

Building the Carcass

Constructing the carcass is a logical starting point for any cabinetry project. Get this one underway by cutting panels for the two sides, back and bottom, according to the *Material List* on page 38. While it doesn't really matter on a painted cabinet, pay attention to the grain direction if you decide to go with a clear finish instead; it should run vertically on the side and back panels.

Notice in the *Exploded View Drawing* that there's no specific joinery identified for these first four carcass parts. The back and bottom panels simply butt against the inside faces of the sides.

The choice of how to reinforce these joints is entirely up to you. You could use brad nails and glue, wood biscuits, dowels, Festool Domino tenons or pocket screws. We opted for pocket screws, boring the screw pockets into the back face of the cabinet back panel and the bottom face of the bottom panel. We also bored screw pockets on the inside faces of the side panels near the top, for installing the cabinet's top panel.

Lay out the position of the bottom panel on the side panels so its bottom face is 3/4" up from the bottom edges of the sides. Spread glue onto the contact surfaces of the parts and clamp up the assembly. Make sure not to over-tighten the clamps in the process, which could rack the carcass out of square. We drove 1 1/4" fine-thread pocket screws to secure these connections.

While the glue cures, you can turn your attention to the face frame. For a painted cabinet, ordinary 3/4" poplar



Rip and crosscut four panels for the cabinet's sides, back and bottom. Use a sharp saw blade to minimize tearout when making the cross-grain cuts. If you intend to paint your project, choose plywood with a smooth face veneer such as birch or maple that takes a painted finish well.

is an excellent choice: it cuts, routs and fastens like a champ without costing an arm and a leg. And, better still, its closed grain is ideal for painting.

Measuring off of your cabinet to be certain of final part lengths, rip and crosscut the face frame's two stiles

and wide and narrow rails. Here again, the simplicity and sturdiness of pocket screw joinery is why many production cabinet shops build face frames with pocket screws exclusively. If this is the joinery option you choose, lay out pairs of screw pockets on the ends of each rail



Bring the carcass sides, back and bottom panels together with glue and whatever reinforcement option for the joinery you prefer. Pocket screws such as these are easy to install and form sturdy connections.



Pocket screws are a cabinetmaker's friend here again, when assembling a face frame. Even narrow rails will typically accept two screw pocket holes per joint, and the connections don't require glue.



Install the face frame on the cabinet carcass with glue and clamps. Some woodworkers use brad nails as well, but they really aren't necessary — and you'd need to putty over the nail heads.

and bore them. Then, locate and mark the position of the middle rail on the stiles, using the *Face Frame Drawing* on this page as a guide. Assemble the parts by driving screws into their pockets — there's no need for glue on these joints.

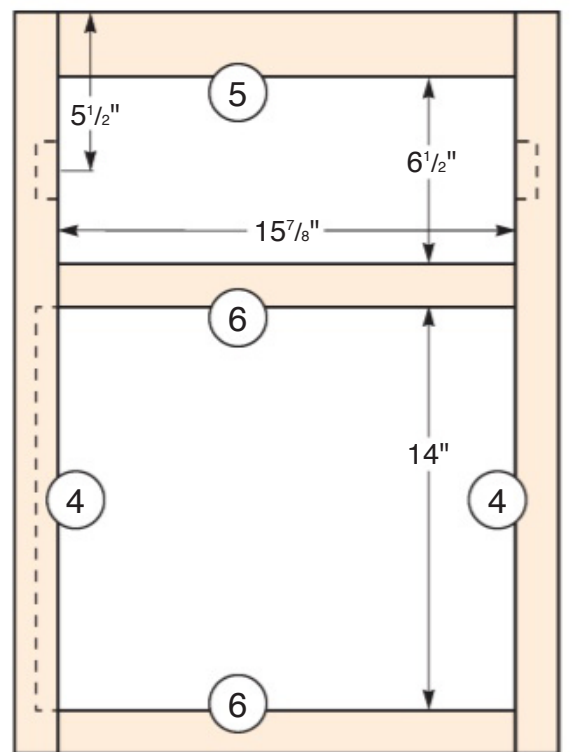
Remove the clamps from the carcass so you can check the fit of the face frame on it. Its ends and edges should line up evenly. Give the face frame a quick sanding, if any of the joints need flattening, then glue and clamp the face frame to the front edges of the cabinet. Some woodworkers nail face frames in place, but glue alone is strong enough here.

Building the Door

This cabinet's door consists of a raised center panel of solid poplar, surrounded by a rail-and-stile frame that enables the panel to expand

Face Frame

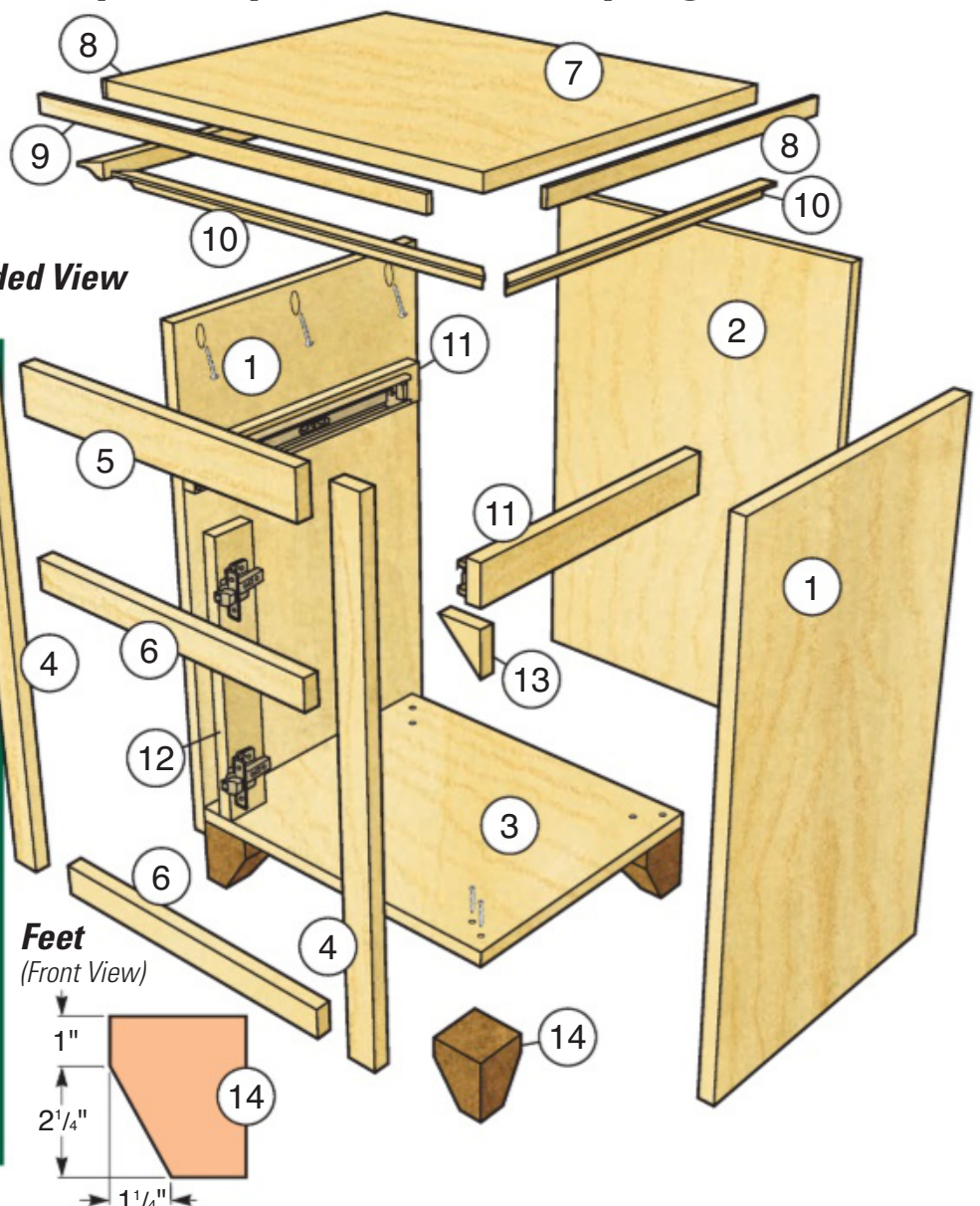
(Front View)



and contract. If you've never built a raised-panel door before, be sure to watch our "More on the Web" video at woodworkersjournal.com that overviews the machining process in detail.

Then proceed by measuring the inside door opening on the face frame, and cut a pair of stiles 1/8" shorter than the opening. The rails will have

Case Exploded View



MATERIAL LIST

Carcass	T x W x L
1 Sides (2)	3/4" x 15 1/4" x 25 3/4"
2 Back (1)	3/4" x 17 3/8" x 25 3/4"
3 Bottom (1)	3/4" x 14 1/2" x 17 3/8"
4 Face Frame Stiles (2)	3/4" x 1 1/2" x 25 3/4"
5 Wide Face Frame Rail (1)	3/4" x 2 1/4" x 15 7/8"
6 Narrow Face Frame Rails (2)	3/4" x 1 1/2" x 15 7/8"
7 Top (1)	3/4" x 20 1/4" x 16 3/4"
8 Side Trim (2)	1/4" x 3/4" x 16 3/4"
9 Front Trim (1)	1/4" x 3/4" x 20 3/4"
10 Decorative Molding (1)	3/4" x 3/4" x 55"
11 Slide Supports (2)	3/4" x 2" x 14 1/2"
12 Hinge Mounting Plate (1)	3/4" x 2 1/4" x 14"
13 Door Stop (1)	3/4" x 2 1/4" x 2 1/4"
14 Feet (4)	2 3/4" x 2 3/4" x 3 1/4"

Cabinet Hard-to-Find Hardware

100-lb. Low Profile Full Extension Drawer Slides - Accuride 3732 (1) #35565 ... \$17.99 pr.
Mini Blum® 90° Clip-On Frameless Inset Hinge (1) #38411 \$14.99 pr.

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

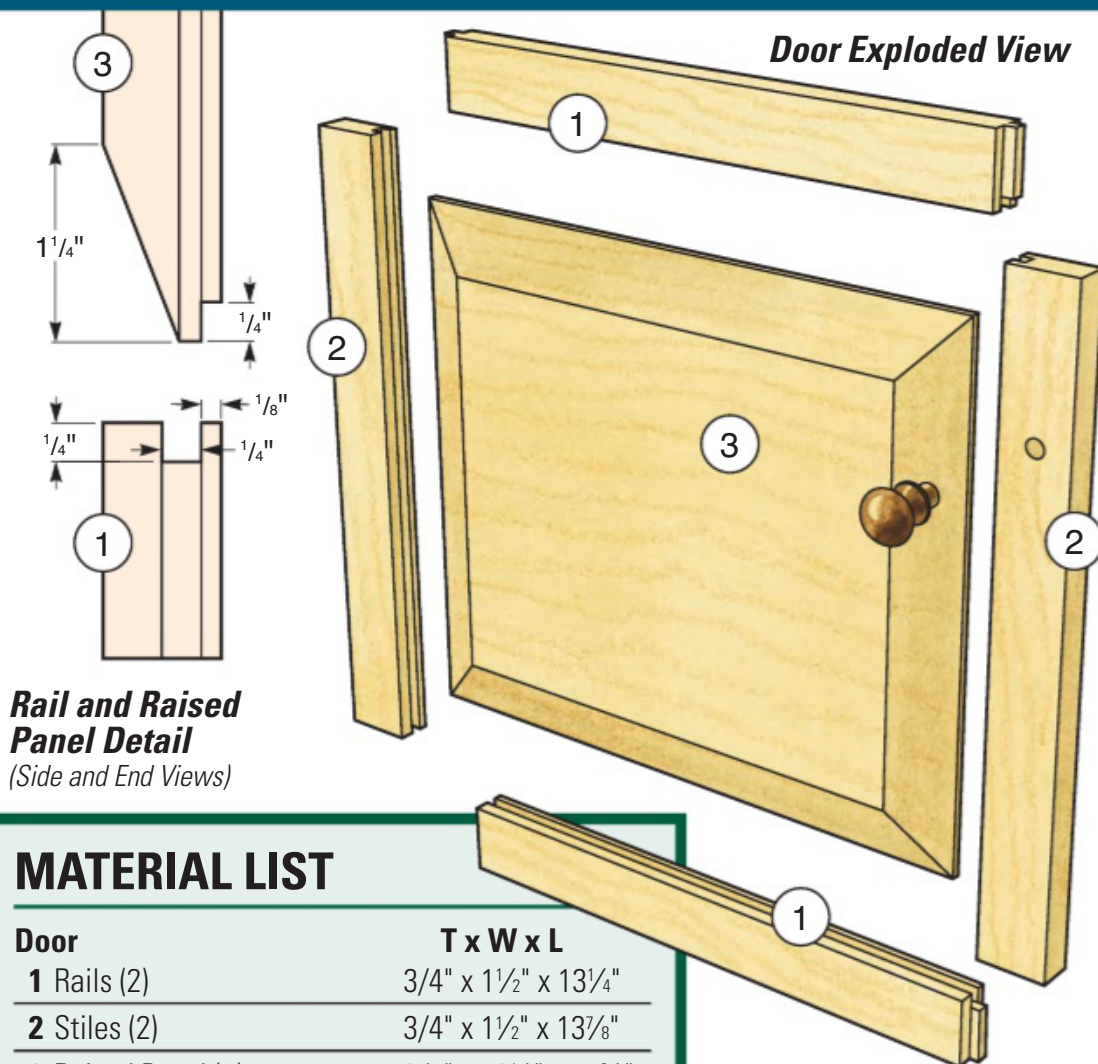
1/4"-long tongues on their ends that fit into mating grooves in the stiles. Cross-cut the rails to 13 3/4" long to account for these joints.

Step over to your table saw and set up a 1/4"-wide dado blade. Raise it to 1/4" and plow grooves along one edge of each stile and rail. Position these offset grooves 1/8" in from the back faces of the parts (see photo 1 below). After cutting the grooves, raise 1/4"-long offset tongues on the ends of the rails to fit the grooves (see photo 2).

Next, dry assemble the door frame joints. Measure the inside opening of the frame to determine the final size of the center panel, and glue up a panel blank. Tilt your table saw blade to 20 degrees off of vertical for cutting the four face bevels around the panel edges. When the panel is standing on edge against the rip fence, the blade should intersect its bottom edge about 1/4" in from the back face. Raise the blade just high enough to cut the bevels, install a tall featherboard and make these four cuts (see photo 3).

Finally, notice in the panel detail drawing above that there's still a 1/4"-wide, 1/8"-deep rabbet to plow around the edges of the back face so the panel will fit into its frame grooves. We made these on a crosscut sled with a dado blade (see photo 4).

Scrape and sand the door panel to remove any saw marks. Go ahead and glue



MATERIAL LIST

Door	T x W x L
1 Rails (2)	3/4" x 1 1/2" x 13 3/4"
2 Stiles (2)	3/4" x 1 1/2" x 13 3/8"
3 Raised Panel (1)	3/4" x 13 3/4" x 11 3/8"



1 Plow a 1/4" x 1/4" groove along one edge of the door's stiles and rails, using a table saw and dado blade. Locate this offset groove 1/8" from the back part faces.



2 Raise 1/4"-long tongues on the ends of the rails to fit the frame grooves. A stop, clamped to a crosscut sled, ensures that the tongues will all be the same length.



3 With the saw blade tilted 20 degrees off of vertical, bevel-cut the door panel's ends and edges to create its field area. Use a tall featherboard to support these cuts.

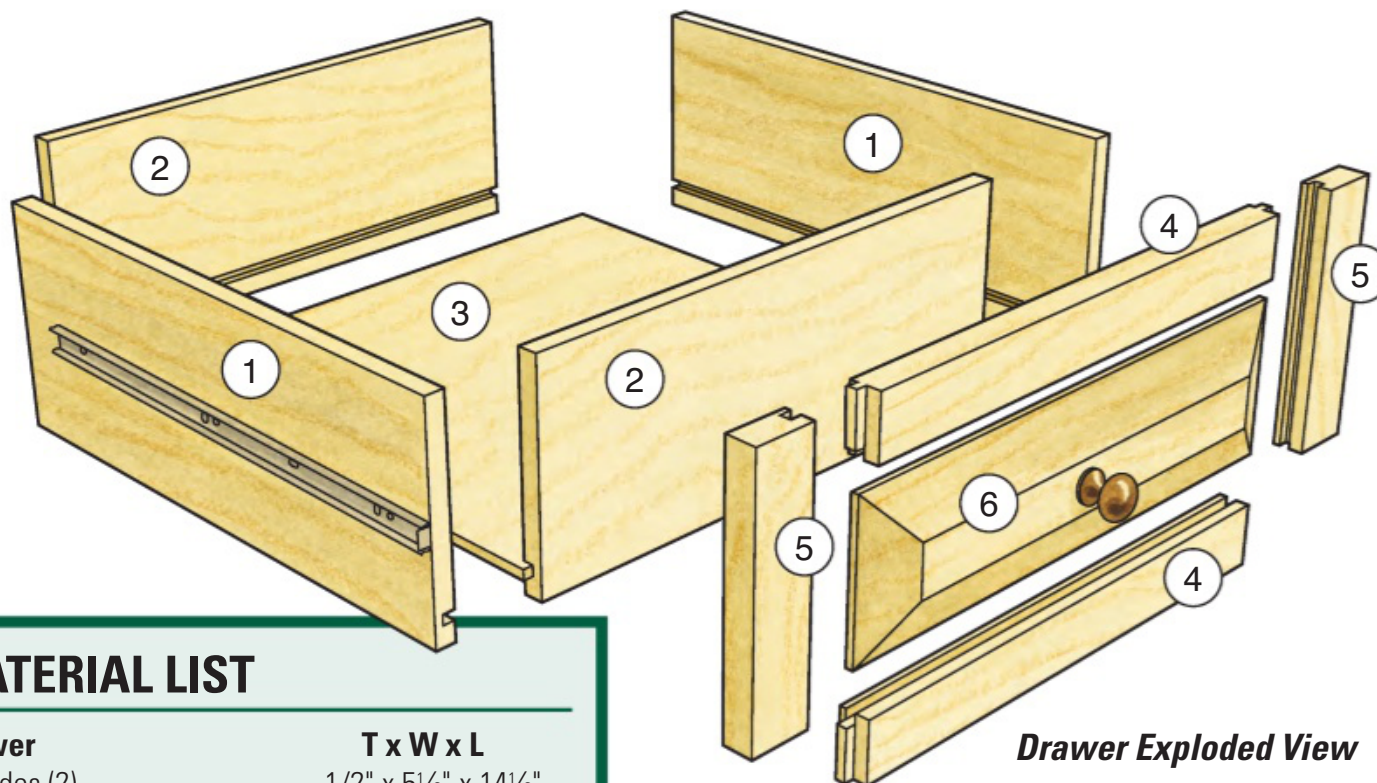


4 A shallow rabbet milled around the back face of the door panel fits its edges to the frame grooves and brings the back faces of the parts flush (inset).



MORE ON THE WEB

For a video overviewing how to make this project's raised panel door, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.



Drawer Exploded View

MATERIAL LIST

Drawer	T x W x L
1 Sides (2)	1/2" x 5 1/2" x 14 1/2"
2 Front and Back (2)	1/2" x 5 1/2" x 13 7/8"
3 Bottom (1)	1/4" x 13 7/8" x 14 3/8"
4 Face Rails (2)	3/4" x 1 1/2" x 13 1/4"
5 Face Stiles (2)	3/4" x 1 1/2" x 6 3/8"
6 Raised Panel (1)	3/4" x 3 7/8" x 13 1/4"

the door together, limiting the glue to only the tongue-and-groove corner joints, so the panel can expand and contract freely when needed.

As you can see in the *Exploded View Drawing*, above, there's still the matter of making the drawer's front raised-panel framework. Follow the same procedure to machine and assemble this frame as you did for constructing the door. However, be mindful of one safety caveat: take extra precautions when sawing the short end bevels on the drawer's narrow raised-panel framework. Were this panel more square than rectangular, you could saw the ends just as you do the edges. But, the ends are too narrow to guide by hand against the rip fence and through the saw blade without running the risk of the panel rocking forward or backward and inviting a dangerous kickback situation.

For safety's sake, saw these narrow end bevels with the workpiece clamped securely in a table saw tenoning jig. If you don't have a metal version, here's a reason to make one from scrap using an online plan (they're plentiful). It's a good jig to have on hand in any wood shop for a variety of cutting applications.

Sand the rails, stiles and panel, and assemble the drawer face framework's tongue-and-groove joints with glue.

Hanging the Door and Drawer

Next, cut and install a pair of 3/4"-thick slide supports inside the cabinet. Center them vertically on the drawer opening. Once those are glued and brad-nailed in place, make up a hinge mounting plate and attach that to either the left or right inside wall of the cabinet, depending on which way you want the door to swing.



Cut a 1/4"-deep groove along the inside face of the drawer sides, front and back, to house the drawer bottom. Size the width of these grooves to match the bottom panel's thickness.



Assemble the drawer's raised panel framework with glue and clamps. Be careful to only glue the tongue-and-groove corner joints; the panel must be able to float freely in its grooves.

Assembling the Drawer

This cabinet's drawer box construction couldn't be simpler: its corners are just glued and nailed together. Build it by first cutting the front, back and sides to size from 1/2" plywood or solid lumber. Then, head back to the table saw to plow a groove along the inside faces of the four drawer parts, 1/2" up from their bottom edges. Make these drawer bottom grooves 1/4" deep and just wide enough to fit the thickness of the material you plan to use for the drawer's bottom panel.

Clamp the parts together to check the final length and width of the panel you'll need to cut for the drawer bottom, and make it now. Finish-sand the drawer box parts. When you glue and clamp it up, check the diagonal measurements to be sure they're equal (and the box is square). Reinforce these butt joints with some 1 1/4", 18-gauge brads after the clamps come off.



A pair of slide supports and a hinge mounting plate (being fastened in place here with glue and brad nails) raise the drawer slides and door hinge hardware so they're flush with the face frame openings.



Mini Blum 90° Frameless Inset Hinges (inset) require 26 mm-dia. holes to recess the hinge cups in the back face of the door stile. For accuracy's sake, bore these holes on a drill press with the door held against a clamped fence.

Butt this plate against the back of the face frame before gluing and nailing it permanently.

With those tasks behind you, it's time to drill a couple of 26 mm-dia. stopped holes in the door back for installing a pair of Mini Blum Frameless Inset Hinges. Locate these cup holes 2" in from the top and bottom ends of the door. Bore them on a drill press against a clamped fence for accuracy. Then, fit the door-side hinge components in these holes; align the hardware so it's perpendicular to the door stile, and fasten the hinges with the included screws.

Position and hang the door in its opening, driving the cabinet-side hinge screws into the hinge mounting plate. Check the door for proper swing clearance, and use the adjustment screws on the hinges to fine-tune these settings. Cut and install a triangular door stop against the back of the face frame to prevent the door from closing too far.

Now it's time to hang the drawer. Follow the instructions that come with the slide hardware to mount them inside the drawer opening. Be sure that the front ends of the cabinet-side components of the slides align flush with the back of the face frame.

Fasten the drawer-side members of the slides to the sides of the drawer box with screws. Here, the front ends of the hardware should be flush with the front

of the drawer box. Once those are in place, fit the slides together to check the drawer's alignment and action. Make any adjustments to the slides that are needed, then carefully mount the drawer's raised panel framework to it. (Double-sided carpet tape can provide a "third hand" to get this framework temporarily centered before fastening it to the drawer box from the inside with 1"-long screws.)

Painting and Finishing Up

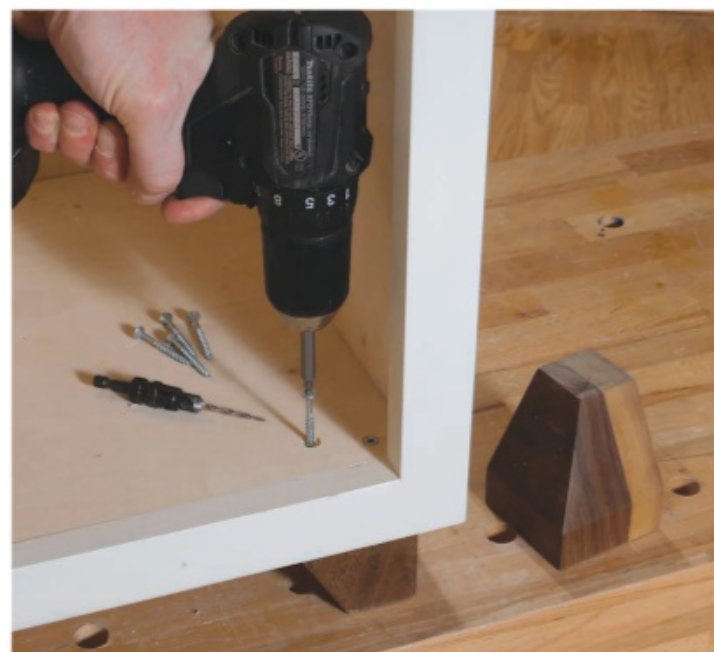
Cut a plywood panel for the cabinet's top, and band its front and side edges with 1/4" solid wood, glued in place, to hide the edge plys. When the glue dries, sand and install it on the carcass — ours secured with pocket screws. Then, miter-cut and install 3/4" moldings of your choice underneath the front and side edges of the top with glue.

Once that's done, your cabinet is ready for finish; remove the hardware as needed and apply a quality primer and paint, sanding lightly between coats. Install knobs on the door and drawer, and remount the metal hardware.

There are many hardware or shop-made options for cabinet feet; we settled on blocks of glued-up walnut, tapering their two inside faces on the band saw. If you choose to do the same, install them with pairs of flathead wood screws.



Full-extension drawer slides like these have numerous slotted screw holes so they can be installed and then adjusted as needed.



Shop-made walnut feet, featuring a pair of tapered faces, add a dash of contrast to the cabinet's bottom. Attach them with screws.

Tool Chest

By WJ Staff

Help keep your hand tools and other small supplies organized and at the ready with this easy-to-build, two-drawer tool chest.



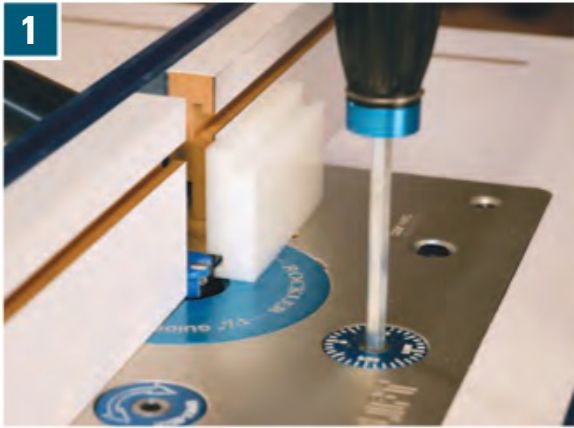
If one of your New Year's resolutions for 2020 is to get your shop better organized, this easy-to-build, double drawer tool chest can help keep that promise. Ours is made of 1/4," 1/2" and 3/4" Baltic birch plywood — this is a practical shop accessory, not a jewelry box. We used Rockler's Drawer Lock Router Bit in the router table to form sturdy, interlocking corner joints for the drawers. The case's butt joints are reinforced with stepped Miller Dowels that are as easy to install as drilling holes and pounding them in.

Making the Drawers

Your first inclination might be to make the tool chest's case first, but then the drawers must be precisely fitted to

its interior. The easier route — especially considering the interlocking nature of the corner joinery and how that impacts final part sizing — is to make the drawers first and wrap the case around them. Start by cutting two 7½" x 13" pieces of 1/2"-thick Baltic birch plywood. They'll yield all four upper and lower drawer sides.

Install the drawer lock bit in your router table, then take a close look at the inset photo for photo 4 on the facing page. Notice that the geometry for a drawer lock joint consists of a tongue-and-groove profile on one piece that fits into a mirror image tongue-and-groove on the mating piece. Adjust the bit vertically so the cutter creates an equal-sized tongue-and-groove. Rockler offers a plastic setup block that can make



1
Rockler's plastic Drawer Lock Set-Up Jig makes it easy to dial in the correct height and projection for a drawer lock router bit. Use the jig in the configuration shown here to prepare for cutting the drawer side portion of the joints.



2
To prevent chipping the plywood veneer on the faces of the drawer side workpieces during routing, score them 3/8" in from both ends of one face with a sharp knife or razor blade several times before routing.



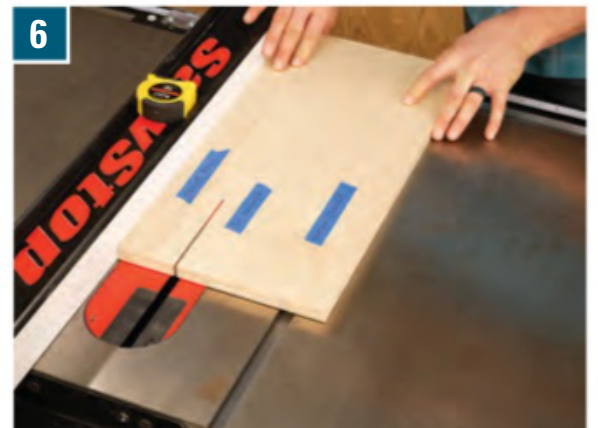
3
After making test cuts on scrap, rout the drawer lock profile into the drawer side blanks with the panels oriented vertically against the fence. Install a featherboard on the router table to keep the panels pressed firmly against the fence.



4
Reset the bit's projection using the other end of the setup block to cut a deeper profile into the ends of the drawer backs. Make test cuts and adjust the bit accordingly. The drawer back fits correctly when its thin outer tongue overlaps the end of the drawer side (inset).



5
Rout the drawer lock profile across both ends of the back panel — the face against the router table will become the inside back face of each drawer. We made these cuts into a double-wide blank of 1/2" plywood to improve stability during routing and to help speed up the process. Once the joints are cut, you can rip the panel to form both drawer backs.



6
The front rail and drawer fronts are cut from the same piece of plywood to create continuous grain across the front of the chest. Start with a piece of 3/4"-thick Baltic birch plywood measuring 10 3/4" x 21 3/4". Cut the 3"-wide front rail off the top of the panel. Then trim 1/8" from each end of the remaining wider piece to create a doubled-up blank for the drawer fronts.

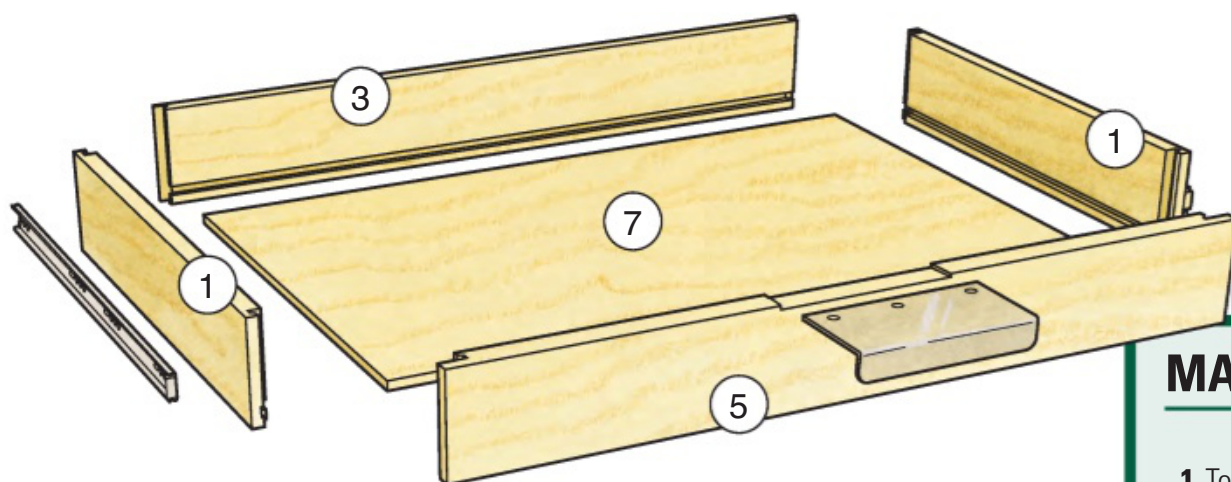
finding this bit height quick and easy (see photo 1). It also can help you determine bit projection out from the router table fence. But, if you don't have the benefit of the setup block, move the fence until the top portion of the cutter will cut 1/4" into the drawer side stock, and raise the bit 3/8" above the table. When the bit's settings are dialed in, knife a line across the face of the plywood 3/8" from both ends where the top corner of the router bit will intersect it, to help minimize tearout during routing (see photo 2). Now, carefully mill the profile across one face of both workpieces, on both ends, with the blanks standing vertically against the router table fence, to form the drawer side profile of the four corner joints (see photo 3). Set these workpieces aside for the moment.

Rip and crosscut another piece of 1/2" Baltic to 7 1/2" x 20 3/4" to create both drawer backs. In the inset for photo 4, above, you'll see that the drawer back has a thin, elongated tongue that covers the ends of the drawer sides. To achieve this overlapping profile, reset the bit's projection from the fence using the other end of Rockler's setup block as a guide (the bit's projection changes to 3/8" but its height remains the same). Then mill this cut into both ends of the drawer back stock (see photo 5). Set this workpiece aside for now as well.

The drawer faces come next, and we'll harvest them from the same piece of plywood as the tool chest's top rail. Start with a piece of 3/4" plywood measuring 10 3/4" x 21 3/4". Cut the 3"-wide front rail off the top of the panel (see photo 6). Then,



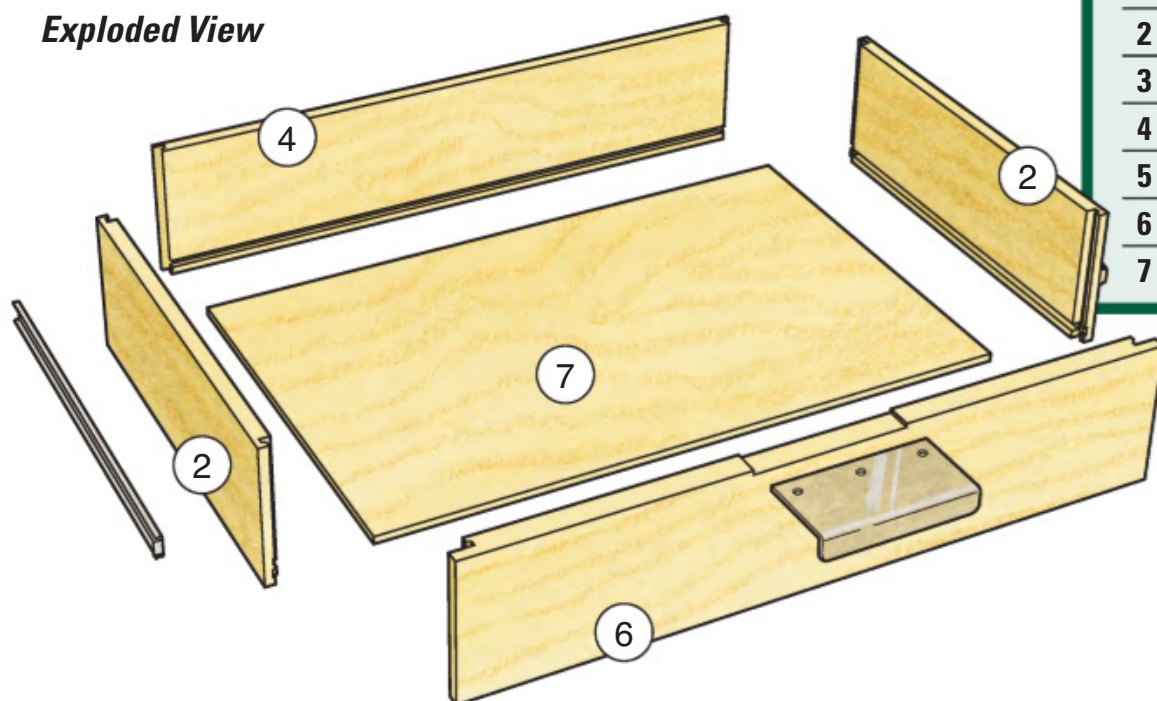
7
The drawer face blank receives a deeper profile cut that forms a long tongue to overlap the drawer sides and drawer slides (right inset). Make shallow passes, resetting the fence further from the bit to lengthen this tongue. Continue routing until the length of the inside face of the drawer front matches the inside face of the drawer back (left inset).



Exploded View

MATERIAL LIST

	T x W x L
1 Top Drawer Sides (2)	1/2" x 2 3/4" x 13"
2 Bottom Drawer Sides (2)	1/2" x 4 1/2" x 13"
3 Top Drawer Back (1)	1/2" x 2 3/4" x 20 3/4"
4 Bottom Drawer Back (1)	1/2" x 4 1/2" x 20 3/4"
5 Top Drawer Front (1)	3/4" x 2 3/4" x 21 1/2"
6 Bottom Drawer Front (1)	3/4" x 4 1/2" x 21 1/2"
7 Drawer Bottoms (2)	1/4" x 13" x 20 1/4"



Once the corner joints fit together well, cut apart the upper and lower drawer fronts, sides and backs. Then set the table saw blade to a 1/4" cutting height and make multiple side-by-side passes to cut a groove for the bottom panels in all eight drawer parts.



After the drawer bottoms are cut to size and the parts finish-sanded, glue the drawer boxes together. Check them for squareness by measuring both diagonals. If these numbers don't match, adjust the clamping pressure or the positions of the clamps until they do.

trim 1/8" off each short end of the remaining wider piece to create a single combined blank for both drawer fronts.

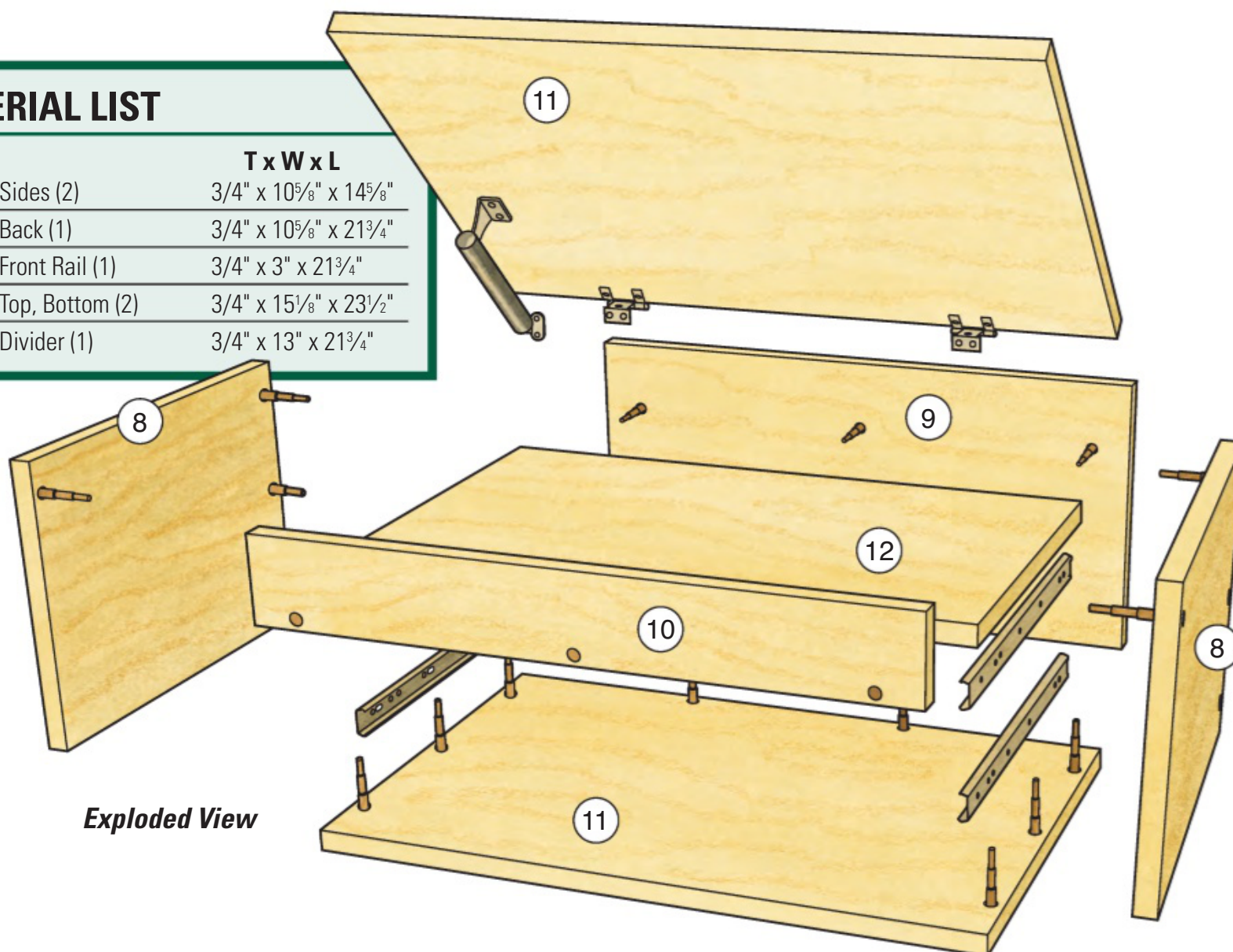
Study the two insets for photo 7 on the preceding page and you'll see that the thicker drawer front material creates a tongue that both covers the drawer sides and also conceals the ends of the drawer slides. The goal for this tongue length is 7/8". To form it, make a series of passes into the ends of the drawer front workpiece, shifting the fence back a little with each pass to expose more of the router bit. Make each new cut in a scrap piece first to check your progress, before continuing to rout the drawer front ends. Stop cutting when the

length of the inside face of the drawer front blank matches the length of the inside face of the drawer back blank. Now, dry-fit the corner joints. If they lock together well, rip the drawer side and drawer back blanks to their final widths. Then lower the saw blade to 1/4" and plow 1/4"-wide grooves along the inside bottom edge of each drawer part to fit your 1/4" drawer bottom plywood (see left photo, above). Cut these grooves carefully so the plywood will fit them snugly.

Assemble the drawer boxes again in order to take inside measurements for the drawer bottoms. Cut the two drawer bottoms to size. Finish-sand all the drawer parts, and bring

MATERIAL LIST

	T x W x L
8 Chest Sides (2)	3/4" x 10 ⁵ / ₈ " x 14 ⁵ / ₈ "
9 Chest Back (1)	3/4" x 10 ⁵ / ₈ " x 21 ³ / ₄ "
10 Chest Front Rail (1)	3/4" x 3" x 21 ³ / ₄ "
11 Chest Top, Bottom (2)	3/4" x 15 ¹ / ₈ " x 23 ¹ / ₂ "
12 Chest Divider (1)	3/4" x 13" x 21 ³ / ₄ "



Exploded View

Tool Chest Hard-to-Find Hardware

12" Series 757 100-lb. Over-Travel Centerline® Lifetime Slides (2) #49778	 \$15.99 pr.
Flat Tip Partial Wrap-Around Hinges, Pair (1) #49393	 \$9.99 pr.
Easy-Lift Lid Support (1) #66649	 \$13.99 ea.
Stainless Steel 120mm Edge Pulls (2) #1014281	 \$12.99 ea.
Rockler Drawer Lock Router Bit (1) #22637	 \$34.99 ea.
Router Bit Set-Up Jig for 22637 Drawer Lock Corner Bit (1) #53810	 \$7.99 ea.
1x Miller Tru-Fit Drill Bit (1) #20300	 \$19.99 ea.
1x Miller Walnut Dowels (1) #21366	 \$14.99 pk.

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call 800-610-0883 (code WJ1577).

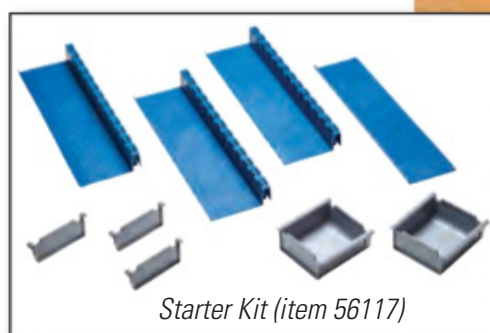
MORE ON THE WEB



For a video demonstrating the
Lock-Align system, please visit
woodworkersjournal.com and click
on "More on the Web" under the
Magazine tab.

Lock-Align Drawer Organizers

A tool chest without some form of inner dividers will quickly become a disorganized dumping ground for hand tools and other small parts. But Rockler's system of Lock-Align Drawer Organizers can help. The interlocking, synthetic rubber components create a grid of compartment walls that you can customize to the size of the drawer by cutting with a utility knife or scissors. Then, dividers and small parts bins slide into slots in the walls and hook over their rims for a secure connection. A starter kit of trays and bins is available. Additional trays, bins and holders are sold separately.



Starter Kit (item 56117)





Create a subassembly consisting of the front rail, divider and back panel. We reinforced these glue joints with walnut stepped Miller Dowels. Use a Miller Tru-Fit Drill Bit (inset) to bore the tapering dowel holes.



Apply a small amount of glue to the ribbed section of the dowel, then tap it into the hole with a mallet until the dowel seats at the bottom. Apply painter's tape around the protruding dowel to prevent marring, and trim off the excess with a flush-cut saw (inset).



Continue to assemble the chest carcass by installing the side panels to the initial subassembly, followed by the back and bottom panels. Each of these joints is first glued, then reinforced with Miller Dowels.

the drawer boxes together with glue and clamps. Before the glue begins to set, be sure to check the boxes for square by measuring their diagonals: if the numbers match, you're all set. If they don't match, adjust the clamping pressure or the clamp positions to correct the problem; out-of-square drawers are a hassle to correct after the fact — especially when they're made of plywood that can be hand-planed to correct things.

Assembling the Chest Carcass

Cut a pair of workpieces for the chest divider and back panel to size from 3/4" plywood. Finish-sand them, along with the front rail. Then glue the front rail to one long edge of the divider so the rail's bottom edge is flush with the bottom face of the divider. When the joint dries, you can reinforce it with three Miller Dowels as we did, or use countersunk #8 screws or even brad nails, if you prefer. Now, draw a layout line 3" in from one long edge of the back panel. Align the bottom back edge of the divider to this line, and glue and dowel the divider and back panel together to complete the chest's inner subassembly.

Cut the chest's side panels to shape and sand them. Attach the sides with glue and dowels to the inner subassembly — make the back edges of the side panels flush with the back face of the back panel. Cut, sand and install the chest's bottom panel next, with its back edge flush to the back of the carcass and its ends extending evenly out from the side panels. Use dowels or other fasteners to reinforce these joints, too.

Installing Hardware

The finish line for this project is in sight, but there's a little more milling yet to do. Rockler's metal flush-mount drawer pulls require a 1/8"-shallow mortise cut into the top faces of the drawers. The easiest way to accomplish this is to create a simple routing jig that controls the length of the mortise cuts, then use a straight bit to cut them. You can see on the next page that our routing jig amounts to a pair of long scraps that straddle the drawer face and also help to stabilize the router base during mortising. Two crosspieces, fastened to the long

Rockler's 120mm Edge Pulls (see inset) mount flush to the top edges of the drawer fronts, so you'll need to cut a 1/8"-deep mortise in the top of each drawer front to match the length of the pull. One way to do this is to make a simple jig to guide your router and limit the cutting area. We made one with a couple of long scraps of plywood that sandwich the drawer front and two shorter crosspieces that serve as stops for the router base. Once the mortises are cut, drill pilot holes for the screws and install the pulls.



Install a pair of 12" Series 757 100-lb. Over-Travel Centerline Lifetime Drawer Slides 7/16" back from the front edge of the case sides, to allow the drawer faces to close flush with the chest sides. Locate the slides in the carcass so they will be centered on each drawer side. Center and attach the drawer side components of the slides to each drawer side as well.



Mount a pair of partial wrap-around hinges to the top and back panels of the chest. Then install the Easy-Lift Lid Support, adjusting its tension as directed in the lid support instructions. Once you are satisfied with the lid and drawer operation, remove all hardware and apply your preferred topcoat finish to complete the project.

pieces, stop the router's travel and limit the length of the mortises to fit the 120 mm-long pulls. Once the drawer faces are mortised, fasten the pulls to them with the included screws.

Next up are the drawer slides. Carefully lay out the positions of the cabinet side components of the slides inside the chest. Inset their front edges 7/16" back from the front of the chest, and fasten them in place with the included screws. It's a good idea to use the slotted holes provided on the slides for the screws, in case you need to move the slides slightly up, down or back and forth. Fasten the drawer side member of each slide so it's centered on the width of the drawer sides. Then, connect the slide components together to hang the drawers, and check their action. Adjust the slides as needed to create even gaps between the drawers and so the drawer faces close flush with the front of the chest.

Cut and sand a panel for the chest lid. We installed ours with a pair of low-profile, partial wrap-around hinges that don't require mortising. Just mark their positions on the lid and back panel, drill pilot holes and fasten them in place. Then, to keep the lid up while using tools, we completed this project's hardware needs with Rockler's Easy-Lift Lid Support — it also simply screws to the lid and back panel.

Finishing Up

You could skip a finish on this project in order to hustle it into service, but eventually raw, blonde plywood will begin to look grimy from use. So why not apply two coats of your favorite film finish — polyurethane, shellac or lacquer — it will keep this tool chest looking great for years to come.

TOOL PREVIEW

Fusion F2 Table Saw

By Rob Johnstone

Laguna brings a feature-rich hybrid saw to market at a compelling price.



Table saws are some of the most versatile and important tools a woodworker can use. Our surveys indicate that nearly 93 percent of woodworkers own a table saw. The data also suggests that many woodworkers are looking to upgrade their table saws.

If you are one of those woodworkers, the Fusion F2

would be one to consider.

Laguna's Fusion F2 is what I could call a hybrid saw — combining features of a traditional cabinet saw with a 1¾hp motor. (Cabinet saws have 3hp or larger motors.)

With that said, the Fusion F2 is a feature-rich table saw at a very compelling price. In its 36" fence configuration, it retails for around \$1,399.

Key Features

Laguna reports that the F2's trunnion system, mounted to the cabinet, is totally new and the result of years of research. The result is very smooth blade adjustment without compromising strength and durability.

Laguna also reports "micro-adjustable blade tilt at a 2:1 ratio and zero backlash."

Fusion F2 by the Numbers:

Motor: 1 $\frac{3}{4}$ hp, single phase (3,450 rpm)

Electrical: 115 volt, 15 amp

Power Cord: 6 ft.

Overall Dimensions: 66 $\frac{3}{4}$ " L x 39 $\frac{3}{8}$ " W x 42 $\frac{7}{8}$ " H

Footprint: 19 $\frac{1}{4}$ " L x 18 $\frac{5}{8}$ " W

Weight: 276 lbs.

Rip Capacity: 36" right, 19 $\frac{5}{8}$ " left

Rip Fence Height: 3"

Standard Blade Size: 10" dia.

Dado Blade Capacity: 8" x 3/4" wide

Arbor Size/Speed: 5/8", 4,500 rpm

Max. Depth of Cut: 3 $\frac{1}{8}$ " @ 90°

Max. Depth of Cut (Bevel): 2 $\frac{1}{8}$ " @ 45°

Front of Table to Blade (at max height): 8 $\frac{5}{8}$ "

Blade Tilt: 0 to 45° left

Miter Slots: 3/4", T-slot style

Dust Collection: 4" dia., 400 CFM min. draw

Other details include:

- Three-post height adjustment system
- Spindle lock
- Cast-iron table, wings
- Quick-release blade guard/riving knife
- Quick-release throatplate
- On-board rip fence, push stick storage
- Poly V-belt drive
- Magnetic On/Off switch
- Built-in mobility kit

Fire It Up

When you ready this saw for use, the Fusion F2 will

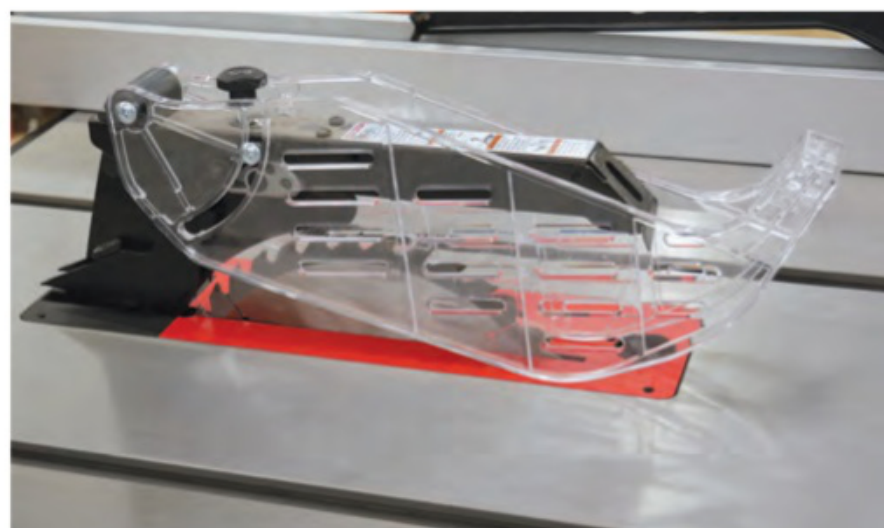
accept 10" thin-kerf and standard-kerf saw blades. It also will handle an 8" stacked dado head up to 3/4" wide.

Cutting makes a lot of sawdust, and the F2 has been designed to contain that dust and exhaust it via a 4" dust port that can be connected to a dust collection system.

All in all, the F2 Fusion saw from Laguna presents a solid option for woodworkers looking to outfit their shop with a workhorse that will serve them well.



Laguna's Fusion F2 has many practical and useful features, including on-board storage for the rip fence, push stick and miter gauge. Priced below cabinet saws, it is a practical table saw for the home shop woodworker.



The quick-release throatplate is made from a resin-based phenolic material. The included splitter with anti-kickback pawls can be quickly changed out for a classic riving knife.

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21212771

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Pierce

18-GAUGE BRAD NAILER

Customer Rating
★★★★★

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\$49.99

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COMPARE TO **\$119.99** BOSTITCH MODEL: BTFP12233
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ITEM 64255

21212012

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CHICAGO ELECTRIC

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW

Customer Rating
★★★★★

NOW
\$144.99

\$189.99

COMPARE TO **\$218.71** CHICAGO ELECTRIC MODEL: 56597
SAVE \$73

ITEM 56597

21214315

LIMIT 1 - Coupon valid through 3/4/20*

ADMIRAL

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW WITH LED AND LASER GUIDE

Customer Rating
★★★★★

NOW
\$179

\$199.99

COMPARE TO **\$269** ADMIRAL MODEL: 64686
SAVE \$90

ITEM 64686

21217847

LIMIT 1 - Coupon valid through 3/4/20*

HERCULES

PROFESSIONAL 12" DUAL-BEVEL SLIDING COMPOUND MITER SAW WITH LED SHADOW GUIDE

Customer Rating
★★★★★

NOW
\$299

\$349.99

COMPARE TO **\$599** HERCULES MODEL: 56682
SAVE \$300

ITEM 56682/63978 shown

21244224

LIMIT 1 - Coupon valid through 3/4/20*

CENTRAL MACHINERY

14" OSCILLATING SPINDLE SANDER

Customer Rating
★★★★★

NOW
\$109.99

\$147.99

COMPARE TO **\$152.99** TRITON TOOLS MODEL: TSPS450
SAVE \$43

ITEM 62146/69257 shown

21247455

LIMIT 1 - Coupon valid through 3/4/20*

CHICAGO ELECTRIC

MOBILE MITER SAW STAND

Customer Rating
★★★★★

NOW
\$99.99

\$119.99

COMPARE TO **\$169** CHICAGO ELECTRIC MODEL: 63409
SAVE \$69

ITEM 63409/62750 shown

21252648

LIMIT 1 - Coupon valid through 3/4/20*

HARDY

POWDER-FREE NITRILE GLOVES PACK OF 100

Customer Rating
★★★★★

NOW
\$5.99

\$7.99

COMPARE TO **\$14.97** VENOM MODEL: VEM4145
SAVE 59%

ITEM 37050, 64417, 64418, 61363, 68497, 61360, 61359, 68498, 68496 shown

21259045

LIMIT 3 - Coupon valid through 3/4/20*

ADMIRAL

12", 80 TOOTH FINISHING SAW BLADE

Customer Rating
★★★★★

NOW
\$22.99

\$27.99

COMPARE TO **\$59.98** DEWALT MODEL: DW3232PTX
SAVE 61%

ITEM 64911/62725 shown

21259243

LIMIT 3 - Coupon valid through 3/4/20*

EARTHQUAKE XT

PRO AIR IMPACT WRENCHES

Customer Rating
★★★★★

NOW
\$129.99

\$149.99

COMPARE TO **\$614.95** SNAP-ON MODEL: PT850
SAVE \$484

ITEM 62891

21259549

LIMIT 1 - Coupon valid through 3/4/20*

DUST AND PARTICLE MASKS

PACK OF 5

Customer Rating
★★★★★

NOW
\$1.69

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COMPARE TO **\$9.27** ACME UNITED MODEL: ACM13259
SAVE 81%

ITEM 63723/62606/50027 shown

21271560

LIMIT 4 - Coupon valid through 3/4/20*

PITTSBURGH

MECHANIC'S ROLLER SEAT

Customer Rating
★★★★★

NOW
\$199.99

\$269.99

COMPARE TO **\$499.99** ACDELCO MODEL: 34803
SAVE 60%

ITEM 61653/3338 shown

21272336

LIMIT 3 - Coupon valid through 3/4/20*

CENTRAL MACHINERY

FOLDABLE SAWHORSE

Customer Rating
★★★★★

NOW
\$8.99

\$12.99

COMPARE TO **\$17.99** STANLEY MODEL: STST11200
SAVE 50%

ITEM 60710/61979 shown

21273354

LIMIT 5 - Coupon valid through 3/4/20*

7" BENCH BRUSH

Customer Rating
★★★★★

NOW
\$1.49

\$1.99

COMPARE TO **\$16.36** TOUGH GUY MODEL: 1A849
SAVE 90%

ITEM 62617/1072 shown

21279798

LIMIT 3 - Coupon valid through 3/4/20*

CENTRAL PNEUMATIC

3/8" x 25 FT. RETRACTABLE AIR HOSE REEL

Customer Rating
★★★★★

NOW
\$39.99

\$57.99

COMPARE TO **\$149.99** COXREELS MODEL: 464125
SAVE \$110

ITEM 46104/69266/64682/69234 shown

21286396

LIMIT 2 - Coupon valid through 3/4/20*

VOYAGER

15" TOOL BAG WITH 14 POCKETS

Customer Rating
★★★★★

NOW
\$6.99

\$10.99

COMPARE TO **\$12.97** HUSKY MODEL: 823035H12
SAVE 46%

ITEM 62348/62341/61469 shown

21288473

LIMIT 4 - Coupon valid through 3/4/20*

CENTRAL PNEUMATIC

3" HIGH SPEED AIR CUT-OFF TOOL

Customer Rating
★★★★★

NOW
\$6.99

\$9.99

COMPARE TO **\$16.38** SPEEDWAY MODEL: 7625
SAVE 57%

ITEM 60243/47077/69473/60374 shown

21292951

LIMIT 5 - Coupon valid through 3/4/20*

AVANTI **SUPER COUPON**

HVLP HANDHELD PAINT SPRAYER

Customer Rating ★★★★★

~~\$99.99~~

NOW \$69.99

SAVE \$30

ITEM 64934

21302686

LIMIT 2 - Coupon valid through 3/4/20*

PITTSBURGH **SUPER COUPON**

4 PIECE WOOD CHISEL SET WITH CLEAR PVC HANDLE

LIFETIME WARRANTY

Customer Rating ★★★★★

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NOW \$4.99

SAVE 83%

COMPARE TO **\$29.97**

DEWALT MODEL: DWHT16063

ITEM 42429/69471 shown

21305267

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Customer Rating ★★★★★

Item 64031, 56429, 64033, 64059, 64721, 64722, 64720

21306145

LIMIT 1 - Coupon valid through 3/4/20*

HaulMaster **SUPER COUPON**

40" x 72" MOVING BLANKET

Customer Rating ★★★★★

~~\$4.99~~

NOW \$3.99

SAVE 60%

COMPARE TO **\$9.98**

PRATT RETAIL SPECIALTIES MODEL: HOMOVBLAN

ITEM 69504/62336/47262 shown

21313342

LIMIT 4 - Coupon valid through 3/4/20*

Bauer **SUPER COUPON**

15 AMP, 12-1/2" PORTABLE THICKNESS PLANER

Customer Rating ★★★★★

~~\$349.99~~

NOW \$299.99

SAVE \$149

COMPARE TO **\$449**

DEWALT MODEL: DW734

ITEM 63445

21313795

LIMIT 3 - Coupon valid through 3/4/20*

PITTSBURGH **SUPER COUPON**

50" CLAMP EDGE AND SAW GUIDE

Customer Rating ★★★★★

LIFETIME WARRANTY

~~\$22.99~~

NOW \$14.99

SAVE 62%

COMPARE TO **\$39.98**

BORA MODEL: S43050

Tools sold separately.

ITEM 56363/66581 shown

21314602

LIMIT 3 - Coupon valid through 3/4/20*

WINDSOR DESIGN **SUPER COUPON**

DOVETAIL JIG

Customer Rating ★★★★★

~~\$27.99~~

NOW \$21.99

SAVE 40%

COMPARE TO **\$47.16**

GENERAL TOOLS MODEL: 861

ITEM 34102

21321338

LIMIT 2 - Coupon valid through 3/4/20*

CENTRAL MACHINERY **SUPER COUPON**

4" x 36" BELT/6" DISC SANDER

Customer Rating ★★★★★

~~\$77.99~~

NOW \$64.99

SAVE \$84

COMPARE TO **\$149**

RYOBI MODEL: BD4601G

ITEM 5154/64778/97181 shown

21322718

LIMIT 1 - Coupon valid through 3/4/20*

HaulMaster **SUPER COUPON**

18" x 12" MOVER'S DOLLY

• 1000 lb. capacity

Customer Rating ★★★★★

~~\$10.99~~

NOW \$7.99

SAVE 65%

COMPARE TO **\$22.99**

BUFFALO TOOLS MODEL: HOFDOLLY

ITEM 60497

61899/62399/63095/63096/63097/63098 shown

21328455

LIMIT 4 - Coupon valid through 3/4/20*

SUPER COUPON

TWO TIER EASY-STORE STEP LADDER

• 225 lb. capacity

Customer Rating ★★★★★

~~\$29.99~~

NOW \$19.99

SAVE 40%

COMPARE TO **\$33.88**

WERNER MODEL: S322A-1

ITEM 67514

21329974

LIMIT 4 - Coupon valid through 3/4/20*

drillmaster **SUPER COUPON**

80 PIECE ROTARY TOOL KIT

Customer Rating ★★★★★

~~\$9.99~~

NOW \$6.49

SAVE 71%

COMPARE TO **\$22.76**

PROFESSIONAL WOODWORKER MODEL: 51832

ITEM 63235/63292/97626 shown

21335367

LIMIT 5 - Coupon valid through 3/4/20*

Lifetime CARBIDE **SUPER COUPON**

ALUMINUM OXIDE SANDING SPONGES PACK OF 10

Customer Rating ★★★★★

~~\$4.99~~

NOW \$3.99

SAVE 20%

COARSE ITEM 46751/63918
MEDIUM ITEM 46752/63915
FINE ITEM 63912/46753

Item 46751 shown

21338985

LIMIT 4 - Coupon valid through 3/4/20*

PITTSBURGH **SUPER COUPON**

16 OZ. HAMMERS WITH FIBERGLASS HANDLE

LIFETIME WARRANTY

Customer Rating ★★★★★

~~\$5.49~~

NOW \$2.99

SAVE 70%

COMPARE TO **\$9.98**

KOBALT MODEL: 62742

TYPE ITEM
CLAW 69006/60715/60714/47872
RIP 69005/61262/47873

Item 47873 shown

21340900

LIMIT 5 - Coupon valid through 3/4/20*

SUPER COUPON

200 LUMEN LED SUPER BRIGHT FLIP LIGHT

- Wireless, tool-free and easy installation

Customer Rating ★★★★★

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COMPARE TO **\$4.99**

PROMIER MODEL: SW-SWITCH-12/24

ITEM 64189/64723/63922 shown

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LIMIT 4 - Coupon valid through 3/4/20*

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- Weighs 3.4 lbs.

Customer Rating ★★★★★

~~\$69.99~~

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SAVE \$39

COMPARE TO **\$99**

RYOBI MODEL: P1811

ITEM 64754

63531 shown

21351127

LIMIT 1 - Coupon valid through 3/4/20*

PITTSBURGH **SUPER COUPON**

32 PIECE SCREWDRIVER SET

LIFETIME WARRANTY

Customer Rating ★★★★★

~~\$7.99~~

NOW \$5.99

SAVE 81%

COMPARE TO **\$31.97**

PERFORMAX MODEL: 48201

ITEM 61259/90764 shown

21356171

LIMIT 4 - Coupon valid through 3/4/20*

WINDSOR DESIGN **SUPER COUPON**

60" HARDWOOD WORKBENCH WITH 4 DRAWERS

Customer Rating ★★★★★

~~\$119.99~~

NOW \$119.99

SAVE \$279

COMPARE TO **\$399.95**

GRIZZLY MODEL: H7723

Tools sold separately.

ITEM 63395/93454/69054/62603 shown

21359090

LIMIT 1 - Coupon valid through 3/4/20*

HaulMaster **SUPER COUPON**

1000 LB. CAPACITY SWING-BACK BOLT-ON TRAILER JACK

Customer Rating ★★★★★

~~\$25.99~~

NOW \$18.99

SAVE 62%

COMPARE TO **\$49.99**

REESE TOWPOWER MODEL: 74410

ITEM 69780/41005 shown

21359104

LIMIT 3 - Coupon valid through 3/4/20*

PITTSBURGH **SUPER COUPON**

12" RATCHETING BAR CLAMP/SPREADER

LIFETIME WARRANTY

Customer Rating ★★★★★

~~\$4.29~~

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SAVE 85%

COMPARE TO **\$19.98**

IRWIN MODEL: 1964718

ITEM 62123/46807/69221/63017/69222 shown

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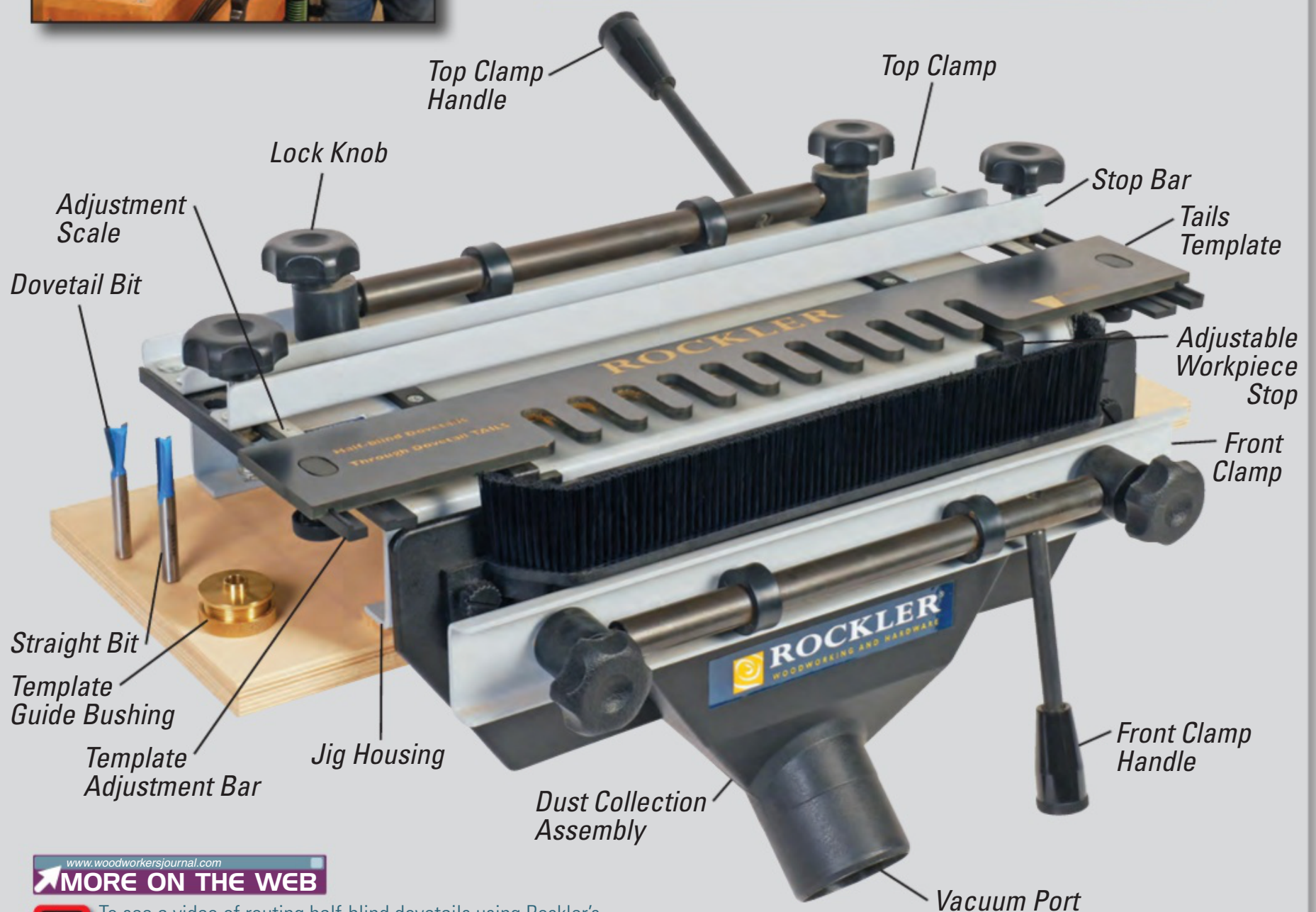
TOOL TUTORIAL

Dovetail Jigs: Handy Options to Handwork

By Chris Marshall



With a quality router jig, a little patience and some diligent practice, you can add a variety of half-blind or through dovetails to your projects. Some dovetail jigs also cut box joints and more.



www.woodworkersjournal.com
MORE ON THE WEB



To see a video of routing half-blind dovetails using Rockler's dovetail jig (above), please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

When examining a piece of furniture, even non-woodworkers will often open drawers and search for that pleasing interplay of pins and tails that mark dovetail joints. In the same way, it's hard not to fawn over a blanket chest adorned with through dovetails on its corners. There's a truism at work here: dovetails are one of the calling cards of high craftsmanship. And, in spite of the fact that we woodworkers have other joinery options that also form equally rugged connections, they just don't get the same nod of approval as

dovetails. So, it's only natural that, sooner or later, you're going to want to learn to make these interlocking, timelessly popular joints. At that point you'll face a choice: learn to saw and chop them by hand — the classic method. Or buy a dovetail jig and whip them out with a router instead. Both are entirely viable options, but router-cut dovetails require less hand-and-eye coordination. They're also quick to churn out, once your jig and router setup are carefully dialed in. If this power tool method seems a better fit for you, here's what to keep in mind.



On the Level

When I started routing dovetails 20 or so years ago, it didn't take long to learn a few humbling lessons you may face, too. First, dovetail jigs aren't panaceas for simplicity. If you hope to unpack a new dovetail jig on a Saturday morning and be milling flawless joints in an hour or two, temper your enthusiasm. To cut a properly fitting joint, most jigs will require that you fine-tune a combination of settings on both the jig and the router bit depth. The trouble is, achieving these critical settings isn't always quick or easy to understand.

Part of this challenge comes from the nature of dovetails themselves, regardless of how they are cut: pins or tails must fit their sockets within close tolerances. Joints with repeating geometry like these are also subject to cumulative error. Settings can't begin to drift, even in the slightest, over the width of the parts or the joint will be progressively thrown out of registration. The wider the joint, the more important that every router pass is done with precision.

Then there's the matter of a jig's ease of use. I don't envy the engineers who've been tasked to make their company's dovetail jig simple to set up and operate, more versatile than the competition and still priced affordably for the average home-shop woodworker. It would be no small order! Some jig designs show the spit and polish of brilliant engineering: they're a breeze to dial in and systematically troubleshoot so you know clearly what to tweak next. Others can be more enigmatic, suffering from design shortcomings or cryptic instruction manuals.

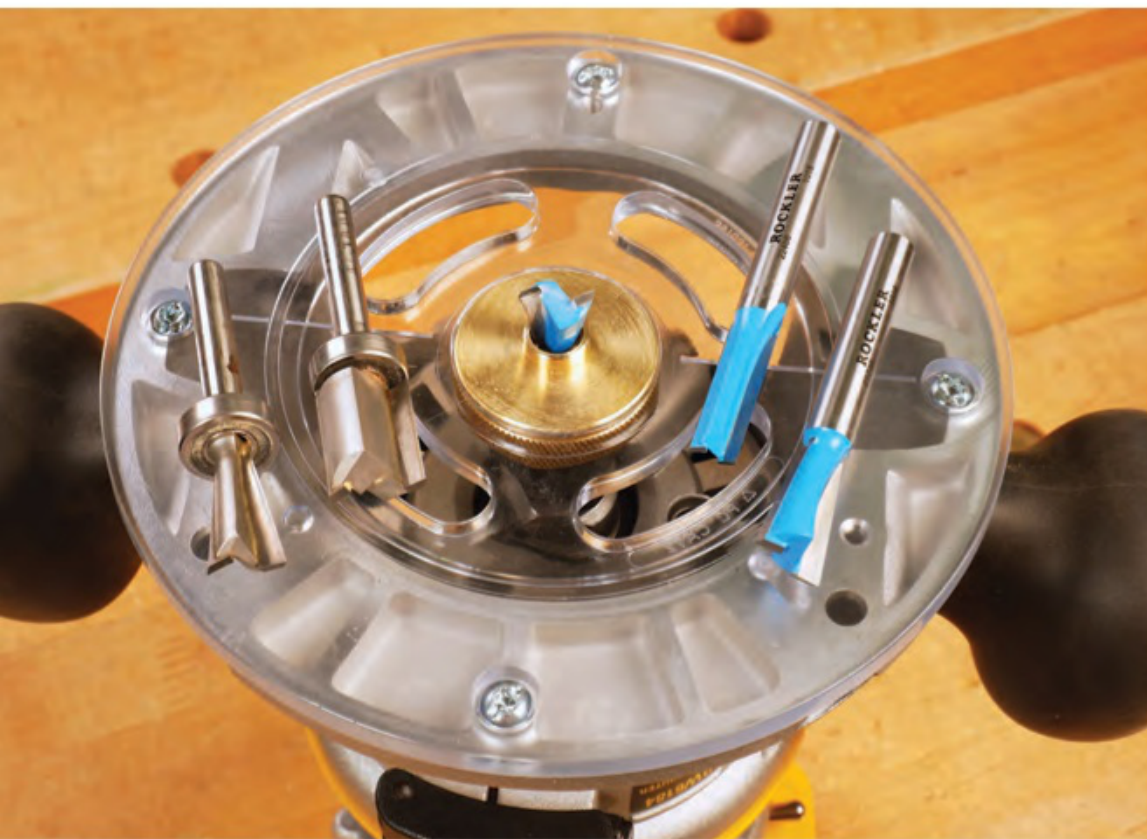
Thankfully, I've seen dovetail jigs become generally more user-friendly over the years, and some fine new jigs have come to market, too. You'll probably also be able to find YouTube videos for just about any dovetail jig you buy that can clarify details in the manual or offer tips and tricks to shorten your learning curve. With any jig, plan on making several test cuts before expecting a piston-fitting dovetail. And be patient with your process. You'll get there eventually!



Once a dovetail jig and router bit (or bits) are properly set up, you can machine dovetails quickly and easily for one drawer or a production run of as many drawers as you need.



Fine-tuning the settings on a dovetail jig can be time-consuming. Bit depth, stops on the jig and template adjustments all can impact how joints fit together. Mark the order of the test joints to keep track of your progress.



How Dovetail Jigs Work

Dovetail jigs are really just elaborate examples of template routing. The router's path is limited by a template to cut a specific pattern of pins or tails and the sockets in between. In most cases, you

feed the router over the template, which is mounted on top of the jig's housing. For a few jigs, a handheld router is unnecessary: the template with a workpiece clamped to it is inverted and guided over the router bit on a router table instead.

Depending on the joint, workpieces are presented to the jig's template with either the board's edge facing up or a face side up. Clamps in front or on top of the jig's housing lock boards in place for routing. In the case of half-blind joints, both the pin and tail boards are cut simultaneously. For through dovetails, the tail and pin boards are cut with separate templates, one board at a time.

Most dovetail jigs require that a guide bushing be mounted to the router's baseplate to follow the openings in the template. Or the bit may have an integral pilot bearing on top that takes the place of the guide bushing. You'll also need an 8° or 14° dovetail router bit, depending on the joint's geometry. For through dovetails, a straight-cutting router bit is

also required. These bits are often provided with the jig, as are the guide collar or collars required to operate them. But standard aftermarket bits are suitable options, too, provided the cutting angle is correct for the joint style.

A mid-sized or larger router with a 1/2"-capacity collet is the right choice for making the demanding cuts these dovetail jigs require. I find that the lower center of gravity of a fixed-base router makes it easier to handle and preferable to a plunge router. The fixed base makes precise depth-of-cut changes a little easier too — you're not working against the spring compression of a plunge router this way.

Fixed-template Jigs

There are two primary families of dovetail jigs, based on their template style. Fixed-template dovetail jigs, like Rockler's example at left, uses one template for cutting the tails of a through dovetail pattern (and both the pins and tails of a half-blind joint) with a dovetail-shaped router bit. The template's slots are straight and parallel. For through dovetails, a second interchangeable template enables the "pin" side of the joint to be cut using a straight router bit instead of the dovetail cutter. Here, the template's fingers are angled, rather parallel, in order to mill angled faces on the pins that fit between the tails.

The templates that come standard with a fixed-tem-

A mid-size router with a fixed base that can be equipped with guide bushings is ideal for dovetail jigs. Bit requirements will include both dovetail and straight styles; some jigs also use bits with integral pilot bearings.



On fixed-template dovetail jigs, both the pin and tail boards of half-blind dovetails are routed simultaneously with one template. The tail board mounts in the jig's front clamp, and the pin board clamps behind it.



You can't alter the joint pattern created by a fixed template, but you might be able to expand the variety of joints your dovetail jig can make by installing accessory templates, like these from Rockler.



Adjustable-template dovetail jigs feature pairs of metal fingers that create tail cuts on one end and pin cuts on the other. You can alter their spacing and pattern by loosening set screws and sliding them left or right.



Once the tails of a through dovetail joint are routed on an adjustable template (inset), flipping the template over resets the jig for cutting the mating pattern of pins and tail sockets on the pin board.

plate jig typically cut a pattern of pins and tails that have the same size and spacing. But optional templates can expand the range of joints to patterns with larger tails, irregular spacing between the pins and tails and even box joint styles.

Adjustable-template Jigs

One of the benefits of learning to hand-cut dovetails is that you can choose any pattern of pins and tails that suits your preference and application. That's impossible to do with a fixed-template jig; spacing is always predetermined by the template, and it can't be changed.

If customizing your dovetail joint layouts is important to you, an adjustable-template jig, such as the one on top of this page, can help. Here's what makes this family of jigs distinct: a collection of paired metal fingers create the template that guides the router bit in a handheld router. One end of each pair of fingers forms a parallel slot for cutting tails with a dovetail bit. The other end of the fingers are angled to guide the pin cuts of the joint using a straight router bit. The same metal fingers will cut a range of joints in

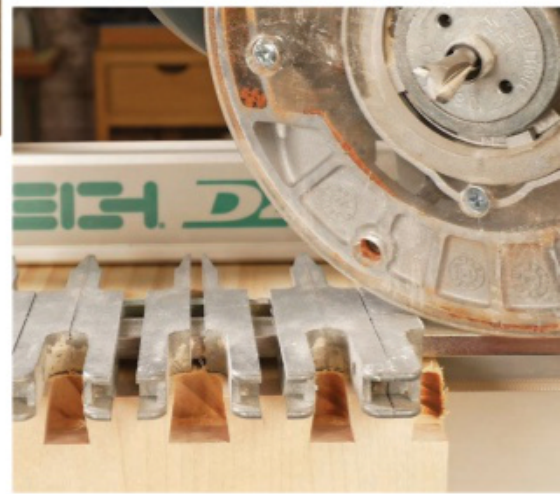
both half-blind and through dovetail styles.

Each pair of fingers can be unlocked and opened or closed to create wider or narrower pins and tails. Even better, adjusting one end of the fingers automatically dials in the other end for the mating cut. Pairs can be spread apart from other pairs along the jig's mounting bars to vary the joint layout and

spacing however you like. Once you set the pattern, tails are cut with the template oriented outward in the jig. To cut the pins, just flip the template over and reinstall, and switch router bits.

Other Variations

If you'd rather not steer a heavy router over the top of a



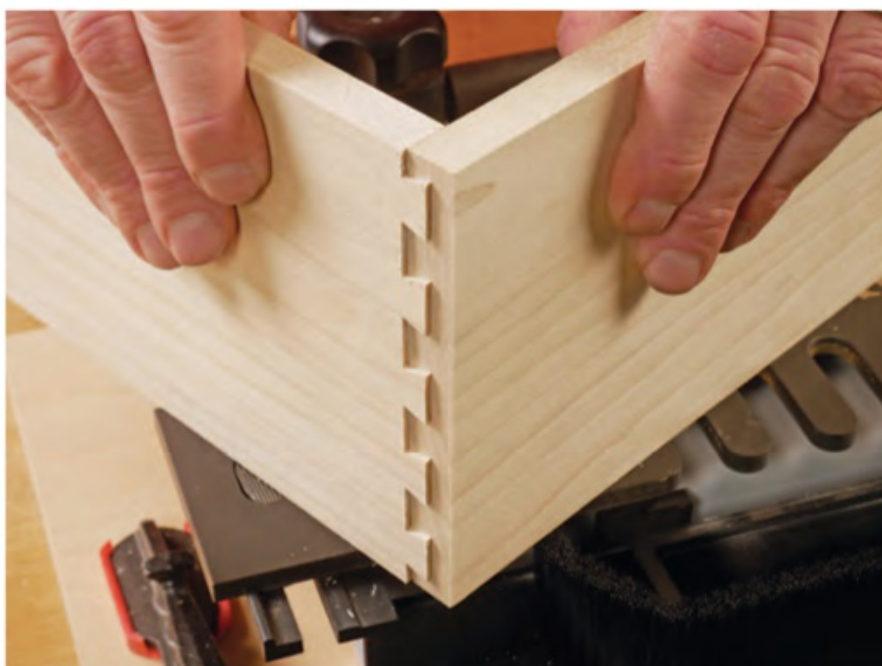
The RTJ400 Dovetail Jig from Leigh Industries is a "top down" variation on the fixed-template concept: here, workpieces clamp above the template, which is fed over a router table. In this photo, through dovetail pins are being cut.



All it takes are a pair of aluminum or phenolic templates, piloted dovetail and straight bits and two backup boards (inset) to mill through dovetails using a Keller & Company dovetail jig system.



If you can pull the pins and tails partially apart on a through dovetail joint, their fit is too loose. Resetting the bit for a slightly shallower cut will tighten the joint. Overly tight joints can be loosened by lowering the bit.



Half-blind tails that stand proud of the pin board like this require deeper sockets in the pin board to seat into. Adjust the jig's template or stop bar slightly backward to remedy the problem.



Sometimes, a dovetail jig's workpiece stops can be adjusted to prevent misaligned edges. Be sure your boards are the same width, too.

conventional dovetail jig, a "top-down" option, such as the RTJ400 from Leigh Industries (bottom left photo, previous page) might be a better choice. Here, you can use a router table and benefit from its larger worksurface to support the jig when

feeding workpieces through their cuts. Effectively, the jig is a fixed template with an integral clamping system. It functions similarly to a conventional fixed-template jig, just upside down.

Another even more streamlined option for dovetail jigs amounts to a pair of fixed templates and nothing more. With these, you fasten a piece of wood to each template to serve as a backup board during cutting. It also provides a clamping surface for workpieces. Keller & Company innovated this "template only" dovetailing method in the late 1970s, and it remains one of the simplest systems on the market.

Aside from their ease of use, there's no limit to the width of workpieces you can rout with Keller's aluminum or phenolic dovetailing templates. With other dovetail jig styles, workpieces must be narrower than the clamping apparatus that holds them in place. Depending on the jig, that might only be 12" — too narrow for large projects.

Dovetailing Challenges

As I suggested at the outset, dialing a dovetail jig in for accuracy usually takes some trial and error. Shifting the jig's template slightly forward or backward, changing the bit's depth of cut or altering how workpieces are offset from one another inside the jig all influence how well the joint parts align and fit together. Here are a few of the common problems you'll probably encounter when working with your jig.

If you're just getting started, expect several or even all of these situations to occur sooner or later.

- **Overly loose or tight joints.** A properly made half-blind or through dovetail joint should slip together without noticeable gaps, but you shouldn't have to pound them together either. Overly tight fits on a dry joint will only cause you more trouble, once glue is applied and the wood begins to swell. Conversely, loose joints are inherently weak and look sloppy, too.

What's the fix? Typically, loose or tight joints are the result of a router bit that's set too deeply (loose fit) for the cut or not deep enough (tight fit). On the next test joint, try a tiny change to your router's depth of cut, and you'll probably see a noticeable improvement in how the parts come together. Sneak up on a "push" fit, making only slight depth adjustments each time. On a good day, it may take at least two or three more test cuts after the first try before you'll achieve a proper joint.

- **Half-blind joints don't fit together flush.** It's common for the tail board of half-blind joints to either slide too far into the sockets of the pin board or not far enough. In these situations, turn your attention to the template's depth-of-cut setting — not the router bit. A tail board that embeds too deeply into the pin board means the template is allowing the bit to cut too far. Reset the

template further forward on the jig housing and try again. Or if the tail board won't push all the way home, the bit isn't cutting far enough into the pin board. Move the template backward a smidge and make another test cut. In either case, the amount of mismatch between the parts is the distance you should reset the template.

• **Part edges misalign.**

In the bottom photo on the preceding page, you can see that the edge of this joint's pin board stands out from the tail board when assembled. In these situations, make sure your pin and tail boards are precisely the same width. Misaligned parts might also indicate that a stop on the jig needs to be adjusted a nudge. If the offset is only minor, the problem might not be worth tweaking the jig; a few swipes with a hand plane or a pass or two over the jointer could be the quicker fix.

• **Pins or tails grow or shrink across the joint.**

Here's a dastardly problem I once encountered. It occurred well past the stage where my dovetail jig was tuned and cutting beautifully. Some half-blind dovetails on a figured maple drawer I was routing drifted from 3/8"-long tails on one end of a joint to nearly 5/8" long on the other end. The culprit: my bit was slipping ever so slightly out of the collet in the tough maple, cut by cut. I hope this catastrophe never happens to you, but learn from my mishap: be sure to

use a clean router collet in good condition, and periodically check it for tightness as you work — not just before you begin. Dull bits, tough woods, loose collets or simple expansion and contraction of the collet as it heats up and cools off during use all can result in slipping bits ... and ruined workpieces.

Tips for Success

Here are a few more tidbits of hard-fought wisdom that might help ease your dovetailing process:

• **Take time when preparing your stock.** It's crucial that boards are flat, of uniform thickness and have square ends and edges. Otherwise, prepare for "garbage in, garbage out," as they say.

• **Read and reread your jig's manual.** Unless you use a dovetail jig routinely, you won't memorize its nuances or probably even keep it set up for use. Make the manual your friend.

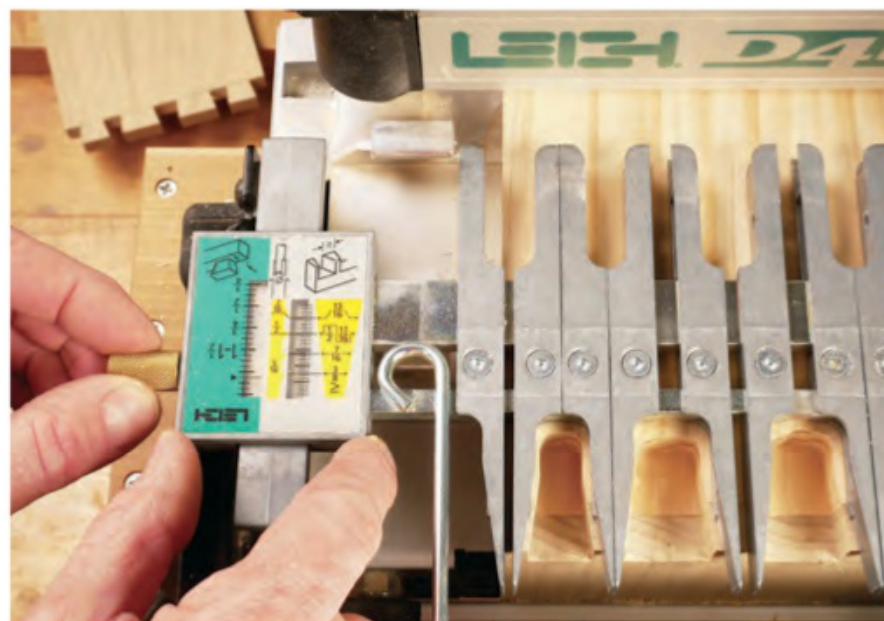
• **Change settings one at a time and incrementally.** A quick way to get befuddled with a dovetail jig is to tweak too many variables at once. Ask any experienced user ...

• **Save your best sample joints.** When a test joint fits just right, by all means save it for future reference. Mark the parts with any relevant information — bit type and depth, template setting, router used, etc. — that can help you replicate the scenario next time. Life is short, so work smarter, not harder.

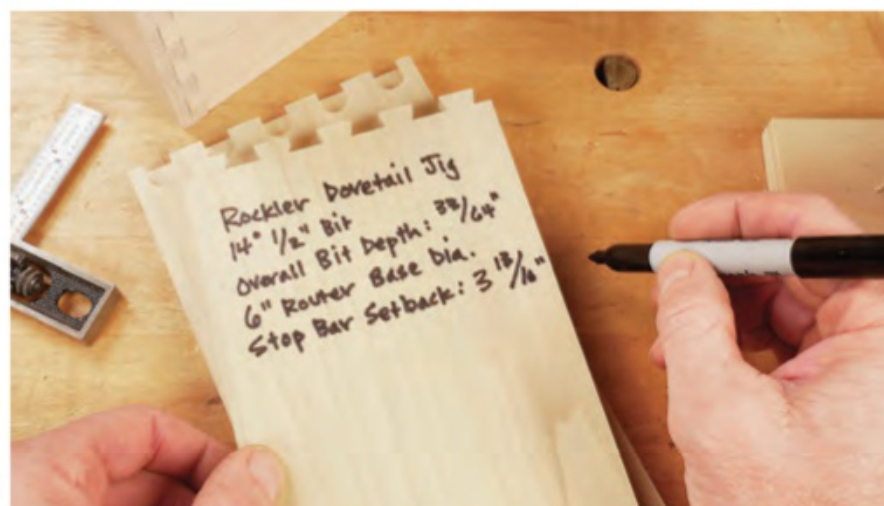
Chris Marshall is senior editor of Woodworker's Journal.



You'll better your odds for dovetailing success if you begin with workpieces that are flat, of uniform thickness and with edges and ends that are precisely square. Prepare your stock carefully.



The tiniest of adjustments to a dovetail jig's template can have marked affects on how the joint fits together. Be methodical and conservative about each adjustment, and assess your progress by making more test cuts.

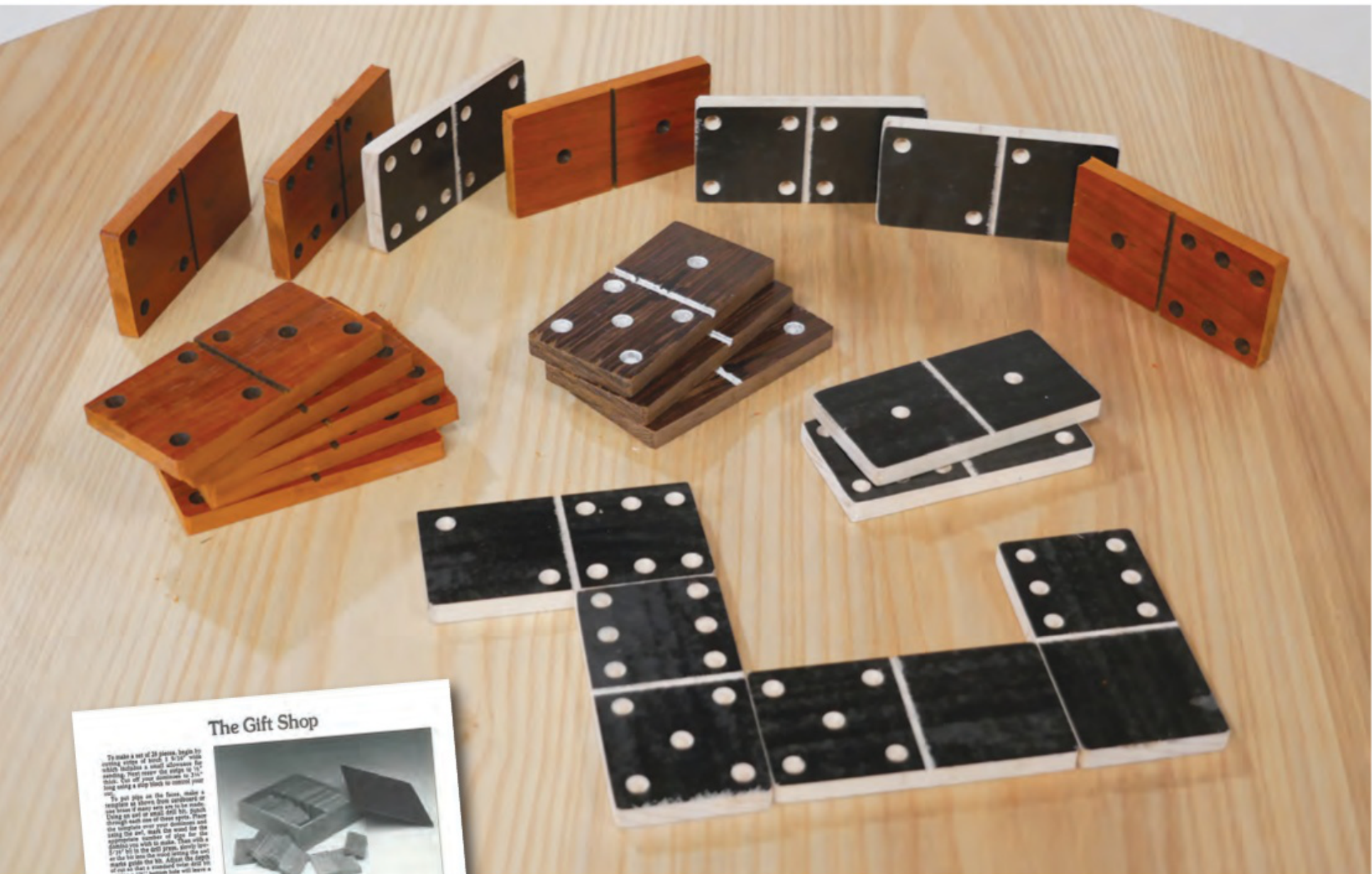


When a test joint fits together well, save the parts to use as setup helpers next time. Write notes on them so you'll recall which router and bit you used, plus other important jig settings and the final cutting depth.

Making Dominoes with a CNC Router

By Rob Johnstone

What is old is new and what is fun is fun! This classic game is fun to make — whether high-tech or analog!



If past is prolog, woodworkers are fond of making dominoes! Here is a glimpse at the original 1981 project plan. The game is the same 28 tiles and fun for all!

I was looking over some very old issues of *Woodworkers Journal* recently. In the May/June 1981 issue, I spotted a very basic plan to make a set of dominoes. While 1981 may seem a long time ago to some of us, dominoes are much older still — developed sometime around 1100 A.D. in China. They migrated to Europe in the 1800s and have been a part of western culture ever since. And as a fellow who has spent some time in cafes in the southern United States, I can report that dominoes remain popular in a variety of games. So with all this history and old-school

credibility, why would I look to a CNC router to make the tiles? Well, with 28 tiles per set and a whole lot of holes to drill, it seemed like a perfect fit.

Essential Programming, Bits

First off, if you have a CNC machine you can find the .tap files to make these dominoes in a free download by going to woodworkersjournal.com and clicking on “More on the Web” under the Magazine tab. You will also find a video showing the routing process from start to finish, with a couple of other ideas thrown in for good measure.

Rockler Domino Drilling Template

Not every woodworker has a CNC router, but don't let that stop you from making a few sets of dominoes if the urge strikes you. Rockler has a drilling template and a specially designed drill bit that makes this a totally manageable task for any home-shop woodworker. And while you could use the technique we practiced in the CNC-made dominoes — painting either the surface of the tiles or painting the dots — another great way to achieve good looking dominoes is as demonstrated in the images at right. Quarter-inch-thick walnut veneered plywood, when drilled, reveals a lovely white interior wood. How you finish them is up to you, but we would recommend applying a spray finish from a rattle can before you start cutting them out. Then touch up



with the same spray once they are cut.

If you have a table saw, handheld drill and a router table, making dominoes can definitely be on your project horizon.

#30498



*Rockler Domino Templates and Bit, with
FREE Downloadable Domino Box Plan*

I used 1/4"-thick hardwood stock to make the pieces. The CNC program is designed to make use of two 5"-wide by 24"-long blanks, with 14 tiles coming out of each piece. I'll also add, there are two CNC routing programs to use here. Cleverly named "One" and "Two," you'll need to run both to get a properly configured group of 28 dominoes.

Because it takes two boards to make one set, it's important that you can register each board accurately on your machine. The benefits of being able to take a partially machined blank off the machine and return it for the rest of the cutting process will become even more clear in just a moment. In addition to using a backer board on my CNC Shark's deck, I mounted location blocks with screws to position each piece of hardwood exactly. (This, of course, only works if each piece of hardwood has exactly the same dimensions.) With this system, you only set your X and Y coordinates once. I recommend setting your Z-axis for each piece of wood — it only takes a second.

You need two router bits to machine the tiles, the first being a V-bit. Ralph Bagnall, our CNC programmer, recom-



The author used a setup board to help place location blocks on the MDF backer board. This allows consecutive hardwood blanks to be aligned accurately. The blanks need to be identical in size — in this case, 1/4" x 5" x 24". Two blanks are required to create one complete domino set.

mends a high-speed steel downspiral like the Onsrud bit sold by Rockler (#28741). I used a 1/4" down-shear finishing bit, which I think is pretty similar. It did a fine job. The first process is using the V-bit to score the dividing lines in the center of each tile and also drilling the holes. As I mentioned earlier, there are two sets of tiles — one set per board — and the hole patterns are

the difference between the two. The cut-out program is the second of the two to run. It leaves small tabs on each tile to keep them from flying around the room as they are cut free of each blank.

Planning Ahead

While making these tiles is not exactly the most demanding woodworking a person will ever do, there are still



Using a V-bit, the divider lines are engraved into the surface of the domino stock. Here, the maple stock is painted black so that the routed lines are easily seen. The paint is non-toxic when cured.



There are two engraving programs required to make a complete set of 28 dominoes. The dot patterns will be different from each other. A CNC router makes quick work of drilling the many holes.

www.woodworkersjournal.com **MORE ON THE WEB**



For a video demonstrating the use of a CNC router to make a set of dominoes, please visit woodworkersjournal.com and click on "More on the Web" under the Magazine tab.

opportunities to be a bit creative and have some fun! Let me explain. Most of the images here show dominoes being made from maple lumber. The maple was painted black to allow the scribed lines and the drilled holes to show through the paint. As you can see, it worked great, creating nice black dominoes with white dots and divider lines.

Taking that two-color idea to the next level, I also used some wenge stock and put a lacquer finish on the wood before machining it. When the lacquer cured, I then put a layer of Frog Tape on top of the board and used the CNC to cut the divider lines and the tile holes. At this point, I took the blank off the machine and painted the dividers and holes white. (Quick tip: it does not work to just spray the masked-off blank with a rattle can of white lacquer to color the dots and lines, or the paint tends to go on too thick.) So with the Frog Tape still in place, use a stiff paint brush to paint the holes and lines by hand. It does not take long at all. Once it dries, remove the tape and step back to the CNC machine. Using the location blocks, slide the blank in place, secure it to the backer board and cut out the dominoes. The wenge version looked so good that I repeated the process using padauk wood and painting the dots and dividers black. They looked great too.

When the tiles are cut out, the CNC leaves small tabs connecting the tiles to the larger blank. Carefully break the tiles free and then sand the tabs flush to the edges of the tile. I used a benchtop belt sander and actually sanded all four edges of each tile smooth.

How to Finish

One quick safety note: while dominoes are not a little kid game, they could get their hands on them. When they do, you can bet they will put them in their mouths. (We made these tiles large enough to not be a choking hazard, but still, keep them away from little kids.) Be sure to use paints and finishes that are non-toxic when they are cured — which is almost all of them. It is always better to be safe than sorry.

Speaking of finish, I left the edges of my dominoes unfinished. I liked the contrast between the surfaces, and there is no reason to finish the edges to control wood movement. (Plus, it would have been a pretty fussy process.)

If you'd prefer to finish all the surfaces, a good way to do that is to wait for the main finish to cure completely and then wipe a coat of paste wax onto each tile. In a minute or two, wipe the wax off and you will have finished the edges with a minimum of fuss.

A final idea that I have not yet tested would be to apply a really fancy veneer to both sides of a contrasting core. You would need to apply veneer to both sides to keep the pieces from distorting. Veneer options are pretty inspiring. Imagine bringing out your Carpathian elm burl dominoes — very fancy!

Whether you make these dominoes using a CNC or a drilling jig (see *sidebar*, page 59), the result will be a custom-made game that will provide years of pleasure.



Cutting out the tiles requires a 1/4" bit of some sort. Our CNC expert recommends a high-speed steel downspiral bit for this effort. We tried a carbide downspiral bit (above) and had satisfactory results. Wood tearout at this point would be very frustrating, so use a proper bit. The cutout program leaves tabs that connect the tiles to the blank (inset) to prevent loose dominoes from catching on the bit and flying across the shop.



The author sanded all four edges of each tile to remove the tabs and machining marks. To speed that process up, he used a benchtop belt sander. He also left the edges of the tiles unfinished.

Rob Johnstone is publisher of Woodworker's Journal.

WHAT'S IN STORE

Smarter Tech for Hole-drilling, Work Tunes

Contact Information

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Easy Wood Tools
866-963-0294

JET
800-274-6848

NOVA
866-748-3025

Rockler
800-279-4441

Connecting a vacuum hose to the dust ports on portable power tools can be challenging, because port sizes and shapes vary widely. But, the *Dust Right® FlexiPort Power Tool Hose Kit* from **Rockler** (item 51170; \$59.99) offers a solution. The kit includes a 12' vacuum hose (2¼") and four soft rubber FlexiPort couplers with ¾", 1", 1¼" and 1½" inside diameters. They can accommodate either round or oval tool ports and reverse-thread onto the vac hose for secure, leak-free connections.



Rockler Dust Right Flexiport Power Tool Hose Kit, 12' Hose

The 73-lb. **JET 1020 Benchtop Drum Sander** has a compact 18" x 27" footprint and features a 1hp single-phase 115-volt motor that spins its 5"-dia. drum at 1,725 rpm. Its open-ended design allows workpieces up to 10" wide to be sanded in a single pass or 20"-wide stock in two passes. The machine will handle material up to 3" thick. Vari-

able-speed control provides feed rate adjustments from 0 to 10 feet per minute, and a separate direct-drive DC motor powers the conveyor belt to pull workpieces through each pass. Abrasive sleeves are easy to load with tool-less take-up fasteners. The conveyor can be adjusted for parallelism with the drum by turning a dial. A 4" dust port on top of the hood removes 97 percent of the dust when paired with a JET dust collector. The 1020 Benchtop Drum Sander (JWDS-1020) is priced at \$899.99.

Powerful 360° sound and a durable jobsite build quality are two of the virtues **DeWALT®** is promising with its *ToughSystem® 2.0 Radio & Charger* (DWST08820;

\$249, bare tool). The indoor/outdoor radio incorporates four high-performance full-range speakers, an active subwoofer and passive bass resonator, all driven by a 55-watt RMS amplifier to provide audio clarity. The radio can be controlled wirelessly, thanks to Bluetooth® connectivity and DeWALT's Sound Systems Android™/iOS® mobile app. Or, use its large, full-color LCD display with rubberized keypad. A USB port on the radio will charge your mobile device. You can power the radio using a DeWALT 12V, 20V MAX* or FLEXVOLT® battery or with the included AC power cord. DeWALT batteries can also be charged with the power cord plugged

JET 1020 Benchtop Drum Sander





in. This ToughSystem unit has a large compartment for storing a phone, tool battery and the power cord. Robust side latches make it modular and stackable with other ToughSystem storage boxes.

Negative Rake Cutters from **Easy Wood Tools** create smoother, safer cuts when turning resin or acrylic on a lathe. Instead of having a neutral rake angle like other insert cutters, these carbide cutters have faces that slope away from the cutting edge; the geometry virtually eliminates chipping and chatter. EWT offers Negative Rake Cutters in three styles: a square Rougher, a round



Easy Wood Tools Negative Rake Cutters

Finisher and two sizes of diamond-shaped Detailers. They range in price from \$16.99 to \$23.99 each.

Following from the success of its Voyager 18" DVR Floor Drill Press, **NOVA™** now offers a smaller *Viking 16" DVR Benchtop Drill Press*. The infinitely variable-speed, direct-drive motor has no belts or pulleys to change. Smart sensors deliver optimal speed and constant torque throughout the machine's 150 to 3,000 rpm speed range. Forward and reverse spin, an electronic depth stop, a self-start for one-handed drilling and an electronic brake are other

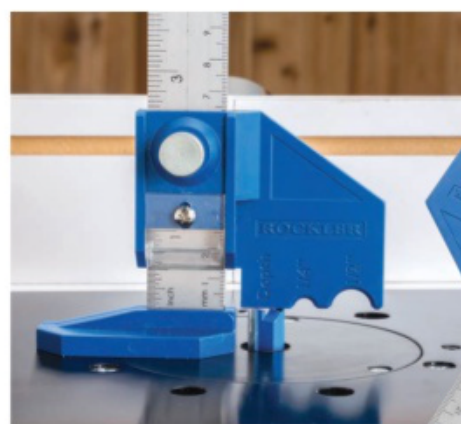
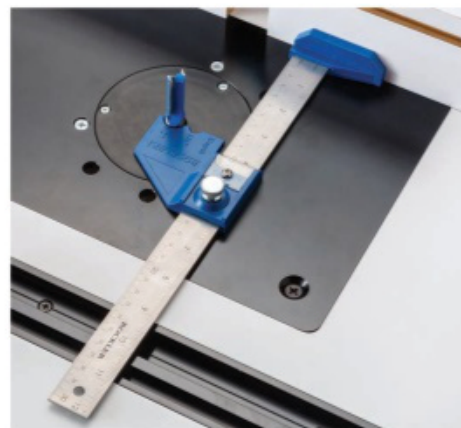
benefits of its DVR technology. NOVA equips the motor with a large, easy-to-read LCD display that can be set to decimal, fractional or metric readouts. A built-in LED light helps to illuminate the machine's cast-iron table, and a pair of cross-hair lasers provide pinpoint accuracy for locating hole centers. The lasers stay aligned, even when the table is moved

or tilted. NOVA's Viking 16" DVR Drill Press sells for \$949.99.

Rockler's Router Bit Center/Depth Gauge (item 55010; \$19.99) combines a 12" steel rule with a nylon foot and locking arm to help set the distance from the center of a 1/4" or 1/2" router bit to the fence: just hook the tool onto the bit shank, then slide the fence over until it touches the gauge. To use it for setting blade or bit height, simply adjust the gauge arm using the rule's imperial or metric graduations, rest its foot flat on the table and raise the cutter until it touches the arm.



NOVA Viking 16" DVR Drill Press



Rockler Router Bit Center/Depth Gauge

SIX SIMPLE FINISHES #1

Stain Finish for Highly Figured Wood

By WJ Staff

In the first of our six-issue series of finishing recipes, we tackle the task of adding color to highly figured wood like fiddleback maple.

www.woodworkersjournal.com
MORE ON THE WEB



For a video demonstrating the technique of applying dye to highly figured hardwood, please go to rockler.com/finishing.



Stain Finish for Highly Figured Wood

Step-by-step instructions:

1. Sand the project up through 320-grit. It is a good idea to sand pieces that will be hard to reach before assembly.
2. Wipe the project with mineral spirits to check for glue splotches. Sand the glue spot away if found.
3. Apply a coat of dye suspended in water to the wood surface. Flood it on with a staining sponge and wipe it off with shop towels.
4. Apply a sealer coat (Zinsser SealCoat™) of a shellac-based finish, flooding the surface with finish and wiping off the excess.
5. If you have any nail holes, cracks or defects in the wood, fill them now with a wood putty filler that matches the stained and sealed wood.
6. Apply at least two coats of a film finish such as polyurethane, shellac or lacquer.
7. Optional: After the finish has cured for at least 72 hours, apply a coat of high quality paste wax and then polish it off.

Getting a great finish on the project you've just completed is a task that some woodworkers dread. And that concern is elevated if the wood you are using is one that is known to be finicky to stain — like highly figured maple or cherry. Typical pigment-based stains — oil- or water-based — often splotch badly on highly figured wood.

One great way to add color and finish at the same time is to use a product like a tinted Watco Oil. On close-grained woods it pops the grain, adds color and builds up a finish all at once. And once you

have the color you want and the Watco cures sufficiently, you can apply additional coats of oil-based polyurethane to create a thicker film coat. But the color options available with that method are limited, and really dark colors of tinted Watco don't work well on close-grain woods.

Dye: Rich, Even Color

A more versatile and effective way to add color to highly figured hardwood is enumerated in the step-by-step at left. By using dye, your color options are almost unlimited, and it is well suited to this type of stock. The molecules of the dye are so small that they penetrate and color the wood deeply and evenly. Suspend the dye in water and test the mixture on scrap wood prepared in the same fashion as your project. You can always add more dye to the solution.

The color intensity of the wet dye solution is what the wood will look like when a clear finish is applied over the dried dye. You can glue dyed stock as you would raw lumber, so pre-finishing is not a problem — even on parts that will receive glue.

Once the dye has dried, polish the surface with a fine synthetic pad and apply a sealer coat. We recommend a shellac-based sealer. When it cures, you can apply a polyurethane (oil- or water-based), lacquer or a standard varnish for more protection.



Woodworking Tools & Supplies Index



February 2020

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HARDWORKING WOODS

Black Cherry: *Prunus serotina*

By Rob Johnstone

Black cherry lumber is one of our most coveted furniture-grade hardwoods.

Cherry lumber has been one of my favorite kinds of wood ever since I first smelled it being machined in my father's cabinet shop. Its pungent and distinctively fruity smell is just one of the pleasures that accompanies the working of this durable and beautiful hardwood.

In my mind, cherry is nearly the perfect hardwood for furniture and cabinetry. Its natural color is rich but not too dark. It is a “Goldilocks” wood in terms of its hardness — that is to say, not too hard and not too soft — in other words, it is just right. It machines easily, glues up well and, when first treated with a coat of linseed oil to help pop the grain, looks spectacular with just a clear finish applied. I am, in fact, such a fan of this wood that I am flabbergasted that some woodworkers shun cherry as

a second-rate species. They don't like the fact that cherry darkens over time as it is exposed to light. Some folks don't like the characteristic black pitch pockets, tiny pin knots and creamy-colored sapwood that are allowed in top quality cherry lumber. The most common complaint is that cherry burns easily as it is cut, routed and shaped.

Beautiful Flaws

To me, the beauty of cherry lumber is actually created by the combination of all of its quirks and qualities. The pitch pockets and pin knots add detail and texture to the figure of the wood. Its predisposition to darken over time adds a richness to the patina of the wood that is entirely pleasing to my aesthetics.

And cherry is not a one-act wood. Naturally growing cherry produces a variety of figure and grain patterns that give woodworkers an array of options to choose from. Curly figured cherry is not uncommon and combines the best qualities of curly maple with the hues of cherry. Quartersawn cherry presents a more subdued overall figure — a lovely, subtle “silk” pattern that runs across the width of the boards. And finally, flat-sawn cherry — one of the few flat-sawn lumbers I recommend — has pin knots and pitch pockets to add a dimension of texture that lifts it out of the plain Jane category of some other hardwoods.

Shop Score Card

Uses: Furniture, flooring, paneling and veneer, musical instruments, turned vessels

Hardness: Moderately hard and strong

Country of Origin: Native to the Eastern United States in temperate hardwood forests

Workability: Works well with both hand and power tools. Easily burned by router bits and saw blades. Carves exceedingly well. Fastens and glues well.

Finishing: Oil finishes highlight its grain and color. Curly grain will splotch when stained. Clear finishes are recommended.

Cost: Moderate to High. Bargains can be found at local sawmills.



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