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Fine WoodWorking

Tools & Shops

ANNUAL ISSUE

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Tuning and using dado planes

Build a Dutch tool chest

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Cover photo: Asa Christiana

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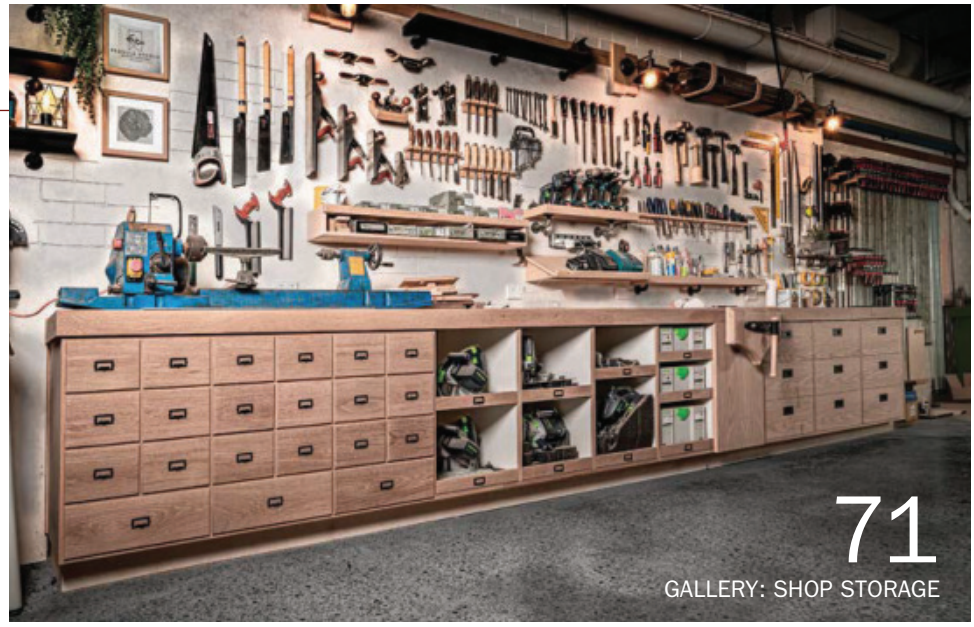

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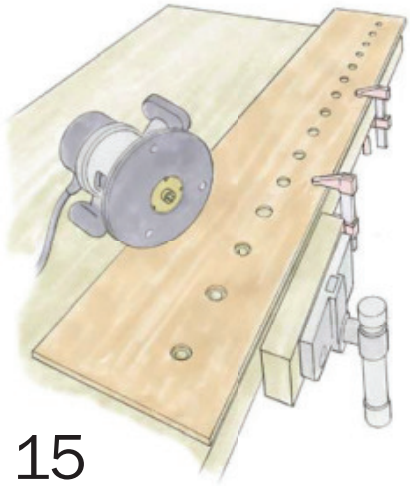

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For members

VIDEO

Sharpening Fundamentals

In this video series, Bob Van Dyke breaks down the task of sharpening, covering the basics of popular sharpening mediums, bevel angles, micro-bevels, hollow grinding, and his personal methods for sharpening chisels, handplanes, and carving gouges.

VIDEO

Take a tour

We visit shops all over the country and take our members along for the ride. From tool selection and layout to workflow and storage, there is something to be learned anytime you peek into the shop of one of our contributors.

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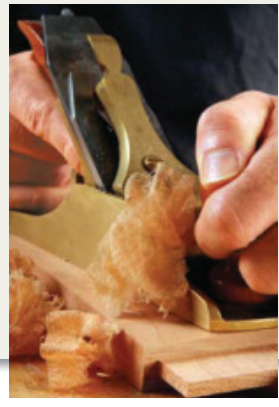
PROJECT GUIDE SPOTLIGHT

Handplanes

Handplanes are not power tools, but they are among the most powerful tools in a woodworker's shop. These must-have hand tools are ideal for smoothing and shaping parts and for cutting and fitting all types of furniture joints. Handplanes have a long history in the woodshop. In this Project Guide, one of seven available online, you will learn about all of the different types of planes, from smoothing planes to block planes and beyond. Learn their history, their anatomy, and most importantly, their use. Get professional tips on setup and sharpening that will help you overcome any obstacles to using these fun, quiet tools.



Online extras

Free content at finewoodworking.com/293

VIDEO

Small but mighty

Associate editor Barry NM Dima's shop might be small, but it packs a punch. An apartment dweller, Barry has found clever ways of getting the most out of his shop, even though it's barely more than 100 sq. ft. See Barry's workbench on p. 38.

VIDEO

Keep your dadoes square

If the floor of your dado isn't fully to depth and the shoulders aren't square, you're going to have a bad time. In this video, Megan Fitzpatrick (p. 54) demonstrates how she goes about checking her dadoes when building a Dutch tool chest.

VIDEO

Shop (vac) tips

Over the years we've had lots of shop vacuum tips submitted by our readers that will help you get even more out of this workshop workhorse (see Asa Christiana's tool review, p. 48).

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SHAPER

A tool that keeps improving. *Users like Leah K.S. Amick add features and capabilities to their Origin routers simply by downloading the latest operating system.*

A woodworking tool that gets better with age

SYSTEM UPDATES AND USER PROJECTS TAKE SHAPER ORIGIN TO NEW LEVELS

When a free system update is available for your Shaper Origin—which happens roughly once a year—a small blue badge appears on the screen, telling you that exciting new features are ready to download via Wi-Fi. That's just part of what makes this revolutionary CNC router better over time. Developers and users continue to add downloadable patterns and projects to ShaperHub, the company's online library, which includes personal storage space for registered users.

The latest operating system, Inverness, makes it easy to design and position objects and other cutting paths using the built-in screen on Origin, without touching a computer.

While users have been able to create objects on Origin for some time, they can now flip, rotate, and scale those cutting paths, and place them at precise distances from the edge of a workpiece.

Inverness also adds custom anchor points, allowing even more flexibility in positioning. Take a round-ended Soss hinge, for example, tricky to mortise accurately with traditional tools. Users import a custom cutting path from ShaperHub directly to Origin, and adjust its position precisely using an anchor point. When they pull the trigger, they'll notice that Inverness has improved the pocket-cutting function too, making the tool's movement even smoother and more precise than before.

Easy positioning. *With the new Inverness operating system come new tools for onboard design, without using a computer. "POSITION" allows users to reposition objects and cutting paths by precise distances. The latest operating system also allows objects to be scaled, flipped, and rotated.*

Even the touch screen itself is improved with Inverness, adjusting the degree of zoom dynamically for best viewing while also responding to the pinch motion for manual zoom.

Next, Origin will add a range of new system extensions, each offering a built-in feature similar to the text and box-joint functions already available. And everything uploads directly to the tool via Wi-Fi.

Users add projects, expand potential

Leah K.S. Amick's Elate Lamp is a great example of a project made possible by Origin—and its companion workholding device, Workstation. Precise cutting files and a detailed set of instructions, available free on ShaperHub, turn a lovely desk lamp with a custom shade and a dozen or more interlocking parts into a two-hour project from start to finish.

In an excellent companion video on YouTube, Amick uses many of the new system capabilities as she moves through the project, flipping cutting paths for mirrored parts, setting custom anchor points, pinching and zooming the on-board screen, and cutting a variety of precise pockets. Along the way, she demonstrates other fundamental cutting and workholding techniques for Origin and Workstation, like using the offset function to sneak up on perfect-fitting joints.

Go to hub.shapertools.com and search "Elate Lamp" to download free plans and instructions for Amick's lamp—and a host of other free projects, paths, and hardware patterns. To explore Origin's full world of features and capabilities, go to ShaperTools.com.

Free plans on ShaperHub. *Plans and cut files for Amick's Elate table lamp join many other free projects and cutting files in Shaper's online library. Amick used Shaper Workstation to hold complex parts firmly and precisely, and took advantage of Origin's new onboard tools to design and machine them.*

contributors

Megan Fitzpatrick (“Build a Dutch Tool Chest”)—woodworking teacher, blogger, editor, and writer—is a familiar presence to many readers. We decided to ask her a few questions.

Describe the view from your workshop window: **The Lost Art Press shop is on the corner of a one-way city street and a busy street in a fairly congested area. So most days, I see at least one almost-wreck when folks try to turn the wrong way into the one-way street. That’s fun!**

What’s the first thing you do upon entering the shop each day? (Don’t say turn on the light.) **Sit on the couch for a few minutes to pet Bean, the shop cat. He likes to bury his head in my hair.**

If you could meet one famous woodworker who is no longer with us, who would that be and why? **Juliette Caron—the first female “compagnon” in France. Her pay rate was 2-3 francs per day compared to 6-10 for men doing the same work. And she did it in skirts.**

Bob Rozaieski (Handwork: “Choosing and using dado planes”) is a longtime teacher of traditional hand-tool woodworking. Previously under the name Logan Cabinet Shoppe, Bob has over a decade’s worth of articles, YouTube videos, blog entries, and formal classes covering topics from tools to joinery to carving. He’s now building furniture for his log cabin in Virginia when not in his 9-to-5, driving his daughters to hockey, or teaching us more about hand tools.

Asa Christiana (“HEPA-Rated Shop Vacuums” and “Versatile Shop Cabinets”) is a former *Fine Woodworking* editor, now working for the magazine as a freelancer from his home in Portland, Ore. He is also a contributing editor for *Fine Homebuilding* magazine. When he’s not building, teaching, writing, or shooting photos, he enjoys hiking and biking in the Pacific Northwest. His high point as a mountaineer was 14,400-ft. Mount Rainier in 2020.

Kelley Franco Throop (From the Bench) and her husband **Tom Throop** (Shop Design) met while living in Hartford, and soon discovered that both were natives of New Canaan, a small town near the Connecticut coast. These days they’re back in that hometown, where Kelley practices law in an office on the main shopping street, and Tom works wood in his shop on a side street a short walk away. They live in nearby Rowayton, on the Long Island Sound, where they run on the weekends and Kelley trains for triathlons.

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letters

From the Editor

A new tool with every project

Outfitting a shop doesn't happen all at once. Instead, a shop acquires its contents over time. At first this may mean slowly building up your machine and tool collections, while later it could mean scaling back on what you own. As our interests in the craft change, so do the tools required for the job at hand. For this reason, our tools—and our shops for that matter—continue to evolve as we do, both in our skills as woodworkers and in what we aim to achieve.

There's a common piece of advice that suggests we pick up a new tool with every project that we build. For a long time I interpreted this to mean that each project serves as a good excuse to buy more tools (which is not a terrible thing). Along the way I have found some wisdom in this advice, though I might limit it to "just one tool" per project. The reason is that with every tool we gather, there is usually a new skill set involved in putting the tool to use, or in discovering its versatility. Coming home with a pile of new tools may not give us the time or focus to get to know them and gain a true understanding of how they can affect not only the things we make, but how we go about making them.

In regard to hand tools specifically, you don't truly own a tool until you get to know it, until it becomes a part of your building process and an extension of your hands. As a graphic designer, I spend most of my time in front of a computer. When I'm required to update layout software or switch programs entirely, there's always an adjustment period before I get to the point where I can "think" in the program, when it no longer becomes a stumbling block to getting the job done. The same process happens with each new tool I buy. At first it may be a novelty, and I either marvel at the amazing things it can do, or wonder why it falls short of expectations ("that video made it look so easy…"). Over time though, the tools I acquire either find a place in my building process and a valued spot in my tool cabinet, or sit unused on a shelf until I finally get the time to figure them out. As a matter of fact, I have a couple of dado planes gathering dust right now, and Bob Rozaieski's Handwork in this issue just may be what I need to get them into the starting lineup.

—Michael Pekovich

Thoughts on router-table fence

Tamar Hannah's "Adjustable Router-Table Fence" (*FWW* #292) is interesting and could be a serious time-saver. However, her comment "If you add spacers between passes, you risk a dangerous climb cut, which could yank the workpiece out of your hands and your fingers toward the spinning bit," doesn't get that adding a spacer after a pass actually puts the spinning bit deeper under the fence such that there would be no contact. Also the concept that a climb cut is caused not by taking too deep a cut, but by wrongly feeding the work left to right, seems to have been missed.

—WAYNE RICHARD, Seneca, S.C.

Michael Pekovich responds: *Sorry for the confusion. You are absolutely correct that the spacers limit the depth of cut when routing a profile along the edge of a board. The advice given here was specific to routing a wide groove in the center of a board. In that case, it is very important that you begin the cut with spacers in place, so that, as you remove them, the bit is cutting the wall farther from the fence as you feed the stock left to right. Should you happen to add a spacer after the first cut, the bit would be cutting along the inside wall of the groove, creating a climb cut since the bit is spinning in the same direction as the feed direction, which is dangerous.*

Rout from the inside out. *When routing a groove that's wider than the bit, start with a spacer behind the fence when making the first pass. Then remove it to cut the outer portion of the groove.*

Photos: staff

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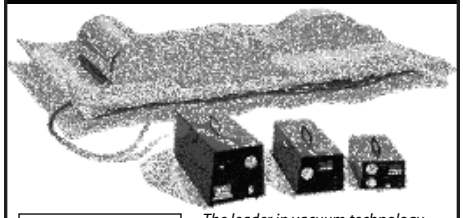

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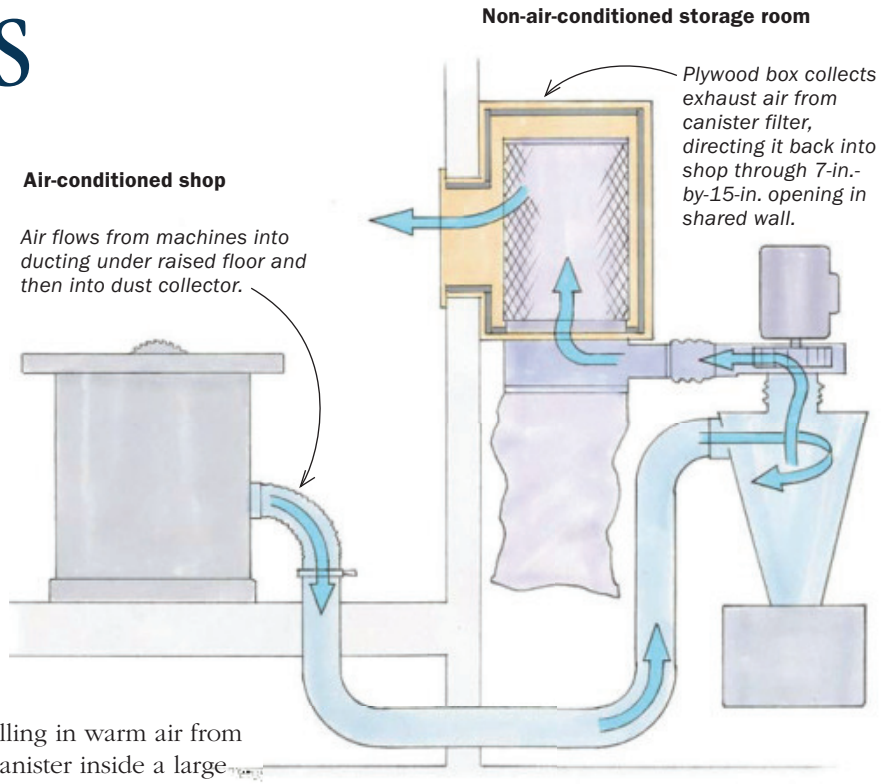
workshop tips

Smart move: Place a dust collector outside the shop



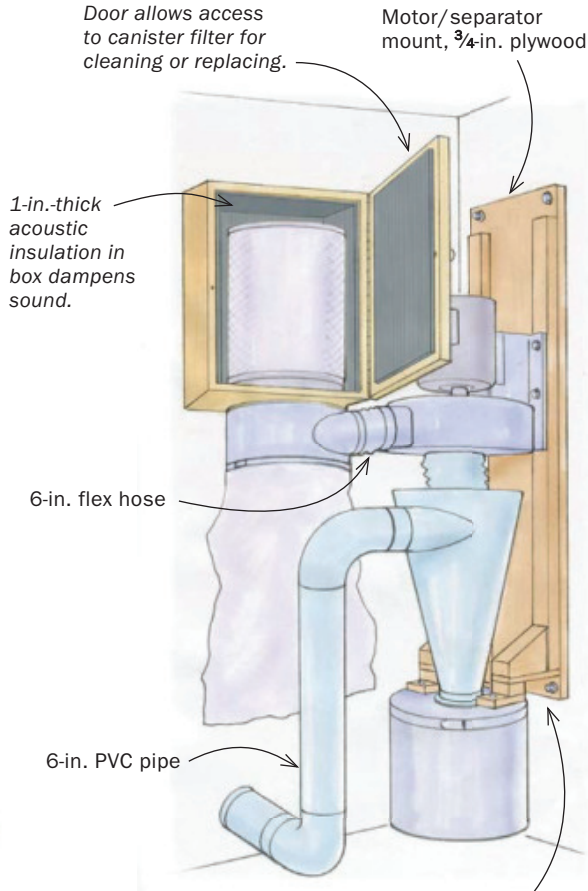
System maximizes floor space in shop, minimizes noise, retains conditioned air, and eliminates hoses underfoot.

What's unusual about my dust-collection system isn't the components. They're similar to many others—I have a large single-stage collector connected to a large cyclone separator (Oneida Super Dust Deputy). It's that I found a way to locate them outside my shop.

With floor space at a premium, I wanted to place the dust collector in the garden tool storage room next to my shop. Living in Florida and heavily reliant on air conditioning, I also wanted to find a way to return the air directly, instead of pulling in warm air from the outdoors. My solution was to enclose the filter canister inside a large plywood box, which directs the exhaust back into the workshop via an opening in the wall. I added a door so the canister could be cleaned or replaced, and installed acoustic insulation in the box to absorb sound. To save even more floor space, I raised the shop floor to allow the ducting to pass below it and emerge where it's needed, eliminating hoses underfoot.

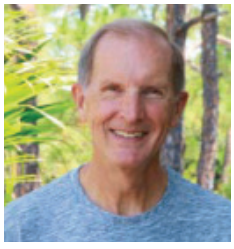
I made a number of other moves to add efficiency. First, I re-oriented the dust collector's motor/impeller unit so I could connect it more directly to both the filter/bag unit and the Oneida separator. Second, I used 6-in. PVC electrical conduit for the ducting, as it has larger radius bends than plumbing pipe, reducing friction that would otherwise steal velocity. To accommodate those big bends, I raised the dust collector by mounting it on a custom wall bracket. I made that from plywood instead of metal, to dampen motor and fan vibration that would resonate through the walls. The dust collector is so quiet in the shop that I had to hang little tape flags in the opening to see when it is running.

—STEVE FIKAR, Shalimar, Fla.



Cyclonic separator is connected directly to dust-collector motor, and both are supported by plywood bracket on adjacent wall.

Best Tip



After retiring from two careers—the first as a pilot and engineer in the U.S. Air Force and the second as a partner in a successful software firm—Steve Fikar built his dream house on Florida's Emerald Coast. His first step was designing the workshop, to be sure he had the proper setup for electrical power, dust collection, lighting, and HVAC. Although cancer has slowed his activities, he says, he finds solace and gratitude in his woodworking sanctuary.

A Reward for the Best Tip

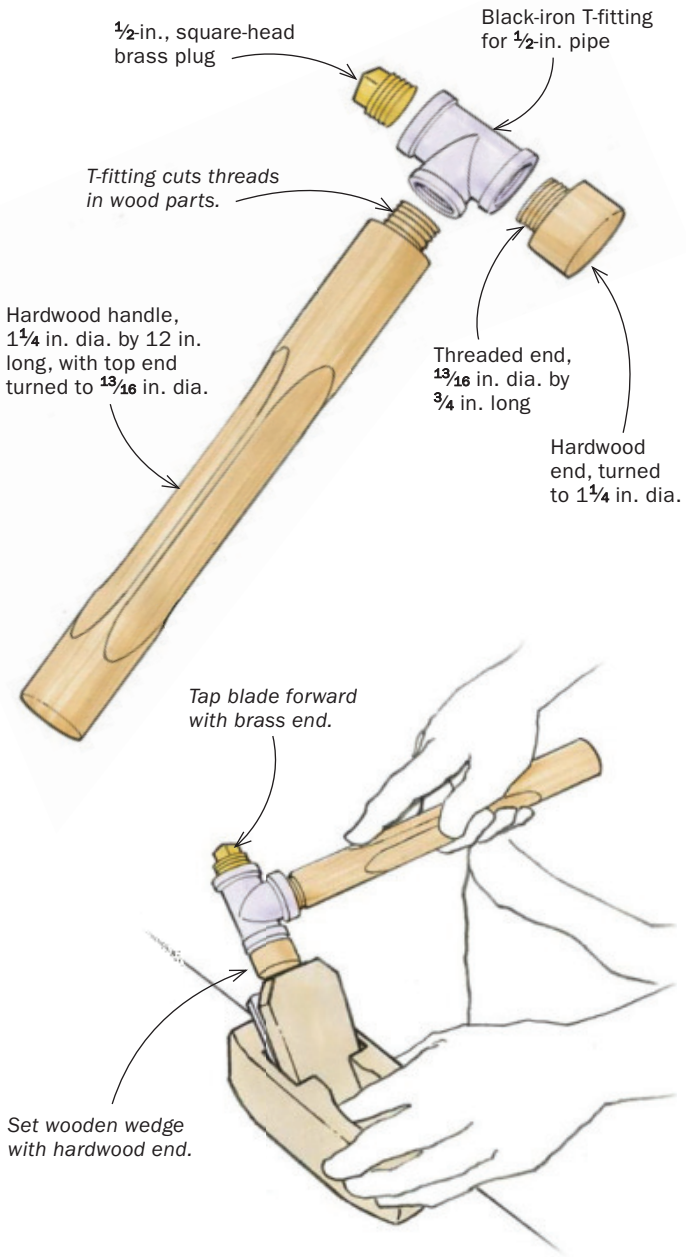
Send your original tips to fwtips@taunton.com. We pay $100 for a published tip with illustration; $50 for one without. The prize for this issue's best tip was a 16 pc. Irwin Marples Forstner Bit Set, sizes ¼-in. through 2 ⅛-in.

Drawings: Dan Thornton

Make your own plane-adjustment hammer

If you use wooden planes you'll need a hammer to adjust them. Here's how to make one with a hardwood end for setting the wedge and a brass end for adjusting the iron—all for under $20. You'll need a black-iron T-fitting for ½-in. pipe, and a ½-in. square-head brass plug. To make the wooden end of the head I turned a square piece of hardwood down to 1¼ in. dia. to match the outside diameter of the T-fitting. Then I turned ¾ in. of that end down to 13⁄16 in., which let me screw it into the end of the T—where it threaded itself as it went in—and then sawed it off to length. I did the same thing to create the hardwood handle, shaping the handle a little to suit my hand.

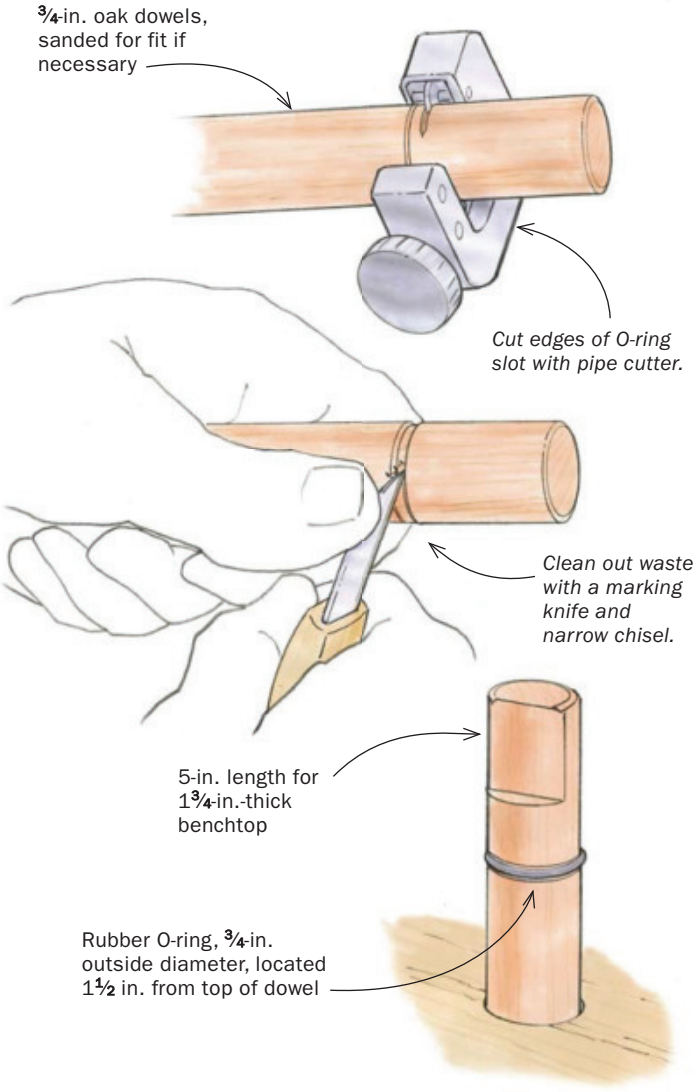
—DAVE SUTTER, Greenwood, S.C.

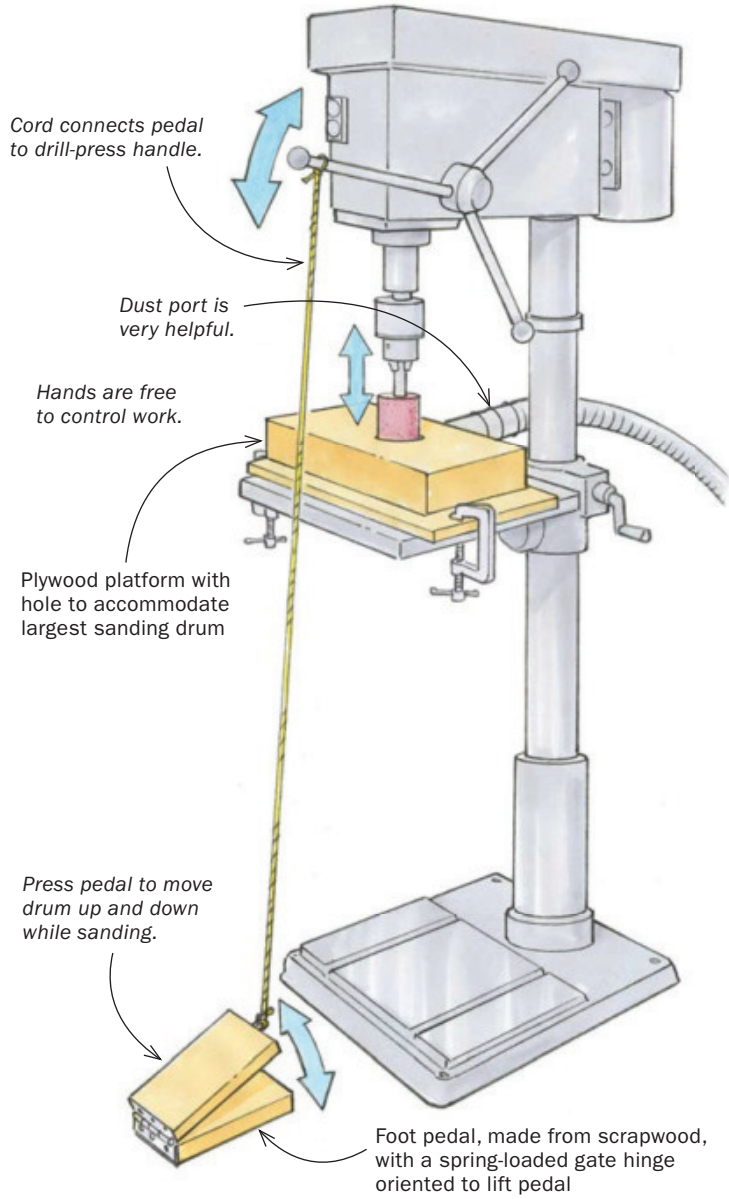


Make non-slip benchdogs

After mounting a front vise and end vise on my workbench, I decided to make my own benchdogs, insetting an O-ring in each one to add light friction and keep it in place. I used a pre-made ¾-in. oak dowel for the dogs, cut into 5-in. lengths. These were a bit tight in the holes so I sanded them to get a smooth sliding fit. Then I found rubber O-rings with a 0.750-in. outside diameter at a local, old-time hardware store. To cut shallow grooves for the O-rings, I first sliced the edges with an inexpensive cutter for copper pipe. Then I cleaned out the waste with my marking knife and a very thin chisel (I made it by sharpening a narrow screwdriver). To create the flat face at the top of each dog, I made a shallow crosscut with my handsaw, and then pared up to it with a wide chisel. I store the benchdogs in the dog holes near the front edge, pushed down flush. Gentle pressure on the bottom pops them up when needed. Note: Buy a couple more O-rings than you need; you might break one or two while fitting them.

—PATRICK DAUGHERTY, Luray, Va.





Foot pedal oscillates drill-press sanding drum

I don't need a spindle sander often enough to justify a dedicated machine. So I bought a set of sanding drums for my drill press. While these are very handy, they aren't as effective as a spindle sander because they don't oscillate up and down to distribute wear on the paper and minimize deep scratches. So I thought up a simple solution.

It starts with a shopmade platform that allows the drum to pass through it. The other component is a foot pedal, which lets me move the drum up and down while keeping my hands free to control the work. The pedal is attached to a cord that pulls the drill-press handle down, and the spring in the drill press returns the chuck and handle to its upper (retracted) position. I made the pedal from two pieces of scrap and a spring-loaded gate hinge, installed so the pedal rises when foot pressure is released. Attach the cord to the pedal and the drill-press handle, and you're ready to start tapping your foot and sanding smooth curves.

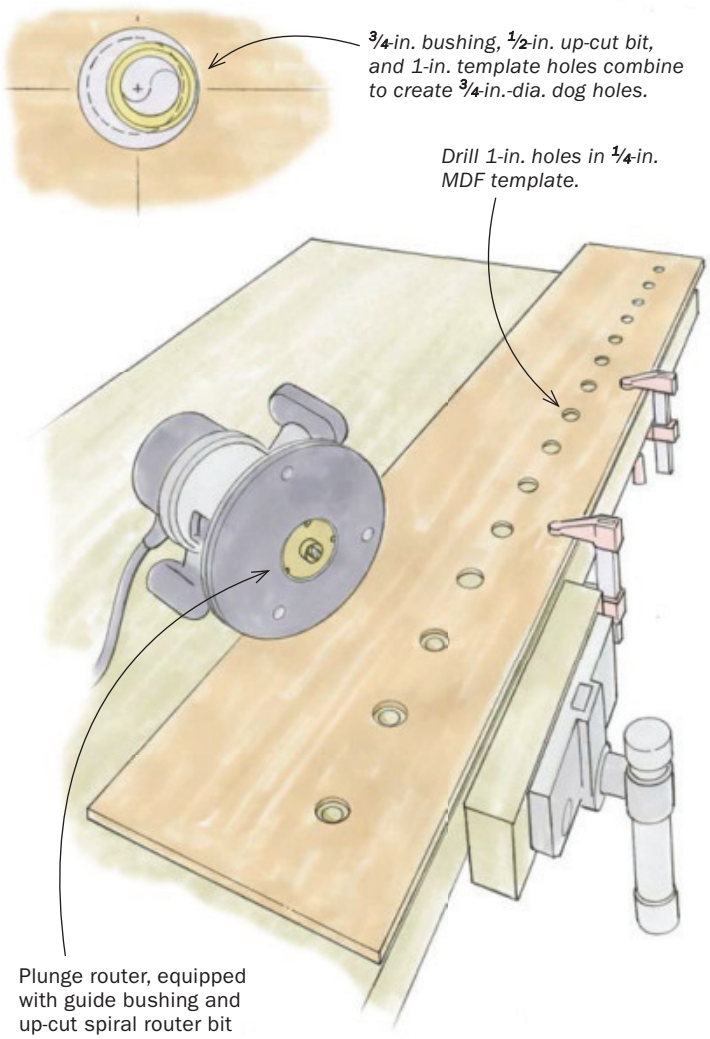
—JIM BELKNAP, Vero Beach, Fla.

Template-rout your dog holes

Dog holes can be difficult to drill in a workbench. A ¾-in. bit is hard to control by hand, and hard to keep square to the bench. So I turned to my plunge router instead, using a ¾-in. guide bushing, a ½-in. up-cut spiral bit, and a very simple template with 1-in.-dia. holes in it to produce the ¾-in. dog holes I needed. I drilled the template on the drill press, spacing out an entire row of dog holes on it. After routing that row, I repositioned the template to rout additional rows.

Depending on the thickness of your workbench top, you might not have the bit length and/or plunge capacity needed to get through it. If not, you have a few good options. Try plunge cutting as far as you can, then reaching deeper with a top-bearing router bit, which will follow the existing holes; or use a ¾-in. Forstner bit to finish them with a handheld drill, keeping the drill shaft centered in the hole. You could also drill through with a ⅝-in. bit, and work from the underside with a bottom-bearing router bit.

—JOE WEISS, Greene, N.Y.



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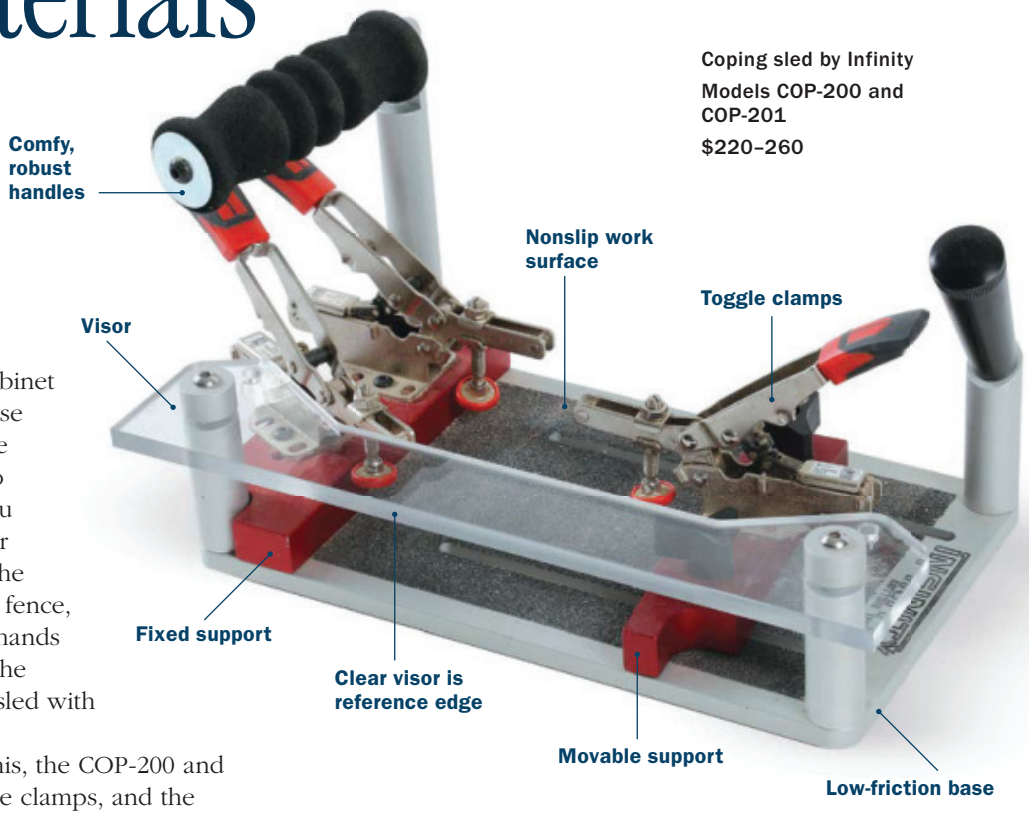


I'VE MADE HUNDREDS of cope-and-stick cabinet doors. The cope cut is tricky, partly because the cut is cross-grain, but more so because the ends of the rails are often only 2 in. to 3 in. wide. Things can go wrong when you are supporting the rails while passing their short ends across the router bit, because the workpiece can tip into the opening in the fence, ruining the workpiece and bringing your hands quickly and dangerously toward the bit. The solution is to hold the rails securely on a sled with your hands a safe distance away.

Infinity has two new sleds that do just this, the COP-200 and the COP-201. The first uses standard toggle clamps, and the second self-adjusting toggle clamps. I tested the 201, which worked great on my router table. With a ⅜-in.-thick anodized aluminum base plate and ¾-in.-thick red aluminum support blocks, the unit is well engineered and weighs in at almost 8 lb. Its heft is key to minimizing chatter. The sled has two handles, and three steel toggle clamps that hold your backer block and workpiece firmly against the sled—two clamps on the fixed support block, and one on the movable block.

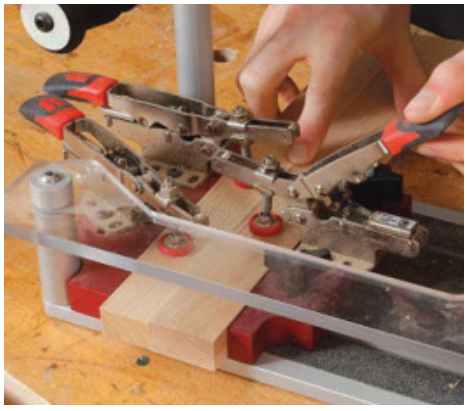
A ⅜-in.-thick clear polycarbonate visor is the reference edge for the sled. It extends beyond the base and rides against the router-table fence. This means the base itself is never against the fence or close to the bit. The visor has two sets of mounting holes, allowing you to set it up for deeper or shallower cuts.

Cope and stick is cut at the router table, but this sled works well at the tablesaw too, where you can put it to use for other joinery.

The fit and finish of the Infinity COP-201 parts are very clean and precise, and assembly was a breeze. One issue is the small, unwanted play in the visor mounting holes, since the edge of the visor needs to be square to the rear base block. It's an easy, one-time fix though, with a squared workpiece in the sled whenever you move the visor.

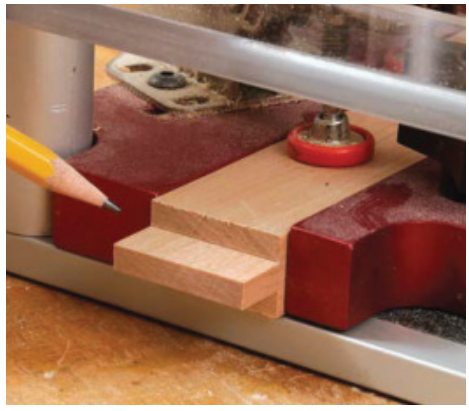
Infinity sells a steel miter bar ($20) to use the sled in a miter slot. Optional setup blocks ($10) help you dial in the bit height while accounting for the thickness of the sled's base.

—Tony O'Malley is a professional cabinetmaker in Emmaus, Pa.



Quick clamping. *Three toggle clamps hold your workpiece and any backer block efficiently and effectively. In addition, one fence is movable, allowing you to secure pieces across their width.*

Safe to use. *The visor rides against the router table's fence, and its length means there's little chance of the sled and work dangerously pivoting into any fence opening. The two handles keep your hands far from the bit.*



Tenons too. *The coping sled can also be used for routing tenons, and for molding or shaping workpieces too small to hold safely by hand.*

Photos: Barry NM Dima

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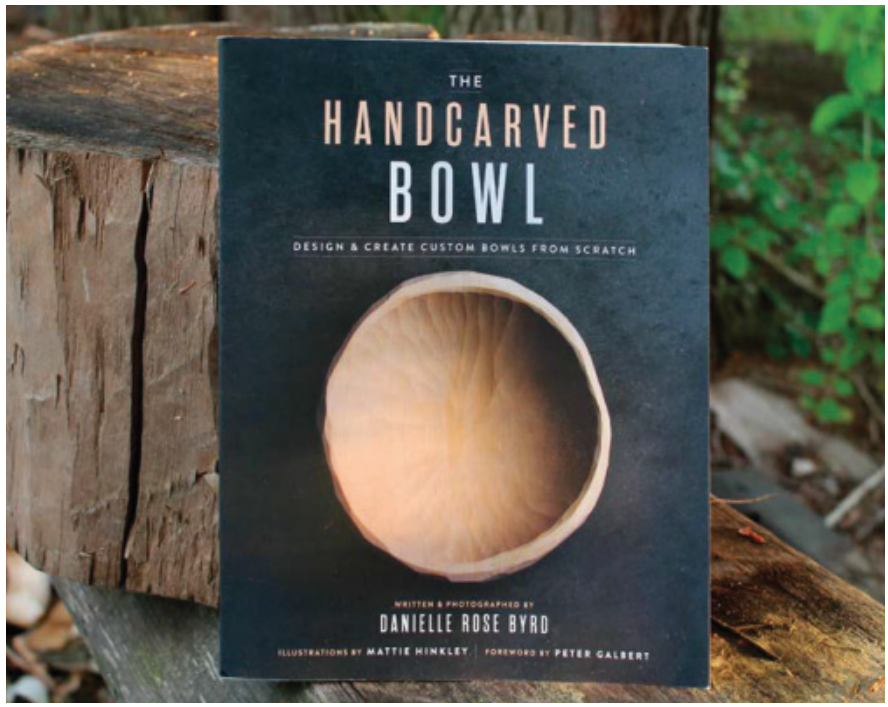
BOOKS

Bowl book's a boon

DANIELLE ROSE BYRD has written a helpful and insightful resource for current or would-be bowl carvers. T*he Handcarved Bowl* provides sound information on choices, skills, and techniques, coaching the reader from the harvesting of logs to the final cuts and oiling of the finished bowl.

Sharpening, equipment selection, drying, decorating, and more are all discussed as Byrd presents step-by-step projects based on three basic bowl forms. The reader is empowered to build on this foundation to develop personal designs. There is more than one way to carve a bowl, and even experienced carvers will benefit from Byrd's perspective and experience.

The text and photos, along with illustrations by Mattie Hinkley, clearly explain processes and situations. Byrd's writing is natural, as if she is speaking to the reader as a caring friend with an ax. Indeed, an authentic, warmhearted attitude permeates the entire book. Byrd helps and encourages the reader through anticipated pitfalls and includes an extensive section on stretching and caring for one's body that would benefit any woodworker.



The Handcarved Bowl will help many people to expand their skills and create wonderful bowls.

—Dave Fisher has been making all kinds of bowls for decades.

The Handcrafted Bowl
by Danielle Rose Byrd
Blue Hills Press
$28

ACCESSORIES

Smooth-cutting dado stack

WHITESIDE MACHINE CO. recently partnered with manufacturer Dimar to offer a line of tablesaw blades, including this 8-in. dado set. I had high hopes for the blades, and they performed as expected. This is a top-of-the-line set.

The blades have thick plates and carefully ground carbide. The configuration is typical, consisting of two 44-tooth outside cutter blades, and a set of chippers enabling dado cuts from ¼ in. to 13⁄16 in. wide in standard fractions. All the teeth are ground to a negative 6° hook. The set also comes with an extensive set of plastic shims, helpfully color coded, so you can dial in exact dado widths between those fractions of an inch. This can be very helpful when working with laminates and plywood.

The blade yielded very smooth cuts in all types of material. I ran it with solid oak and maple, oak and birch veneer plywood, and plastic laminate on MDF. All the cuts were very smooth without any visible chipping or tearout, even a cross-grain cut in oak veneer plywood. I needed to slightly increase my feed pressure when cutting with the grain in solid wood, but this was minor.

—Charlie Durfee is a professional woodworker in Woolwich, Maine.

Dado set by Whiteside
No. 8443DADO
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Photos: Dave Fisher (top); Barry NM Dima (bottom)

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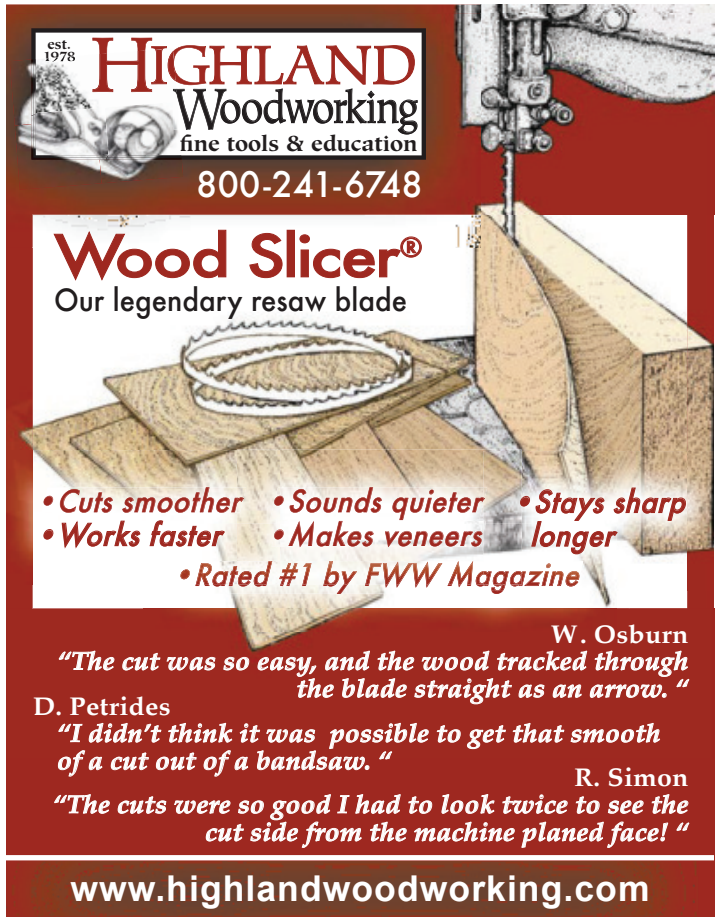
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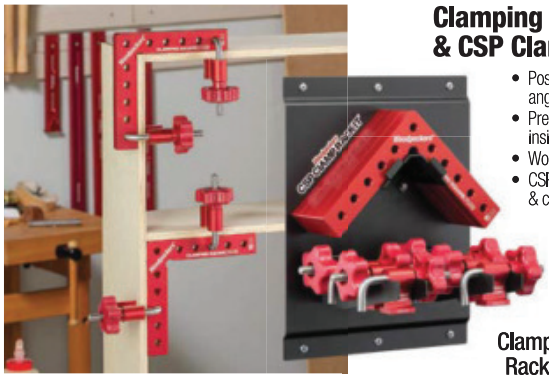

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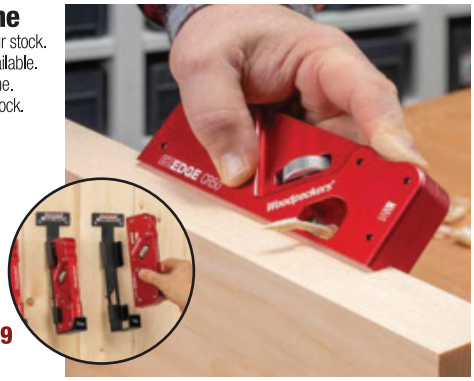

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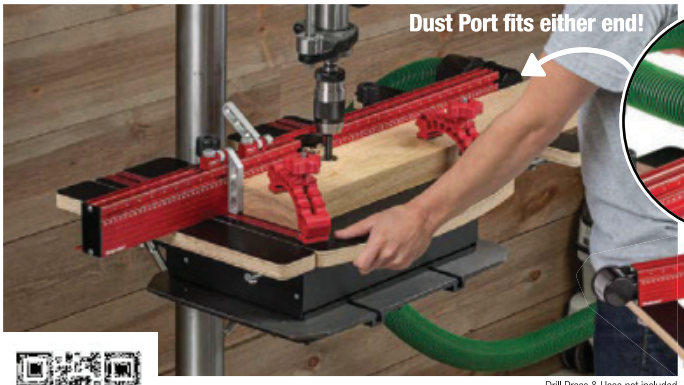

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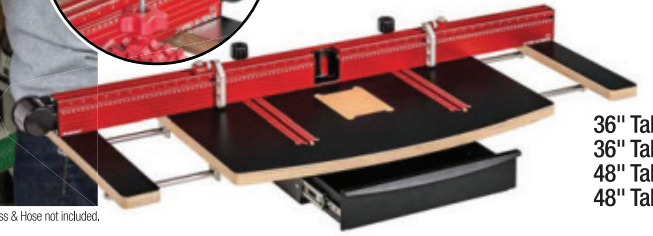

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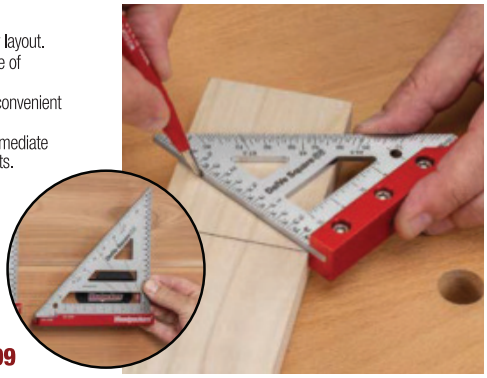

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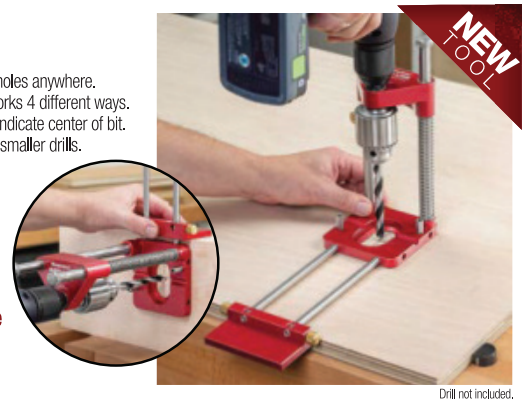

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A shop in the village

BY THOMAS THROOP

My vision for a workshop has been constant throughout my career as a furniture maker. Since arriving back in the States in 1993 from my training at the Makepeace school in Dorset, England, I always imagined having a solo shop on the edge of a village, within walking distance of a café or pub, in a location that would allow me and my business to be knit into the local community.

It was only after a decade working in a series of shared industrial spaces that I found a place to fulfill that long-held vision. What surprised me was that the right building, a snug, sunny space on the edge of a vibrant small town, and just a two-minute walk from excellent sandwich and coffee shops, turned out to be in New Canaan, Conn., the very town where I grew up. In fact, in high school I worked for two years in a lamp factory directly across the street but never noticed the building, because it was tucked behind another house.

The shop at 26 Grove St. was built in the late 1940s by a cabinetmaker returning from World War II. His parents lived in the house up front and he took over the barn behind and added onto it. He lived upstairs with his wife and worked downstairs in the shop. When we bought it from his wife's estate in 2006 the shop was nearly empty, but I could tell he had done a lot of laminate work—there were bits of Formica everywhere, used as everything from shims to wall covering.

It turned out the shop was wired with three-phase electricity, a big bonus, since most of my machinery from previous larger shops was three-phase. And the apartment above would provide the opportunity for rental income, an important part of the financial equation.

Tucked in. *Tom Throop's shop in New Canaan, Conn., is close to the heart of things in town—right next door to the train station and a two-minute walk to restaurants and shops—but set back from the street, nestled behind a residence.*

Economical shop layout

The shop's footprint is around 1,200 sq. ft., a third of which is taken up by a small office and a storage area for lumber and plywood. At 800 sq. ft. for machinery and bench space, it is small. To make the most of it, I spread my machines and bench around the periphery, and put my jointer/planer and SawStop tablesaw at the center. This is very efficient, making for just a few steps between machines and bench. The shop has shaped how I work, and for the better. Its small size forces me to put tools back after use, so I rarely have to hunt for anything, and what I use day-to-day is all close at hand.

The main machines

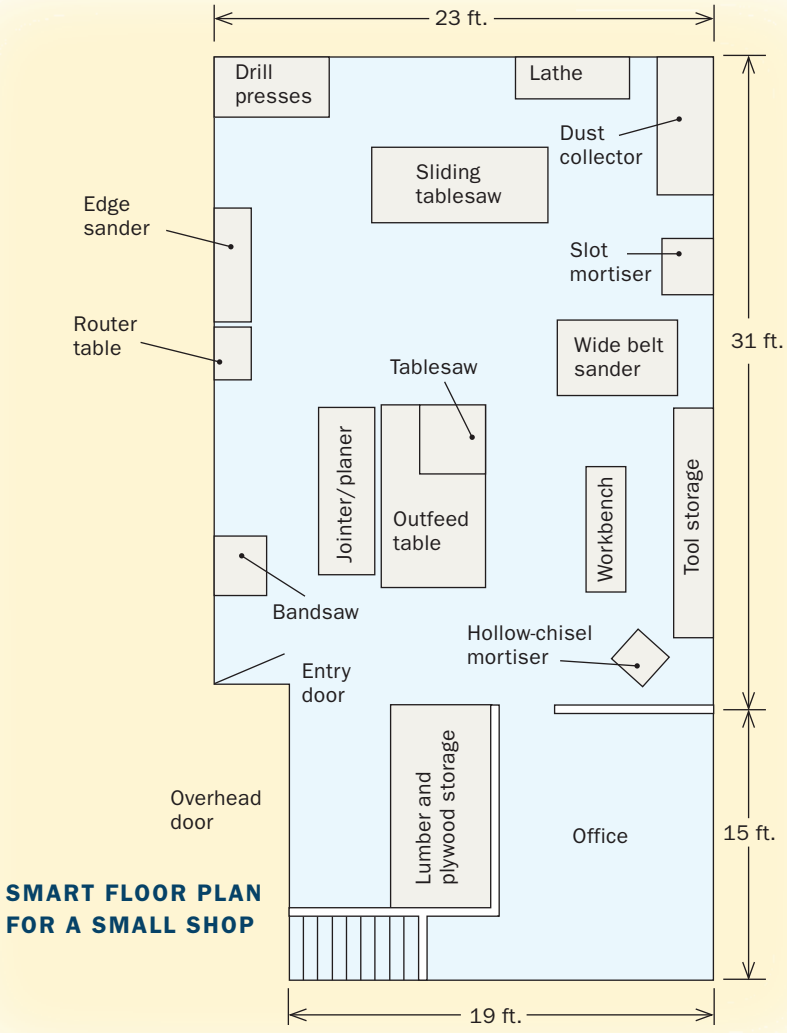
I'm not a tool junkie, but I do like quality and knowing that a tool will work the way that it should every time. A few of my machines were bought new, but most are secondhand, from auctions or private owners. Many are upgrades from the machines I started with; some are second- or third-time upgrades I made as funds allowed. At this point I am pretty much set with what I have and don't foresee many future upgrades. Then again, I do still avidly follow tool auctions.

I primarily make solid wood furniture, and a Felder 20-in. jointer/planer is a centerpiece of the shop and one of the few machines I bought new. I am thankful that I took the leap 20 years ago as it has been a workhorse while maintaining accuracy with minimal adjustment. I have never regretted investing in the 20-in. width and am surprised at how often I max it out.

The other workhorse is a Knapp sliding tablesaw with an 8-ft. stroke. At full extension, it just barely fits between the front and back walls of the shop. I bought it used from a woman in Weehawken, N.J., who bought it when a carpenter she hired to renovate her Victorian house insisted that a large sliding

Photos: Jonathan Binzen; drawings: Michael Pekovich

An island for organization. *To make the most efficient use of his 800-sq.-ft. machine and bench space, Throop located his SawStop tablesaw and Felder jointer/planer side by side as an island in the middle with walking space around them and arrayed his other machines along the walls.*



SMART FLOOR PLAN FOR A SMALL SHOP

LUMBER STORAGE IN A SMALL SHOP

An overhead door right beside Throop's lumber and sheet-goods storage area simplifies getting material into the shop and finished furniture out. An outdoor shed provides snug shelter for shorts and other leftover lumber from previous jobs. Keeping it all well organized makes for easier access.

MACHINE WORK

A slider is central. *Throop finds his Knapp sliding tablesaw (right), with its 8-ft. stroke, superb for straight-line ripping rough-edged planks and precise, repeatable crosscutting. His predecessor, a cabinetmaker, thoughtfully fitted the shop with enormous windows when he built it in the 1940s. They keep the space bright even on overcast days.*

tablesaw would be necessary for the job; he vanished without finishing the renovation, and she put the saw up for sale. I don't use a lot of sheet goods, but I still find it indispensable. It takes a 12-in. blade, and it's excellent for cutting pieces of solid wood square with repeatability, ripping solid stock, straight-lining rough boards, and trimming veneers. It also has an integral shaper, handy for tenoning and grooving.

I bought a Felder RL 160 dust collector new when we bought the building. It is relatively quiet, which was important since there would be tenants above, and it has the power to capture dust from the machines with multiple dust gates open.

One unsung hero of my shop is a Powerex scroll compressor. I bought it used from a heart valve manufacturer in Washington state. It is designed to run continuously and is very quiet. And it's oilless, so the air it produces is very clean. It runs my random-orbit sanders, grinding and shaping tools, and vacuum press.

My pair of Rockwell drill presses came from a machine shop that made hydraulic switches for nuclear reactors. The guy had

Old iron. *A maker of solid-wood furniture, Throop relies extensively on mortise-and-tenon joints. His vintage General hollow-chisel mortiser, with its foot-treadle action, delivers quick, accurate, square-ended mortises in any species. Throop's pair of Rockwell drill presses, bought used from a machine shop that made hydraulic switches for nuclear reactors, see more prosaic duty now, but are still much appreciated, as they let him perform two operations on the same workpiece in quick succession.*

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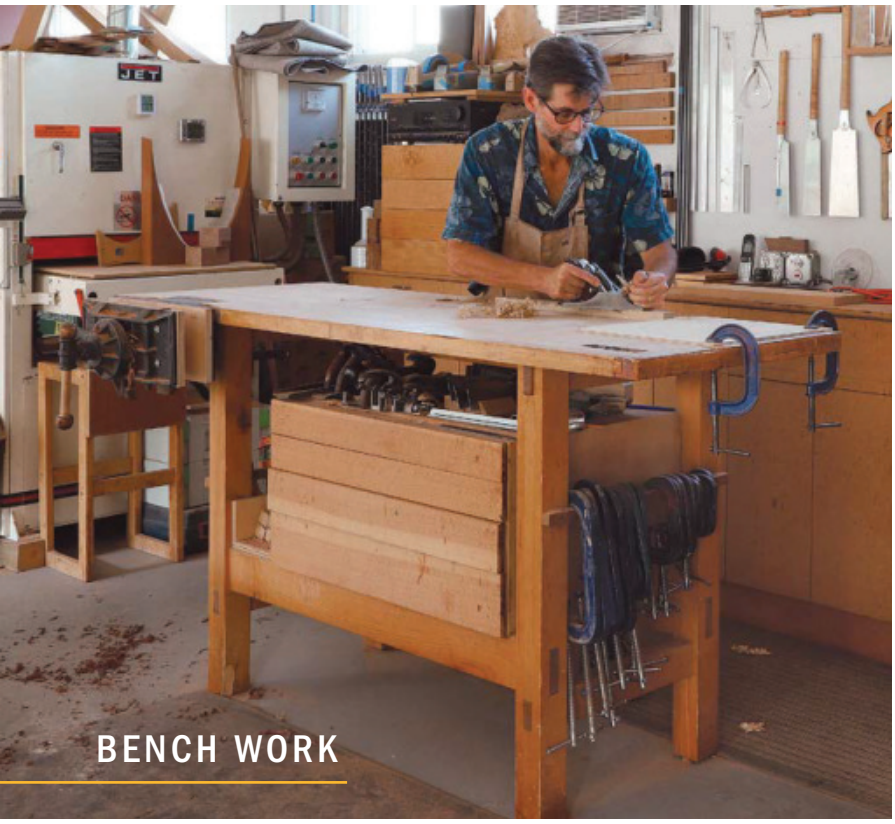

Old faithful. *Built in 1993, when he first opened a shop, Throop's bench features a store-bought maple butcher-block top and legs milled from butternut planks that were a gift from his brother. He made it quickly and cheaply so he could get started making furniture, and it's still going strong. Throop originally fitted his bench with a Record vise, but eventually found an Emmert patternmaker's vise—whose jaws can handle angled workpieces—and replaced the Record.*

10 pairs of drill presses arrayed in a circle, each set up for a different boring operation. He sat in the middle on a swivel chair and coasted from press to press doing his machining. I too find side-by-side drill presses very handy. The two share a fence, and I often have a drill bit in one and a countersink in the other, and I'll do the two operations in quick succession.

At the bench

The heart of the shop is my bench. Not fancy by any stretch, it was built in the winter of 1993 as I was setting up my first shop. For the top, I ordered butcher block countertop from a lumberyard kitchen center, as I didn't want to spend the time to mill and glue one up myself. The butternut legs came from a tree on my brother's property. He had the tree sawn up and presented me with some of the planks to help me get started.

Most all of my hand tools can be found around the bench. The cabinet beneath holds my measuring tools, chisels, router bits, and all manner of miscellany. My handplanes sit atop the cabinet in easy reach. I hang clamps underneath for quick access but also as ballast to keep the bench in place.

I kept one end of the shop open as a 9x12 assembly area. Pieces migrate there from the bench, either onto the floor or onto a mobile lift table, which lets me work at any height. If I wheel the lift table away, the assembly area can be converted in about 15 minutes into a photography studio with a suspended seamless backdrop and a set of soft box hot lights. □

Auxiliary bench at any height. *Throop's assembly table, where he also often works on pieces that are nearing completion, is a benchtop attached to a die lift table. By pumping its hydraulic treadle you set its height anywhere from 16 in. to 40 in. Its large casters roll easily and lock securely. Throop added a Record vise to the top so it can serve as a second workbench.*

Thomas Throop builds furniture in New Canaan, Conn.

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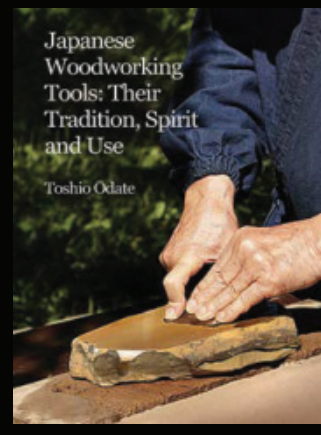

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Versatile Shop Cabinets

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BY ASA CHRISTIANA

1 SIMPLE, STURDY DRAWERS

The tongue-and-grooved drawers have a nailed-on MDF bottom that slides into slots in the cabinet sides. Other details include drilled finger pulls, label holders, and drawer dividers fixed in place with hot glue.

Woodworkers pick up an endless array of essential items along the journey, some used every day, others once a year, all indispensable when their moment arrives. Very soon this plethora of paraphernalia piles up around the shop, stuffed and stacked in every nook and cranny. That makes items hard to find when you need them, and hard to clear out of the way when the shop needs cleaning.

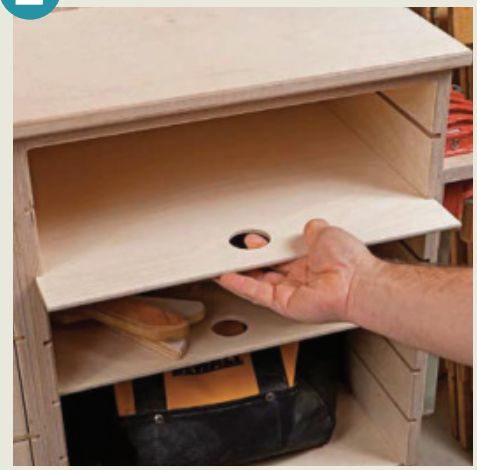
The problem isn't just one of volume but also variety. There are handheld tools small and large, machine helpers, finishing supplies, half-emptied boxes and bags of hardware, odd-shaped jigs and accessories, and so much more—all defying easy, accessible storage.

As a former editor and current freelancer for *Fine Woodworking*, I've traveled around North America documenting clever storage solutions from all corners. In 2020 I visited Clark Kellogg in Houston, Texas, to shoot photos for his articles on hexagonal boxes (*FWW* #285) and custom brass hardware (*FWW* #287), and he showed me a system of slotted cabinets that got my imagination spinning.

While Kellogg's cabinets, (which appeared in Workshop Tips, *FWW* #287) have shelves only, and were designed mainly to hold Systainer tool cases from Festool, I realized that the same slotted system could also support drawers of all sizes, with overlapping bottoms acting as runners. The design and storage options multiplied from there, and the cabinet that now lives in my workshop was born.

Kellogg was only too happy to see his idea evolve, and I'm excited about the sequel. I've used reclaimed kitchen cabinets to organize past shops, but they've always left me frustrated. This system lets me customize drawers for items large and

2 SLIDING SHELVES

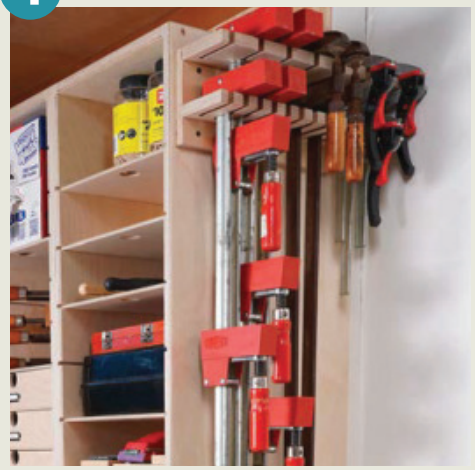


Thin plywood shelves slide into the same ¼-in. cabinet slots, and are surprisingly strong if you run the grain cross-wise.

3 SMART SANDPAPER STORAGE

A stack of shallow drawers organizes sandpaper and sanding disks.

4 EFFICIENT CLAMP STORAGE



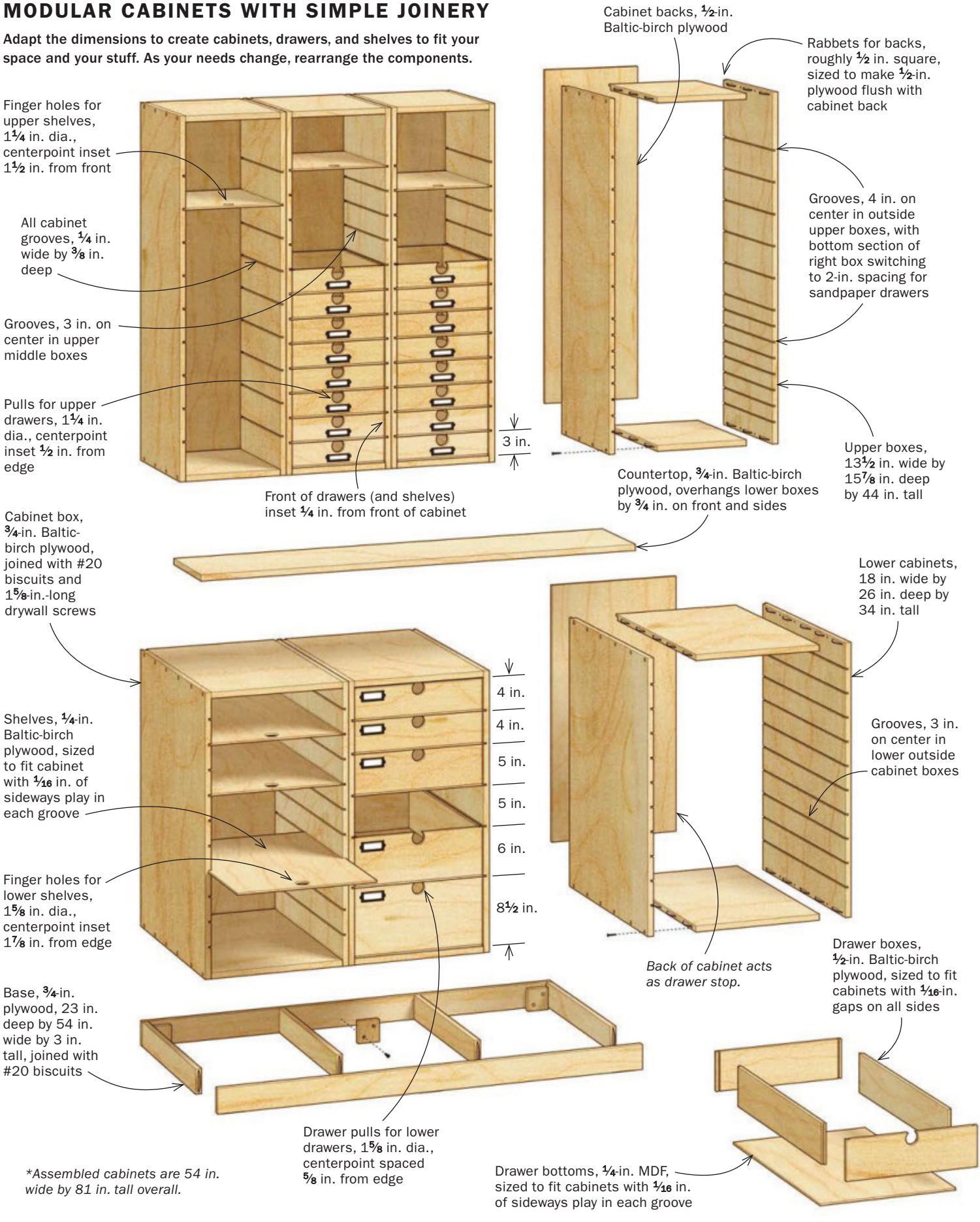
If one end of the cabinet is exposed, it's a great place to attach clamp racks.

Photos: Asa Christiana

1
2
3
4
TOOL BOX
WHITE RAGS
DEWALT

MODULAR CABINETS WITH SIMPLE JOINERY

Adapt the dimensions to create cabinets, drawers, and shelves to fit your space and your stuff. As your needs change, rearrange the components.



**Assembled cabinets are 54 in. wide by 81 in. tall overall.*

Drawings: John Hartman

Managing big pieces on the tablesaw

You can use a circular saw and clamp-on fence to break down big sheets into more manageable sizes. Then ripcuts will be straightforward on the tablesaw. Crosscuts will be trickier however.

Crosscut the largest pieces against the rip fence. *Find and mark a square factory corner (above), and place that against the rip fence to ensure the opposite end is cut square. Maintain pressure against the rip fence as you cut.*

Crosscut the rest on a big sled. *For all but the largest panels, Christiana used a crosscut sled with a 24-in. by 48-in. base. For consistent cuts on parts longer than the sled, he clamped a hook stop to the fence.*

small, and stows everything else on open shelves that can be set to any spacing, making everything easy to grab in seconds. Better yet, I can change the array at any time.

My favorite part of the cabinets is the stack of shallow drawers in the middle, with labels on the front and hot-glued dividers inside, creating the hardware cabinet I've always wanted.

I had a blast designing my version of this variable system, and I'm excited to see how readers re-imagine it.

Easy construction

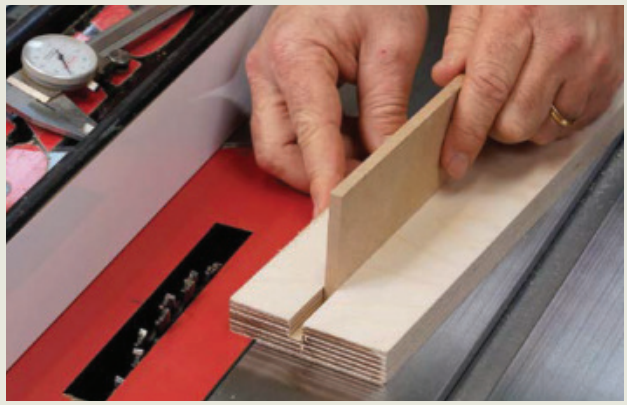
The great thing about building shop cabinets is that many of the regular furniture-making rules, like hiding screws and plywood edges, don't apply. That means you can make these cabinets with almost any joinery method you prefer, place them together on a level toe kick, and simply screw them to their neighbors and the wall for a super-solid assembly, sized to fit your unique space and stuff.

While Kellogg used screws and dadoes to build his boxes, I went with biscuits and screws. I like the way biscuits hold the parts in place while you drive the screws, and how the screws let you assemble the boxes one joint at a time.

Drawer construction is quick and practical, with an easy tablesaw joint connecting the corners and an overlapping MDF bottom nailed on from below, strengthening the joints and serving as slick runners at

Box-joint jig spaces slots

Every cabinet side gets a row of ¼-in. dadoes, ⅜ in. deep, with spacing varying between cabinets. Use an auxiliary fence, clamped to your crosscut sled, to crank out the rows of slots efficiently and accurately.



Set up a dado stack. *Size the stack just over ¼ in. wide (0.260 in. works well) and check that the ¼-in. MDF (for the drawer bottoms) slides nicely in it. The ¼-in. plywood shelves will be thinner, and guaranteed to fit in the same slots.*

Box-jig basics. *Cut a ¼-in. slot in an auxiliary fence and glue in a key of the same width. Sand or chisel a little taper on its top edges before gluing it in place, to encourage the workpiece dadoes to drop onto it. Then clamp the fence to your sled as shown, setting the desired distance between slots. To change the spacing, just move the fence.*

Back edges get rabbets. *Set up a wider dado stack and bury it partially in a sacrificial rip fence. To be sure you rabbet the right edges, start by matching up slots in mating sides and marking their back edges. Cut a test piece to be sure the ½-in. plywood back will end up flush at the back edge.*

the same time. I used an air gun to drive ¾-in. brads through the bottoms, but ¾-in. drywall screws would also work.

By the way, I tried a variety of materials for the drawer bottoms, from plywood to tempered hardboard and MDF, checking the action of a heavily loaded drawer in the plywood dadoes, and MDF was the runaway winner, sliding beautifully.

Like Kellogg's, my shelves are ¼-in. plywood, and are surprisingly stiff, especially if you run the grain cross-wise. If you're concerned about very heavy loads, you can use thicker plywood, and rabbet the edges to create ¼-in. tongues. This will be much easier than varying the sizes of the dadoes.

Practical beauty

Efficiency aside, there's plenty of design here. Like Kellogg, I used Baltic-birch plywood throughout, a very consistent material with pretty edges. I used ¾-in. for the cabinets, ½-in. for the drawer boxes, and ¼-in. for the sliding shelves. For the cabinet backs, I went with ½ in. thick, to allow a strong screwed connection to the wall studs.

Sizing the cabinets—For a variety of reasons, I wanted the lower cabinets to be considerably larger than the uppers. For one, woodworking storage needs vary a lot. Second, I like the look of different cabinet widths in the upper and lower sections. And last, making the lower cabinets significantly deeper than the uppers let me add a narrow countertop at waist height, where drawers can be sifted through and their contents set aside for use. The shallow countertop adds to the finished look of the cabinets and provides level support for the lowest drawers in the upper cabinet.

To come up with the final cabinet sizes, I juggled a few other factors. I started with the amount of shop space I could dedicate to the overall array, sized the lower cabinets to hold a standard 16-in. by 20-in. plastic bin, and made sure that the upper drawers would be large enough to hold a sheet of sandpaper. In addition, I tried to optimize plywood usage as best I could.

Drawer sizes and slot spacing—The drawers are another design opportunity. I spaced the upper and lower arrays symmetrically around a vertical centerline for visual symmetry, and graduated the lower drawers for style and function. Off to one side, I added a stack of shallow drawers for sandpaper storage—long overdue in my life!

I borrowed Kellogg's round finger pulls for the shelves, and then echoed them in the partial-circle drawer pulls.

To fill the cabinet boxes top to bottom and get the drawer sizes I wanted, I varied the spacing of the ¼-in. dadoes in different cabinets. I encourage you to do the same.

Details add beauty and function—I softened the plywood edges with a trim router and two small roundover bits, giving the cabinets, countertop, shelves, and drawer pulls a more finished look and a friendlier feel.

To add a traditional touch to the supply drawers and avoid the guessing game, I added inexpensive label holders (thanks, Amazon) to each one. Inside the hardware drawers, I installed MDF dividers, holding them in place with just a few dots of hot glue at each end. They go in solidly in seconds yet are easy to change out later if you need to rearrange the compartments.

Finish is optional—I like the look of the unfinished birch plywood in the shop

Biscuiting is next

Here are a few tips for cutting quick, accurate biscuit slots. You'll be using the fence to locate all of your cuts. So start by making sure it's square to the front of the tool, parallel to the base across its width, and located to place biscuits at the midline of your plywood. Check the cutting depth too; the biscuits should drop in a little more than halfway.

Start at the outside edges. *To locate the outside slots quickly and accurately, reference the edge of the base on the edges of the workpiece. At the back edge, use the inside of the rabbet. Also, make sure the fence is resting on the outside face of each piece.*

Use layout marks for the rest of the slots. *Mark their locations on blue tape (far left), stuck to your measuring tape, and you'll eliminate measuring errors. Hold the tool's fence as shown (left) to keep it flat and stable as you cut.*

Go vertical to biscuit the sides. *Space the biscuits the same way you did on the tops and bottoms, but inset the layout marks from the edge to make them visible along the bottom of the machine's base. Make sure the fence is tight to the edge as you cut slots, and support the base as shown to keep it from wobbling.*

Drill and assemble

The screws act as clamps, letting you assemble one joint at a time, making the glue-up easier. Dry-fit one upper and one lower cabinet first, so you can measure for and cut the backs.

Drill clearance holes. *With the biscuit slots facing up, you can eyeball the hole locations, lining them up with the slots. Then flip the workpiece and countersink the other side.*

Glue goes in slots only. *Put a bead in each slot, spread it with a small brush, and pop in the biscuits.*

One joint at a time. *Make sure the front edges are flush as you drive screws.*

Add the fourth side. *Flip the workpieces so the last side is on top. The rabbets make it impossible to reverse the pieces and misalign the rows of dadoes.*

Drop in the backs right away. *The snug-fitting backs will square the cabinets. Spread some glue in the rabbets, drop in the back, and nail or screw it in place to complete a strong, square box.*

Round over the inside edges. *Small roundovers (3⁄16-in. radius) combine with inset drawers to create a furniture look. Wait until the cabinet boxes are combined to round over their outside edges.*

Installation is easy too

Mount these modular cabinet boxes on a separate, level base, made by biscuit-joining ¾-in. Baltic-birch plywood.

How to level the base. *Start by leveling the back edge from end to end, placing shims underneath where needed. Then use more shims to level the base front to back. When it's level in every direction, screw plywood feet inside the base to lock it at that level and support the heavy cabinets. Don't attach the feet to the floor.*

setting, and I won't mind when my cabinets start looking a little worn and used. But if you want to protect your new storage system against shop grime and finger grease, I recommend a couple of coats of Zinsser Bulls-Eye SealCoat shellac. It's ready to use out of the can, dries quickly, and won't add a yellow-brown tone to the bright birch.

Warning: Applying a finish will require a lot more sanding! I'll save that for my furniture.

Tips and tricks

While it's fun to build with plywood, especially when you don't have to hide the edges, you'll be using a bunch of it for this project, as well as a couple of sheets of ¼-in. MDF. So clear some extra storage space, and line up some help with lifting. To estimate and optimize materials, start with the front and side view shown in the drawing—or your own custom design—and create a list of all of the parts. Then sketch those out on scale drawings of plywood sheets.

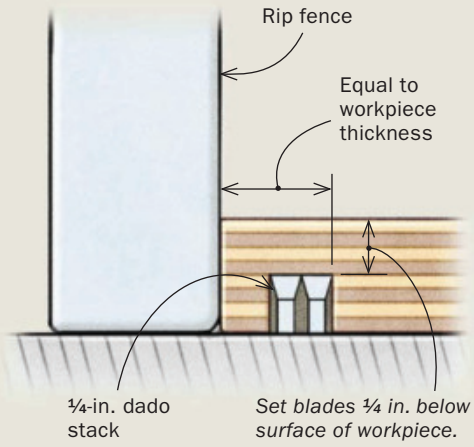
Baltic-birch plywood comes in 4x8 and 5x5 sheets, so see what's available near you and what you can haul, and plan accordingly. Once I got the materials home, I used my plywood-optimizer drawings, circular saw, and clamp-on cutting guide to break down the full sheets into more manageable pieces. If you don't have a vehicle that can transport full-size sheets, you can ask your supplier

Stack and align the boxes. *Start screwing lower boxes to the base at the most visible end, making sure they are flush with the base and each other. Align their front edges carefully as you move down the line. Then screw the upper boxes together. Wait until the end to connect the upper and lower boxes, then screw the whole unit to the wall. Let the base float outward if necessary; if there's a gap at the top, shim it before driving screws.*

Easy drawer joint

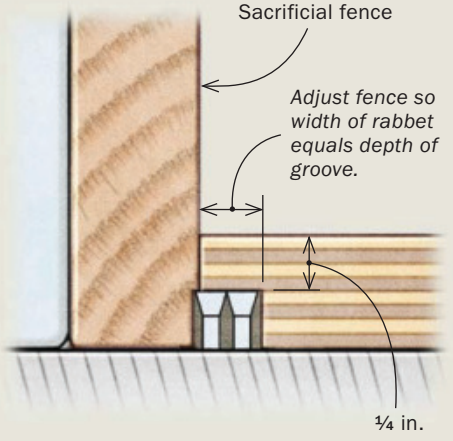
All the drawers are assembled with the same tongue-and-groove joint, and all are cut at the same time with two setups on the tablesaw. Start by measuring your cabinets to size the parts accurately.

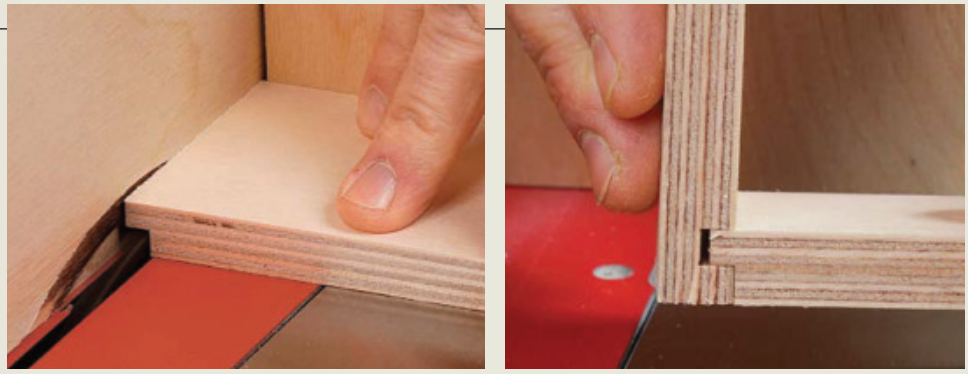
GROOVES



Groove the fronts and backs. *Cut all of these drawer parts, regardless of size, with the same setup. The miter gauge guides the workpieces—with a sacrificial fence preventing tearout—and the rip fence acts as a stop.*

RABBETS





Rabbet makes the tongue. *The next step is rabbeting the ends of the drawer sides to form a small tongue, using the same ¼-in. dado stack, buried slightly in a sacrificial rip fence. Using test pieces, start by dialing in the cutting height (left) and the resulting tongue thickness (right), and then move the rip fence to set the length of the tongue.*

to make these preliminary cuts for you.

When you are installing the cabinets on the long, level base, remember that the base floats on the floor. So if the back wall is out of plumb, you can bump the whole assembly out from the wall a little bit, or place shims behind the upper cabinets when you attach them to the wall.

When you've assembled each of the cabinet boxes and installed the backs, measure them for the shelves and drawers. Measure from the bottom of the dado on one side to the bottom of the dado on the other side; then subtract ⅛ in. to get the width of the shelves and drawer bottoms. To get the width of the drawer boxes themselves, measure between the inside faces of the cabinet sides and subtract the same amount. This will leave 1/16 in. of clearance on each side.

The cabinet backs act as the drawer stops in this simple system, and the front edges of the drawers and shelves are inset ¼ in. to create a shadow line. Measure from the inside face of the back to the front edge to determine lengths.

The last step before cutting the drawer joinery is shaping the finger pulls on the fronts. Forstner bits make it easy to cut partial holes for the pulls. Just set up a fence on the drill press so the hole is drilled partly in the fence and partly in the drawer front. Note that there are different pull sizes for the upper and lower drawers. I routed a ⅛-in. roundover inside the finger pulls for style and function.

Once the drawer bottoms are cut to size, assemble the drawers. Installing the bottoms will serve to square up the drawers, while the glue is still wet in the tongue-and-groove joints.

Finishing touches—If you're leaving your cabinets unfinished, like me, all that's left now is attaching the little label holders, and hot-gluing dividers in the drawers

that need them. To locate the label holders consistently, I made a couple of small drilling guides for their small screws—nothing more than a piece of ¼-in. MDF with a small fence attached. I drilled through each guide on the drill press, using a tiny bit for the pilot holes. I located the holes so I could simply align the guide with one end of the drawer front and push the fence snug against the bottom. Then I ran the same bit through the guide, using my cordless drill this time.

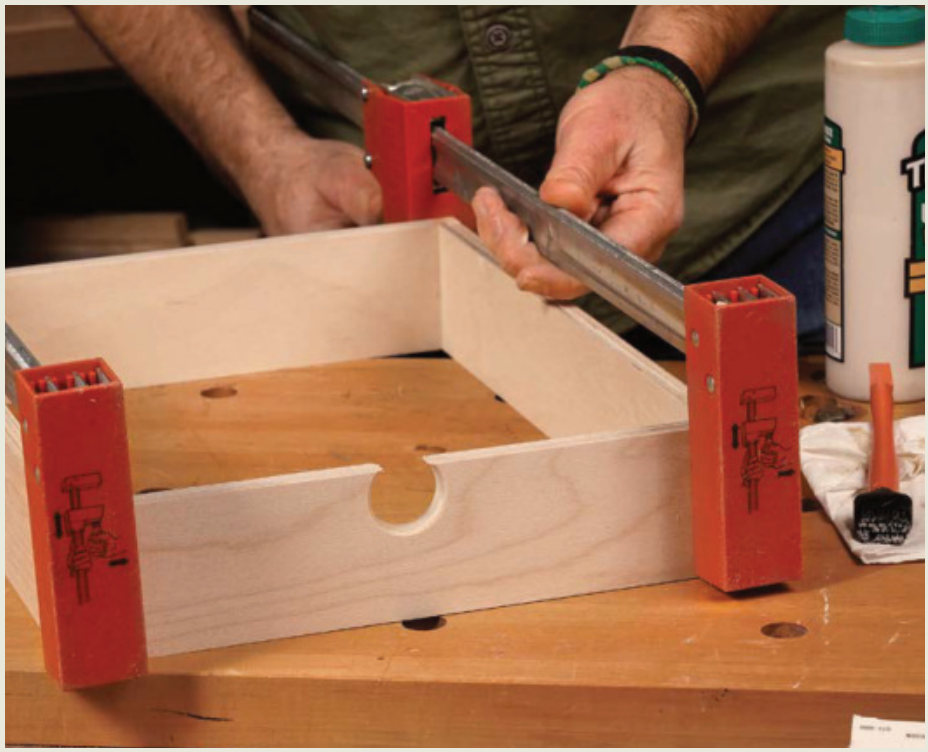
As for the dividers, only the drawers of fasteners really need them, and I installed them in the easiest way possible: by cutting strips of ¼-in. MDF to fit, and securing them with a hot-glue gun. It only takes a couple beads of glue at each end. And you can write on the edges of the dividers to label the little compartments.

Last, I cut up some index cards to make labels, and took advantage of my wife's superior penmanship to put the final touch on the best-looking fixture in my shop. □

Asa Christiana teaches, builds, writes, and shoots photos in Portland, Ore.

Drawer assembly tips

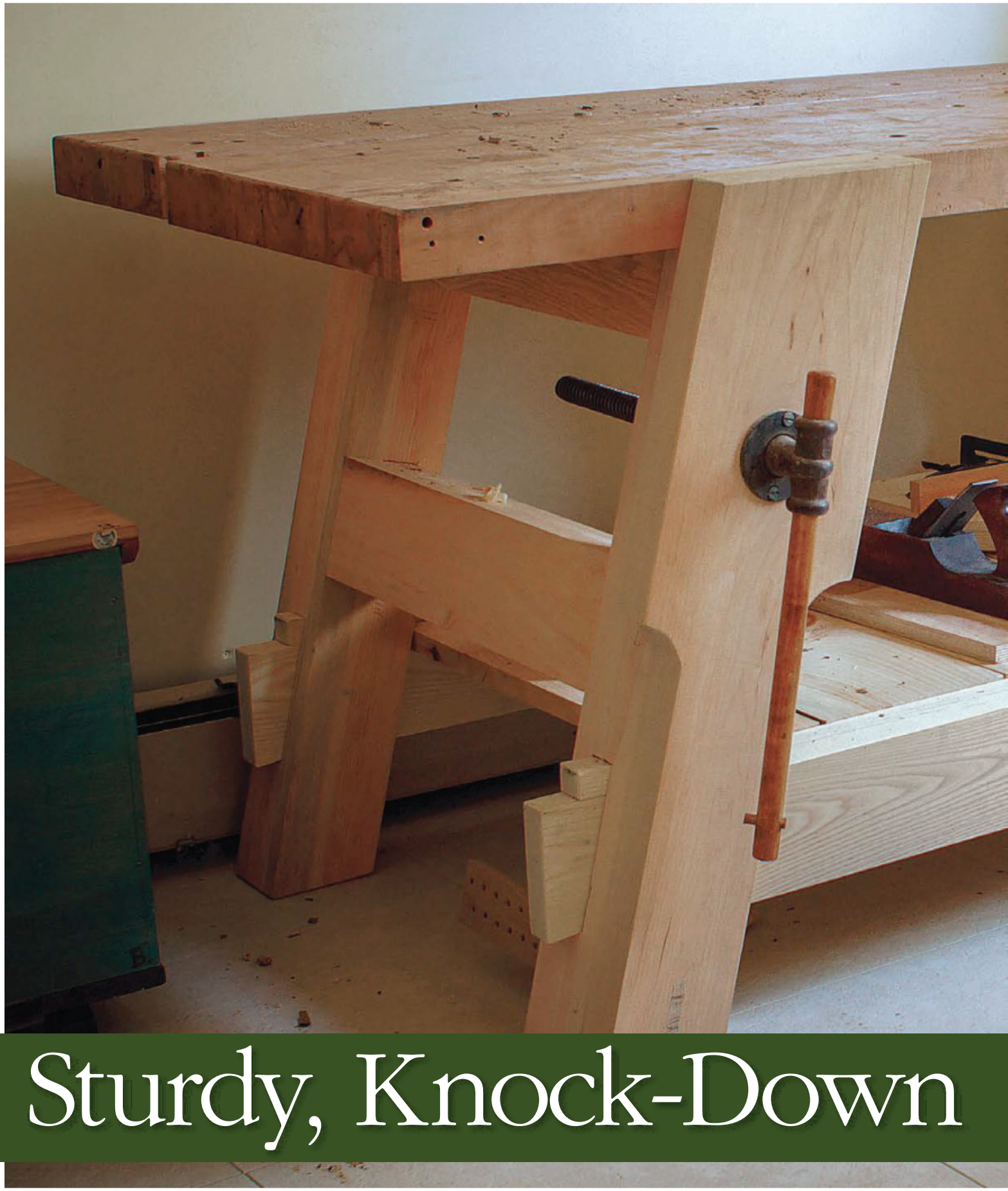
Before assembling drawers, cut the overlapping MDF bottoms to size and draw guidelines on them for nailing, as shown below. Prep the little alignment block too.



Clamp them right-side up. *Parallel-jaw clamps work well here. Make sure the top edges of the box are flush and the clamps don't extend past the bottom edge.*

Start attaching the bottom at a front corner. *Use a little alignment jig to set the overlap, and make sure the bottom is flush at the front edge. Then shoot one 1¼-in. brad at that corner, and a row along the front edge.*

Continue down the same side. *Use your overlap jig again near the back corner, pulling the whole box into alignment as you do, and shoot nails down the side. The layout lines help you place nails in the center of the drawer sides. To prevent brads from curling sideways and popping out, keep the gun parallel to the pieces you're nailing into. Once the front edge and one side are aligned and attached, shoot nails into the other edges.*



Sturdy, Knock-Down

Photo: Barry NM Dima

Clever construction makes small work of big joints

BY BARRY NM DIMA

Workbench

When designing this bench, I pulled on old clichés: big, beefy, bombproof, versatile, stout, smart workholding. I shamelessly took from what came before, especially the Moravian workbench and its angled legs. But I wanted something heartier, so I turned to Roubo benches for proportions. Timber framing then lent a hand with the big knockdown joint. The result is a heavy, portable bench that works so well because, at its core, it's so unoriginal. I even took the top from my old bench.

This article will focus on building the base and vise. The base's thick parts are built up by laminating two pieces of 8/4 stock milled as little as possible. The benefit of this lamination isn't just the lower cost and extra weight, but easy mortise-and-tenons as well, removing some of the pain of working thick parts and adding efficiency instead. The top is just a top, so I won't spill much more ink on that.

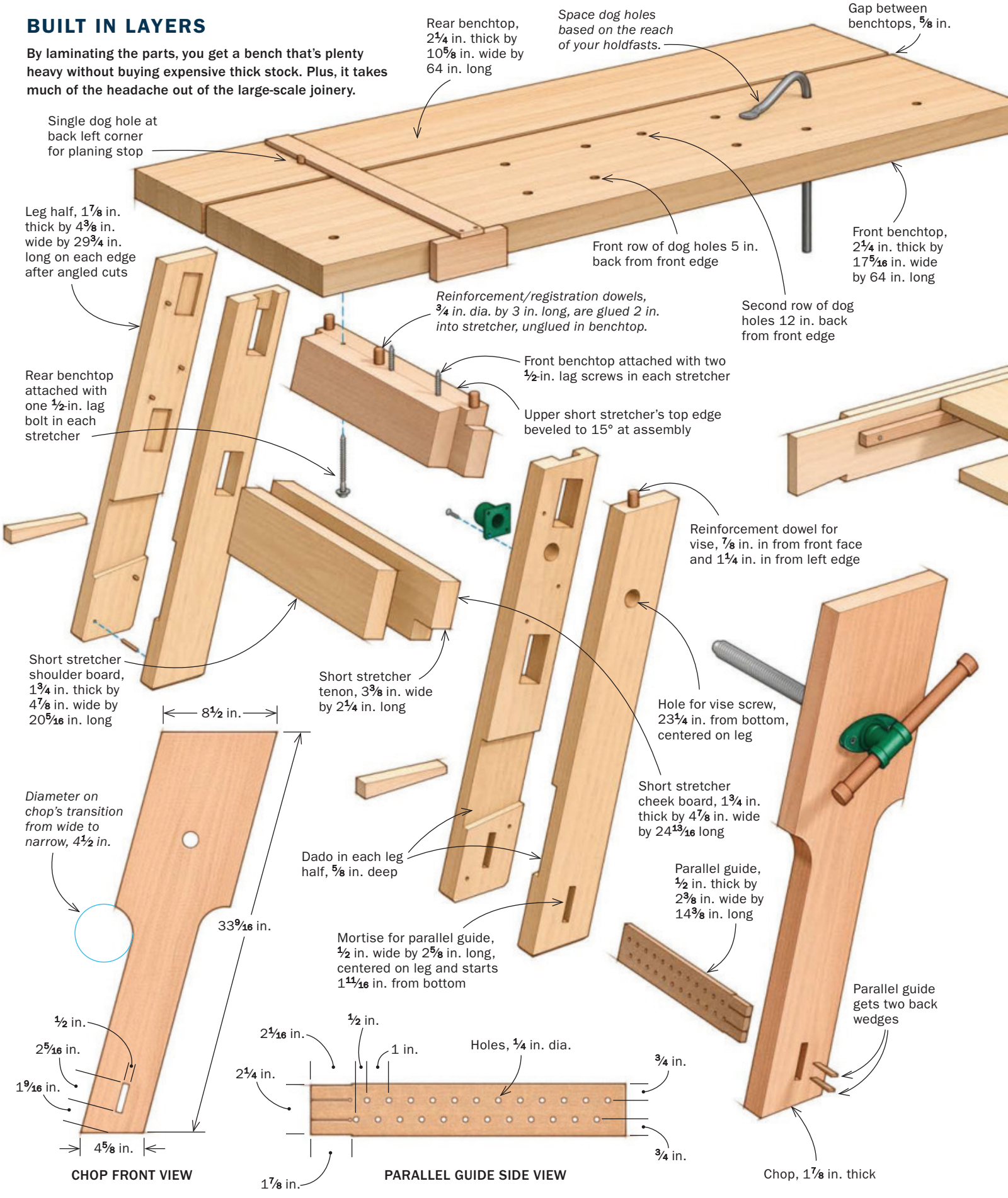
Wood selection

The lumber species are all over the place—white pine, oak, ash, and cherry—but with reason. First, much of it was free, so the price was right. But even if I had bought all the boards, they're common, affordable North American domestics, so my wallet wouldn't have taken a huge hit. Then there's the second, more important reason: The parts straddle the line between workability and weight. The mortised members are pine, while two thirds of what gets tenoned—an easier process—is heavier oak or ash.

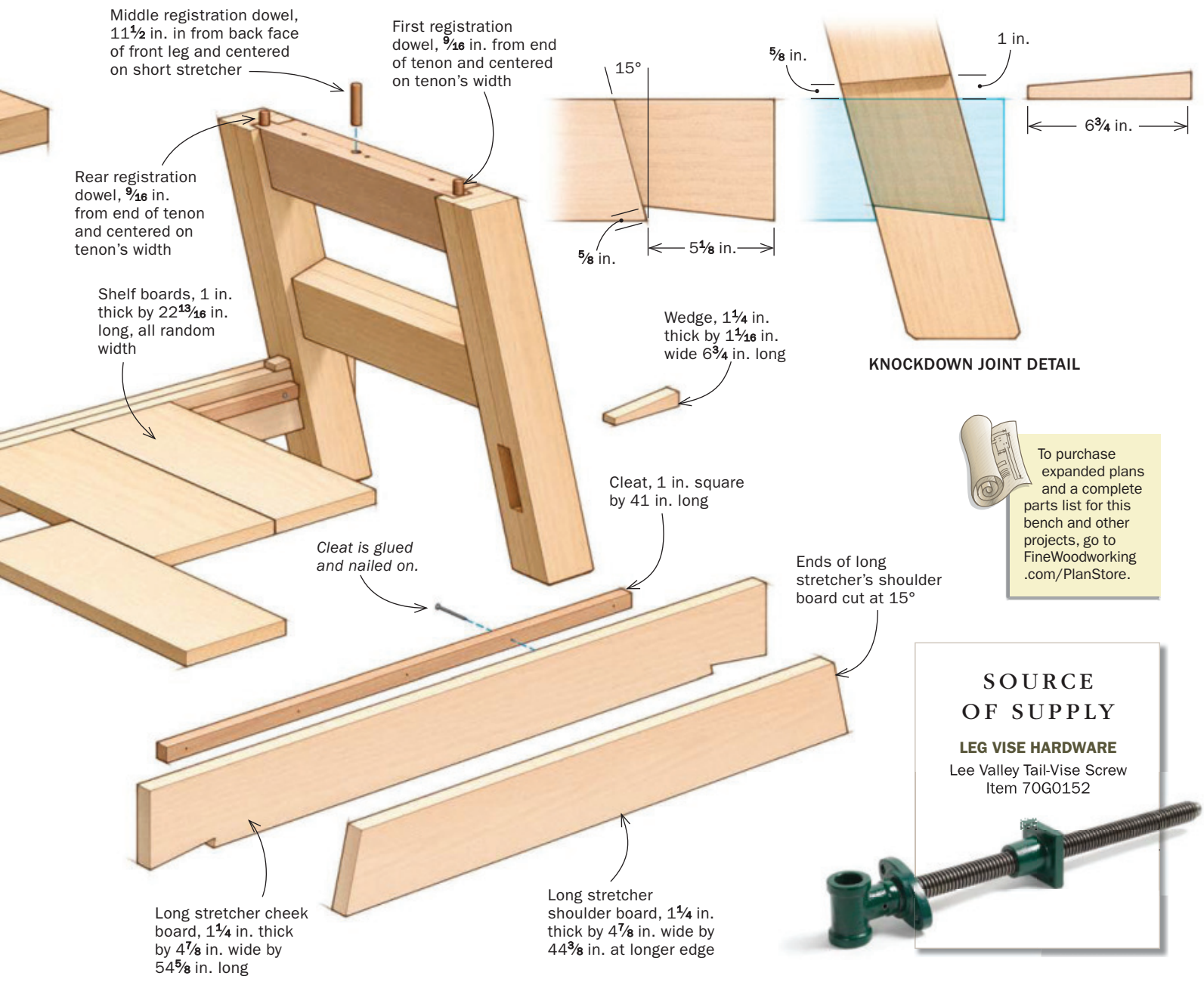
Well, the cherry vise chop may not straddle that line. That board was a perfectly sized offcut from a coworker. Without that serendipity, cherry feels a little premium. But it sure does look nice.

BUILT IN LAYERS

By laminating the parts, you get a bench that's plenty heavy without buying expensive thick stock. Plus, it takes much of the headache out of the large-scale joinery.



Drawings: Christopher Mills

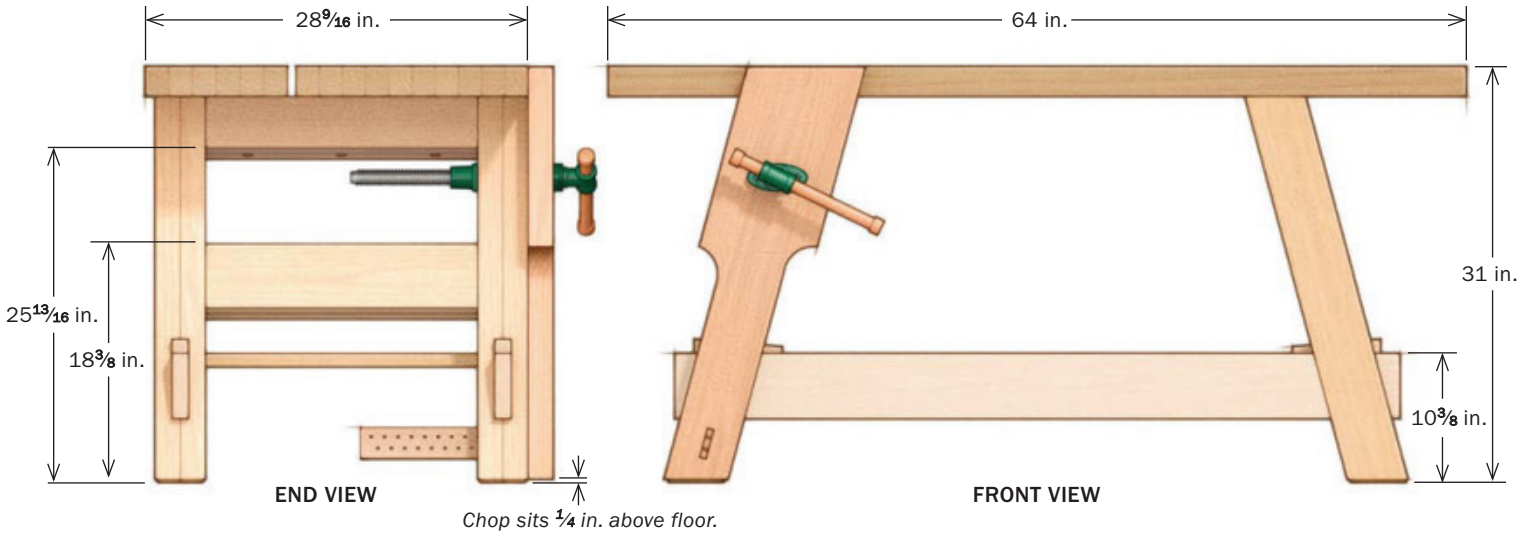


To purchase expanded plans and a complete parts list for this bench and other projects, go to FineWoodworking.com/PlanStore.

SOURCE OF SUPPLY

LEG VISE HARDWARE

Lee Valley Tail-Vise Screw
Item 70G0152



Through-mortise easy in laminated legs

Dowels keep legs aligned from layout to glue-up. *The two halves of the laminated leg get mirroring through-joinery. Dima routs these parts separately, and uses dowels in each half to keep the parts from slipping during layout and assembly.*

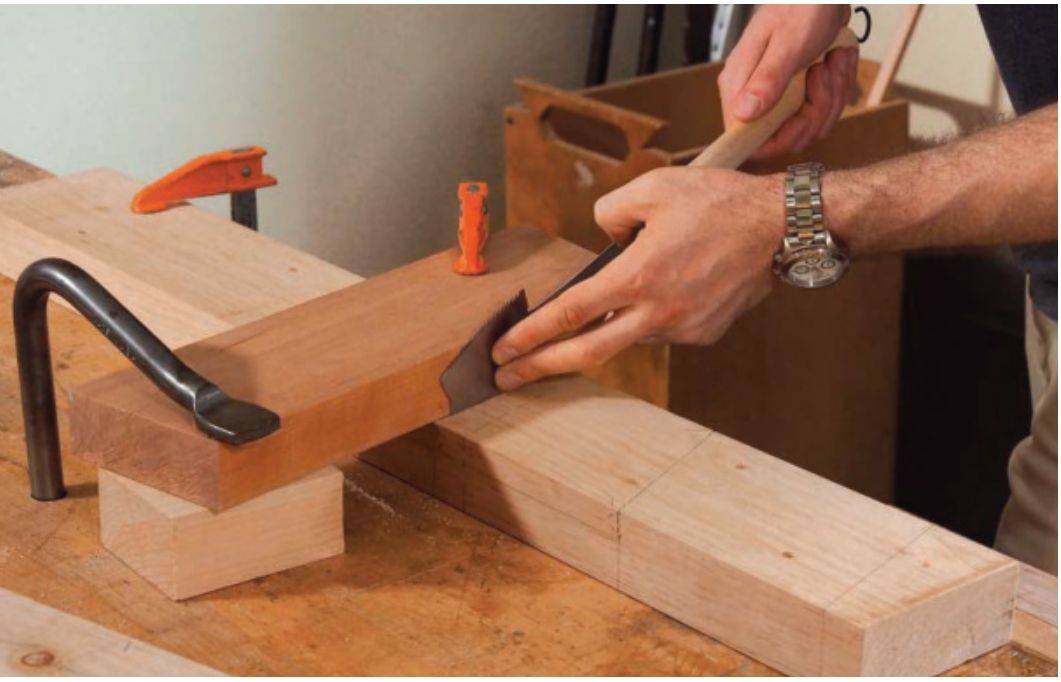
To keep the parts as heavy as possible, I kept milling minimal. As long as my glue surfaces were good, I didn't stress about roughness elsewhere.

Laminated joinery

Cutting joinery in parts this large can prove tricky, if not unsafe. This is where lamination comes in; it let me shape each half of the glue-up to create the joinery.

Take the tenons on the short stretchers: Each rear board in

Lay out the through-mortise on an edge before bringing it across an inside face. *The joint lines are square on the edges but have two different angles on the inside. When laying out the edge, clamp the leg halves together to close any gaps.*



Saw the ends using a saw guide. *To saw accurately, Dima clamps a block along his angled layout lines and presses the saw against that block, which has a jointed edge and face. He uses an azebiki, but a Western saw would work as well.*

Bash out most of the waste. *Dima kerfs the joint before using a mallet and chisel. He works in from both edges to avoid blowout.*

Photos, except where noted: Michael Pekovich

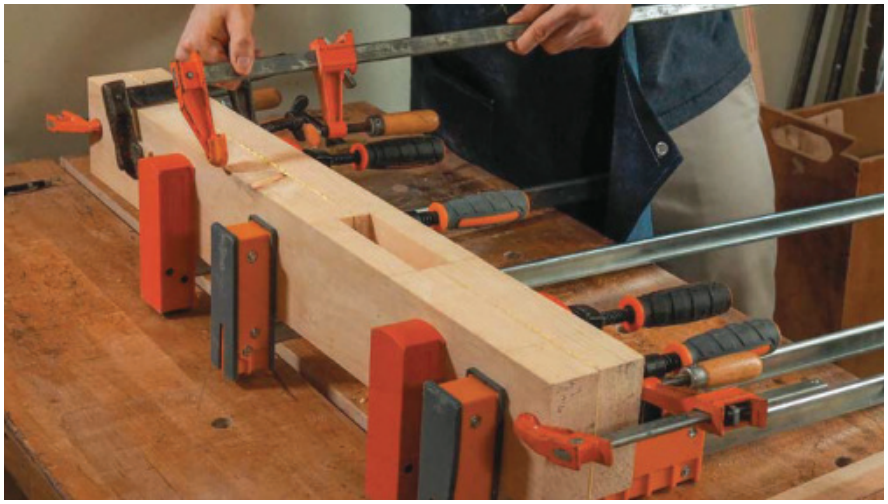
Rout the joint to depth with a short pattern bit. *The bit's bearing lets you clean up the joint's floor without going past the sawn ends. Because the joint is wide, Dima mounts his router on a long auxiliary base.*

the lamination is the cheeks, and each front board creates the shoulders. The result is huge, fast, bareface tenons. Just be sure to cut all the front boards—the shoulders—to the exact same lengths. Otherwise, the shoulder-to-shoulder dimensions will be off, and your assemblies won't be square.

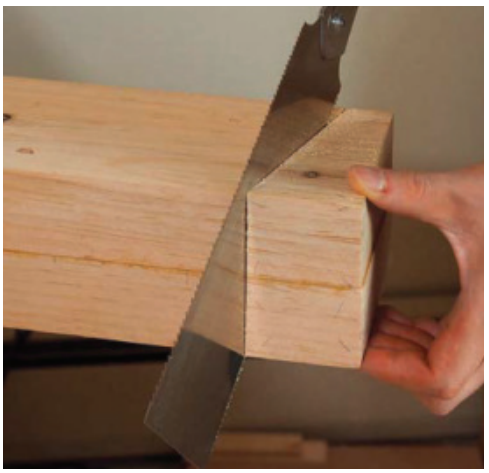
First, though, make the legs. Each gets three mortises, two stopped ones for the short stretchers and one through-mortise for the long stretcher. Here's another benefit of lamination: Instead of cutting this big, deep through-joint in solid stock, you can just form it in each half before glue-up.

To start, clamp the halves together. Then drill for and install alignment dowels. Doing this when the halves are clamped together guarantees the dowel holes line up. Next, lay out the through-mortises on an edge. The dowels make sure the legs go back together exactly as they are now, letting you pull apart the halves to complete the layout.

Keep the dowels clear of this joint, and don't glue them in until you glue up the leg halves. They'll get in the way

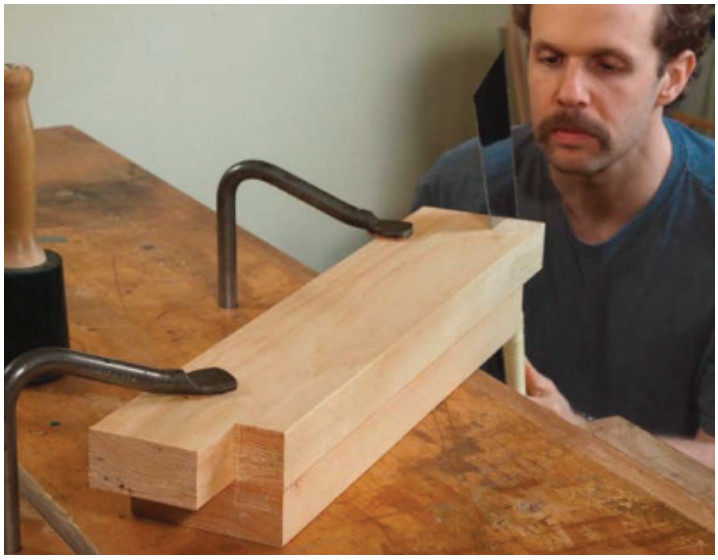


Glue up the legs. *There is a lot of glue surface, so use plenty of clamps. Be judicious with the glue to avoid squeeze-out, especially in the mortise.*



Cut the legs' stopped mortises and saw their angled ends. *The stopped mortises are wide and deep, so Dima removes most of the waste with a drill press or plunge router before squaring up their ends with a chisel. The legs' ends, angled 15°, are then cut carefully with a handsaw.*

Finish the end assemblies



Cut the short stretcher's tenons to width. *These stretchers are also laminations. The shorter front board forms the tenons' shoulders, and the longer rear board forms the cheeks.*

of the router's long auxiliary base when cutting the mortise.

Despite the angles, the layout's simple provided you make a full-size drawing of the joint. The bottom angle corresponds to the rise-over-run of the long stretcher's dovetail. What that angle is, I have no idea, so I use the drawing to set my bevel gauge. The top angle needs to match the wedge's taper.

After cutting the mating dadoes that create these through-mortises, glue up the legs. Next, cut the stopped mortises. Bore for the vise screw and mortise for the parallel guide. I cut this mortise with a little play in its length so the parallel guide won't get hung up in use.

I then cut the legs to length at 15° top and bottom. Angling the legs means you'll need to bevel the top edge of the upper stretcher too. Before gluing up the end assemblies, drill holes in the upper stretcher for the bolts that will secure the top.

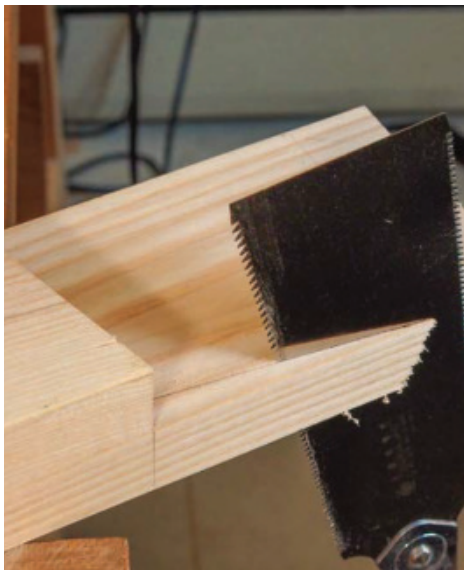
Knockdown long stretchers

The long stretchers, with their half-dovetailed tenons wedged in place, make this bench easily portable, yet the half tail and wedge form a secure, rigid, full dovetail that locks the bench in place. Unlike tusk tenons, which exert pressure against a tenon's end grain, these wedges press against its edge grain. I can smack them into place without fear of blowing out the mortise.

Like the short stretchers, the long ones are laminated. After cutting the angled ends on the shoulder board, glue it to the cheek board. I cut the cheek board to length only after cutting the half tail. This is for two reasons. First, it takes the stress out of the glue-up, because if the shoulder board shifts along its length, I don't worry about losing necessary tenon length. Second, it's tricky to start a cut on a corner, and an overlong tenon spares me that. In thickness, these tenons should fit like a slightly subpar glue joint.

Dry-fit end assembly to mark the angle on the upper short stretcher. *This waste is removed so the stretcher's upper edge lies flush with the legs. Bandsaw close to the line and, after gluing up the assembly, refine the cut with a long plane.*

Bring the bench together



Long stretcher's cheek board gets a half tail on the bottom. *Dima keeps the cheek board long so this cut is easier to start. He trims it to length afterward. These stretchers also use laminations to form the tenon.*

Assemble the bench's base. *After putting the long stretchers into one end assembly, lift and shimmy them into the other end. Seat the joints with a heavy mallet. Chamfers on the feet help prevent splitting at this stage.*

Fit and install the wedges. *These wedges lock the dovetailed long stretchers in place. Leave them long at this point so there's plenty of room for adjustment. When they fit nicely, trim them to length.*

Add the top. *The top's front edge is flush with the front faces of the legs. The top itself is two pieces with a ⅝-in. split between.*

Dowels register the top on the base, and lag screws keep it there. *Install two dowels by the leg vise. These are insurance against the leg vise pushing the top away from the legs. Half-inch lag screws lock down the top.*

Leg vises are easy

Install the parallel guide and vise screw in the chop. *After drilling the holes in the guide, glue and wedge it into the chop. The vise screw mounts to the chop via standard wood screws.*

Put the chop, parallel guide, and vise screw in place to locate the vise flange. *Don't try to find this location by measuring. Instead, slide the chop against the bench and thread on the flange. When the flange seats flush against the leg, screw it in place.*

Mark the chop to length. *By tracing the length off the top, you're guaranteed to have a chop that matches your bench. Dima saws the piece along the pencil line, letting the chop sit slightly below the benchtop, keeping it out of the way.*

USING A LEG VISE

Leg vise pivots against pin in parallel guide to pinch workpiece at the top. *To secure work in the vise, Dima inserts a drift pin in a hole just beyond the dimension he wants to clamp. He then tightens the vise screw with the workpiece in place. The chop should be slightly farther from the bench at the bottom than at the top, where it needs to pinch the stock.*

The front long stretcher should be flush with the front faces of the front legs. The top's front edge will sit in the same plane, yielding plenty of clamping surface. So, this joint is worth checking with a long straightedge after assembling the bench. Now's also a good time to nail on the cleats that support the shelf boards, which for me are just random-width scraps from the build, the ugly stuff that didn't make the cut. Finally, drill for the registration dowels that locate the top on the base.

Leg vise

The vise needs five things to work: a chop, a parallel guide, a screw, a flange, and a handle.

To lay out the chop, I draw a centerline and the 15° bottom end. Almost all other layout comes from these two marks. Cut and shape the chop accordingly, but leave it long at the top for now.

The parallel guide, next, has two jobs. First, it prevents the chop from spinning as you tighten and loosen the screw. Second, it lets the chop pivot against a pin to pinch the work. This is what all those holes are about: You can easily pick the one that lets the chop pivot in to clamp at the top.

The penultimate step is installing the hardware. I use an antique set in the pictures, but modern versions are readily available. Finish up by cinching the chop against the bench to mark its length.

A tidbit on the top

OK, I will spill some ink on the top, but mainly to emphasize that you should build it to your taste. For example, the split top is nice for storing chisels, saws, and other tools, and it provides purchase for shorter clamps when I clamp something wide to the benchtop's front edge. But it's also a space for shavings and tools to fall into, and it allows the two tops to move independently. To be honest, I'm a little split on it myself.

Then there are the dog holes. I originally drilled mine to work around the repurposed top's old base, and the locations work just as well on this one. The drawing on p. 40 places them where I would. Or just drill yours as you need them. That's cool too. □

Barry NM Dima is FWW's associate editor.

HEPA FILTERS AND ONBOARD OUTLETS

These vacuums combine HEPA (High Efficiency Particulate Air) filtration with onboard tool outlets that trigger the vacuum automatically, for the best in health and convenience.

HEPA-rated Shop Vacuums

The best capture piles of fine dust without losing power

BY ASA CHRISTIANA

Every woodworker needs a shop vacuum, trailing behind their portable power tools like a loyal pup, and helping with cleanup. Shop vacuums don't move enough air (measured in cubic feet per minute, or CFM) to handle big chip producers like tablesaws, jointers, and planers, but what they lack in volume they make up in suction power and portability.

Over the past few years, as we've learned more about the danger of very fine dust—the kind that hangs longest in the air and penetrates deepest into the lungs—HEPA-level filtration has become the industry standard for dust-management equipment. While fine filtration might not matter as much on a job site, it matters a lot in the closed environment of your woodshop.

Manufacturers of shop vacuums (aka "dust extractors") have responded by adding HEPA-rated filters. Adding these fine filters is not as easy as it might seem, as they are more prone to clogging, which can cut suction power drastically. To prevent clogging, manufacturers recommend using a fleece collection bag that acts as a pre-filter, capturing most of the fine dust before it reaches the HEPA filter unit.

Another defense against clogging is an automatic filter-cleaning mechanism, which reverses the pressure in short bursts to dislodge caked dust.

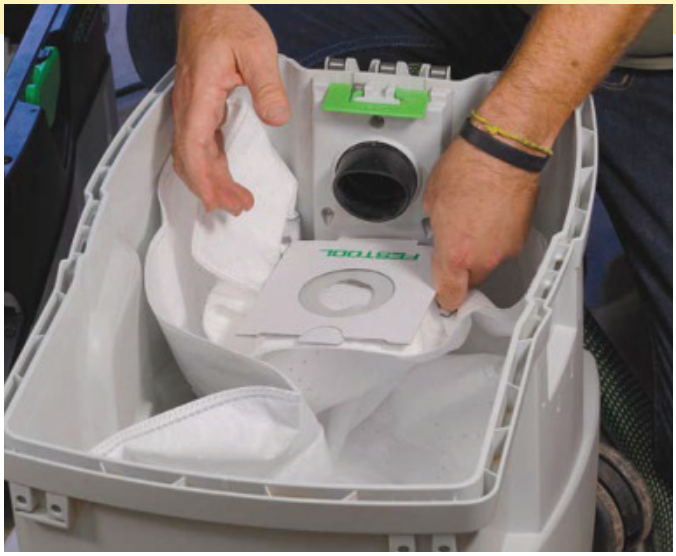
Today's top vacuums also include an onboard outlet for portable power tools, connected to a tool-triggered power switch, which turns on the vacuum when you turn on the tool, and keeps it running for a bit after you're done. These are super convenient, letting you park the vacuum near your chopsaw, for example, without having to lean over to switch it on and off.

These new standards and expectations have launched a wave of new products, so we decided to take a close look at HEPA-rated vacuums, head to head. Some

Limited capacity. *Due to the HEPA filter units, which extend into the tank area in most cases, filter bags tend to have much lower effective capacity than a vacuum's stated tank volume would suggest. When they stopped drawing in dust, the bags in some models were actually only half full.*

Power and capacity matter most

The fleece bags act as an important pre-filter for the fine HEPA filters, keeping them unclogged and free-flowing. Christiana tested raw power with the bags full and empty, and measured the effective capacity of each bag.



INITIAL PRESSURE

After loading a fresh filter bag in each vacuum, Christiana tested initial suction power. A simple gauge measures static pressure in inches of water, which represents how far the vacuum would draw water up a vertical tube.

WORKING PRESSURE

Christiana then loaded each vacuum to two-thirds of its effective working capacity with very fine dust and took another reading. Power drop-off was minimal, showing that the filter bags do a good job keeping the main HEPA filters clean.

manufacturers offer a variety of HEPA models in various sizes, so we picked one from each brand, in an 8-gal. to 11-gal. size that offers the best combination of capacity and portability.

That target range worked well, with one exception. Due to supply-chain disruptions, Festool was not able to provide the models we requested, so we had to go with their 12.7-gal. Cleantec CT 48 E AC HEPA, a larger and pricier model than we were shooting for. But the CT 48's motor and airflow stats are identical to those of the CT 26 and CT 36, for example, so other than tank/bag capacity, you can expect Festool's smaller models to perform similarly.

Tough tests and precise results

Armed with a gauge that measures static pressure, I put seven models through a series of tough tests, designed to simulate the worst conditions they might face in a typical shop. The gauge measures suction in inches of water, which represents how far the vac would pull water up a vertical tube—a standard test. For these pressure tests, I used the largest hose-end provided with the vacuum, to make sure I wasn't throttling it down unnecessarily.

To simulate the most challenging working conditions, I needed a source for very fine dust, so I turned to a large millwork shop here in Portland—Creative Woodworking NW—where the friendly owners were happy to contribute bags of consistently feathery dust captured directly from their wide-belt sander.

To establish a baseline, I loaded a new fleece bag in each vacuum and took a power reading. Initial power varies significantly, as you can see in the chart. Then I tested the vacuums with their bags mostly full, to see if suction power was compromised.

Capacity is lower than stated—I noticed right away that the HEPA filter units extend down into the tank area on most vacuums, stealing potential bag capacity. So I measured effective bag capacity by filling up each one—measuring the volume of dust with a bucket as I fed it into the hose—until the vacuum clogged and lost power.

Photos: Asa Christiana

QUIET POWER

Christiana hooked each vacuum up to his random-orbit sander, loaded with 80-grit paper, and sanded a fresh plywood panel for 4 minutes. Even the weakest machine was powerful enough to keep the panel dust-free. A smart-phone app measured noise in decibels. Readings were remarkably consistent between most vacuums with the exception of the Fein vacuum, which was quieter than the rest of the field.

On all vacs but the Festool, working bag capacities were relatively low compared to stated tank capacities. My guess is that most of the manufacturers are using the same capacity numbers calculated before the HEPA filter units were added.

Working power—Knowing now what each fleece bag could actually hold, I loaded new ones into each vacuum, sucked up enough fine dust to fill each to two-thirds of its working capacity, and took another static-pressure reading at the end of the hose. I repeated this test twice to see if I could get any fine dust past the filter bags and into the HEPA filters, and also to be sure my numbers were solid. The pressure drop was negligible on all models, telling me that the fleece bags do exactly what they are intended to do: prevent fine dust from clogging the HEPA filters.

As for automatic filter-cleaning, all the vacs have it except the Fein, but it doesn't have a measurable effect on vacuum power when the fleece bags are used.

To make sure I wasn't relying only on my vacuum gauge for testing power and efficiency, I tried a real-world sanding test. With each bag two-thirds full, I hooked up my random-orbit sander, sanding a fresh plywood square with a fresh 80-grit disk for four minutes. In all cases, even with the relatively weak DeWalt, there was almost zero dust left on the plywood.

Connecting a tool doesn't hurt power—Next I looked for pressure drop when a tool is connected to the onboard outlet. Connecting my sander had zero effect on my pressure readings, so I tried my power-hungry chopsaw, which lowered the pressure readings only 3% to 4% at most—a negligible amount.

Reusable bags offer savings

While the disposable fleece bags do their job extremely well, they fill relatively quickly in a busy shop and they aren't cheap,

CONSIDER A REUSABLE BAG

Replacing disposable filters can get expensive, so a reusable bag is a good option. Filter bags are widely available online and have a large, re-closable opening, making them easy to empty. Internal dust ports are a universal size, so this $34 aftermarket bag fits all of the vacs in this test.

HEPA vacuums put to the test

Check the numbers for bag capacity and static pressure when comparing vacuums. Note also that although some manufacturers offer branded reusable bags, all bags fit all vacuums, and there are aftermarket models available as well.

BOSCH VAC090AH

DEWALT DWV010

Model	Price	Stated tank capacity	Effective bag capacity	Initial static pressure (in. of water)	Static pressure w/bag 2/3 full	Noise level (db)
BOSCH VAC090AH	$550	9 gal.	4.5 gal.	90	88	80
DEWALT DWV010	$400	8 gal.	1.5 gal.	47	47	80
FEIN TURBO II HEPA	$480	8.4 gal.	3.8 gal.	93	91	74
FESTOOL CLEANTEC CT 48 E AC HEPA*	$975	12.7 gal.	12.2 gal.	97	95	80
MAKITA VC4210L	$620	11 gal.	6.25 gal.	77	74	80
METABO HPT RP350YDH**	$640	9 gal.	5 gal.	78	75	80
MILWAUKEE 8960-20	$650	8 gal.	3 gal.	77	75	80

* Smaller, less-expensive Festool models have same power ratings
** Identical to Metabo ASR 35, other than color scheme; ASR 35 is $40 less

adding a significant operating cost. And if you are thinking about shaking the dust out and reusing them, it's a messy, time-consuming endeavor. As for using these HEPA vacuums without their bags, it's not recommended for fine wood dust, due to the high potential for filter clogging.

Luckily, there are reusable filter bags available to fit all models, and less expensive aftermarket models available online.

A few other factors

As for mobility, the Fein stood out with its compact footprint and four swiveling wheels. The others go with the cart approach (two fixed and two swivel casters).

All but the Bosch and DeWalt vacuums have brakes of some kind. Festool's single, centralized brake was much easier to activate than the wheel brakes on others.

Last but not least, there is the noise. I used a couple of smart-phone apps to compare noise levels, making sure numbers were consistent. Fein was significantly quieter than its competitors, measured on the logarithmic decibel scale.

A few models stand out

The clear winner here is Festool's CT 48 Dust Extractor. It has amazing capacity relative to its size, and unmatched suction power. It packs in a number of subtle but very helpful design touches, like a clever

FEIN TURBO II HEPA

FESTOOL CLEANTEC CT 48 E AC HEPA

MAKITA VC4210L

Disposable filter bags (5 pack)	Reusable bag avail. from mfr.	Hose length (ft)	Cord length (ft)	Notes
$35	$70	10.5	13	Single adapter included, tapering from 1⅜ in. to 1 7/16 in.
$32	No	16	8	Tank latches hard to operate for emptying/changing bag.
$33	No	13	16.5	4 swivel wheels make it very mobile; flat, lipped top great for resting tools.
$53	$217	11.5	24	Foot brake easy and effective; cord and hose storage excellent; comes with helpful vacuum attachments.
$41	$152	14	24	Includes 3 handy hose-end adapters (one stepped).
$70	No	11	24	Two versatile hose adapters; indicator light for full bag/clogged filter.
$70	No	13.5	24	Three handy adapters (one stepped).

METABO HPT RP350YDH

MILWAUKEE 896020

foot brake and easy hose and cord storage. The model we tested is pricey, but you don't really need its automatic filter cleaning device when you use filter bags, so I would go with the CT 48 E HEPA ($840), or save even more with a smaller model like the CT 26 or 36, which have the same suction numbers but lower bag capacities. The Festool CT 26 E HEPA offers 6.3 gal. of capacity, for example, and costs $740.

In the value category, it's hard to beat Fein's Turbo II. While it lacks the capacity of some, it almost matched Festool's power readings. I also like how quiet, compact, and nimble the Fein is, and the secure resting spot on top for my sander.

Bosch and Makita also earned Best Value honors. Between the two, Makita wins on capacity and hose adapters and Bosch wins on price and power. □

Asa Christiana is a former FWW *editor who builds, teaches, writes, and shoots photos in Portland, Ore.*

Build a Dutch Tool Chest

Improve your hand skills with a chest suited for travel, and for the shop

BY MEGAN FITZPATRICK

I'm a die-hard fan of my full-size English tool chest for working in the shop—but it isn't easily loaded into my car. Because I travel to teach, I need something smaller and more portable, and this Dutch tool chest is just right. Built out of pine (or another lightweight wood) and conveniently sized, it's no problem lugging this thing around. And because it holds enough hand tools for most furniture work, I always feel well prepared. Indeed, because this style of chest does store so much, there are plenty of people who enjoy using one while staying put.

Perhaps the chest's most distinctive characteristic is its sloped lid. Historically, the slope allowed rain to slide off when the chest was in transit instead of collecting on the top. But it's also a great surface for working on shop drawings. And it keeps you from piling stuff on top.

With dovetails at the bottom only, this chest is simple to make and a great project for those new to hand-cut joinery. (It's also a nice chest for those with years of experience under their tool belts). The hand-tool skills that you hone in this build—dovetails, dadoes, rabbets, cut-nail joinery, moldings—will serve you well for all your projects to come.

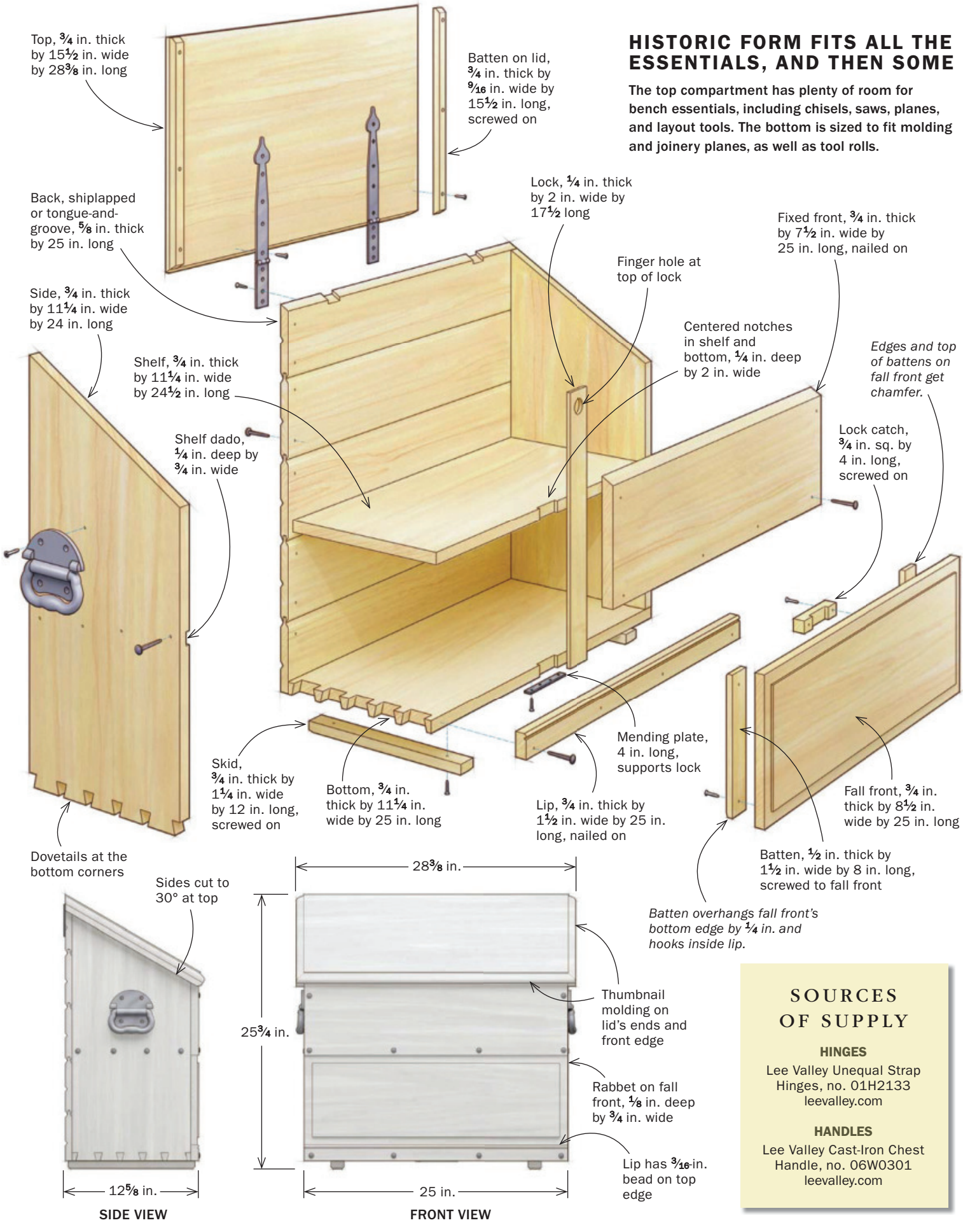
Low-stress stock prep

The interior depth of the chest is 11¼ in.—the same width as a 1x12—so you don't need a jointer and planer to prep the wood. Just pick the straightest, flattest 1x12 you can find. The chest's width is based on

Photos: Barry NM Dima

HISTORIC FORM FITS ALL THE ESSENTIALS, AND THEN SOME

The top compartment has plenty of room for bench essentials, including chisels, saws, planes, and layout tools. The bottom is sized to fit molding and joinery planes, as well as tool rolls.



SOURCES OF SUPPLY

HINGES

Lee Valley Unequal Strap Hinges, no. 01H2133
leevalley.com

HANDLES

Lee Valley Cast-Iron Chest Handle, no. 06W0301
leevalley.com

Drawings: Dan Thornton

Case joinery designed for weight

Dovetails at the bottom. *By orienting the tails on the sides and pins on the bottom, Fitzpatrick ensures the bottom won't fall out under the weight of the tools.*

holding a No. 8 jointer plane, plus a little room to spare.

When determining the arrangement of the boards for the carcase sides and bottom, consider having their heart side face out; that way, if they eventually cup, they will cup inward and be restrained in the middle by the dovetails and shelf dado, and the joints will stay closed. If the bark side faces out, the boards will cup outward, which could open the joints. But also consider appearance, particularly if using a clear finish; good joinery should hold the boards flat in either orientation.

Dovetails and dadoes

The case joinery is fundamental cabinetmaking—dovetails and dadoes. The

Batten and block keep saw on track when sawing the dado wall. *If you need an assist sawing straight and plumb, clamp a batten so the edge of the penciled layout line is visible on the waste side. To help keep the saw against the batten, press against it with another block.*

Batten provides a layout reference. *Before unclamping the batten, butt the shelf against it and pencil its width, accurately marking the dado's other wall. Move the batten to that line and saw on the waste side.*

Chisel out much of the waste. *Use the widest chisel that will fit between your kerfs. Hold it flat to the board and work bevel up as much as you can. Come in from both edges. If you can't reach the middle, flip the chisel bevel down but use a little more caution.*

Finish with a router plane. *When there's about $\frac{1}{16}$ in. to go before you reach final depth, switch from a chisel to a router plane for more control. Set the plane to final depth. As with the chisel, work in from both edges to avoid blowout.*

Assemble the carcase

Trace the angled side. *After cutting the top angle on one side, use it—and not your bevel gauge—to mark the second side, to ensure the two sides match. Keep the bottom ends flush during this layout.*

dadoes get nailed for extra holding power.

After cutting the joints, fit the shelf. It should be 24½ in. long, but if your dadoes are a little deep or shallow, that length will change. You want the shelf to be a dead-on fit to help keep the carcase square, so mark the length off the dado bottoms with the carcase dry-fitted. Even then, I prefer to trim the shelf to just a hair long, then shoot the end to sneak up on a perfect fit.

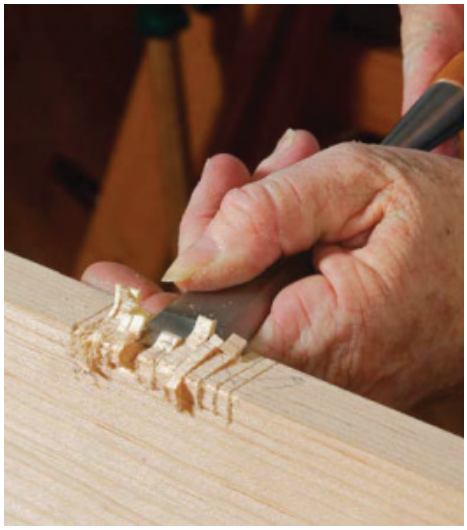
The shelf should be a press fit in the dado. If it starts to go in and stops, the dado walls may taper in toward the dado floor. Check them with a square, using a chisel to square up the walls where needed. If the shelf won't go in at all, trim the shelf, taking cross-grain shavings at the ends.

Glue and nails

Before continuing with the rest of the build, glue up the carcase. Paint the dovetails with glue, knock the joints home, and place the carcase on its back. Put a smear of glue in the dadoes before sliding in the

Doing the glue-up. *Once you glue and clamp the dovetails, do the same for the dadoes and slide in the shelf from the front. Check the bottom compartment for square.*

Nails for the shelf need pilot holes. *Fitzpatrick lays out pilot holes with dividers before using the appropriate drill bit to create the pilot holes. Then she hammers in the stout 50mm Rivierre nails.*



Notch the bottom and shelf for the lock. *Start with the bottom notch, sawing several kerfs and chiseling out the waste. Transfer its width to the shelf with a square before repeating the process there.*

Bottom notch needs a mending plate underneath. *A steel plate stops the lock from sliding straight through the case. Why not just cut a stopped notch? It could break out after the lock has been repeatedly dropped in place.*

shelf from the front. Add clamps to pull the dovetail joints home and pull the shelf fully into the dadoes.

Check the glue-up for square, especially at the bottom and below the shelf. Because there's nothing yet securing the width at the top, it's possible the sides bow a little there. Subsequent steps can fix that.

I prefer to wait overnight for the glue to set before nailing the shelf in place. I typically use 50mm Rivierre nails, but cut nails work too. Either's an aesthetic choice; you don't technically need nails here at all.

Lock and notches

One of the chest's niftier features is the low-tech lock for the bottom compartment: just a stick, two notches, and a catch. The stick slides in from the top compartment through the catch and notches to trap the

Nail on the beaded lip. *This piece both covers the lower notch and offers purchase for the fall front's battens. The bead looks nice and also helps to keep the wood from getting damaged like a hard corner would.*

Bevel the fixed front. *To give the top edge of the fixed front the same angle as the sides, Fitzpatrick lays the front in place and extends the sides' angle with a ruler. After cutting the angle, she'll attach the front with nails.*

Add the fall front

Fall front's batten placement comes from the case itself. *The closer the battens are to the sides of the carcase, the better the fall front will work. To mark their location, lay the chest on the fall front. Fitzpatrick places the battens no more than ⅛ in. inside the carcase sides.*

Countersunk screws attach battens and lock catch. *Be sure the catch is in line with the notches in the carcase. The battens are installed with a ¼-in. overhang at the bottom.*

Nail on the back boards. *The unsupported top ends of the sides may bow in or out. If yours do, use a clamp or spreader clamp to get them straight and the carcase square before drilling pilot holes and nailing on the back boards.*

fall front. This way, when the lid is closed, the fall front can't be opened. You can add a lock to the lid for even more security. The lock notches need to be aligned, so after cutting the lower one, I use it to lay out the one above it. The lock should fit with just a hair of wiggle room side to side.

Close up the case

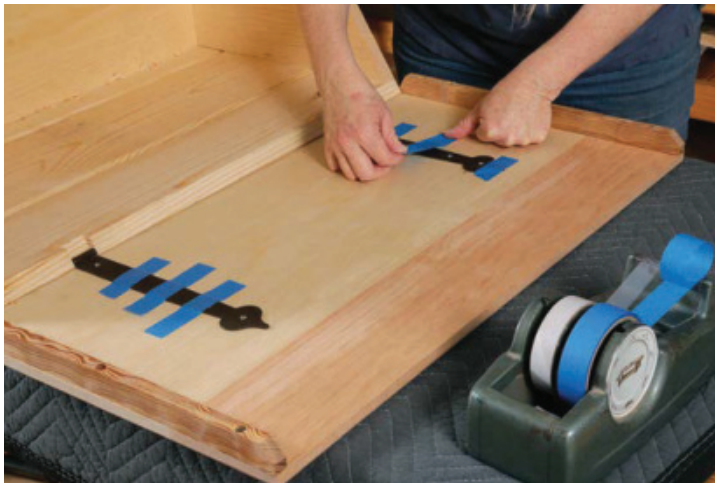
To close the front of the case and cover the notches, add the fixed front to the top compartment and the lip at the bottom of the case. Both get nailed in place. Before nailing on the fixed front, cut its top edge to the same angle as the sides and make sure the carcase is square above the shelf. (You'll check for square again when nailing on the back boards.)

The fall front that covers the bottom compartment is held in place by the lock and a pair of battens. Trim the fall front to fit between the bottom lip and the fixed front with about a ⅛-in. reveal. For looks, I raise a panel on the fall front and mimic it on the lid later on. The battens, which help keep the fall front flat and position it in the case, extend past its bottom edge by ¼ in. and hook over the lip. Locate the battens ⅛ in. or less from the chest sides.

The lock catch is centered on the interior of the fall front and in line with the notches. Screw it in place, then nail on the back boards.

Before trimming the lock to length, reinforce the bottom notch and close it off so the lock doesn't slide through. I use a

Cut notches for the strap hinges before screwing on the short leaf. *The notches provide clearance for the hinge barrels. Fitzpatrick just cuts a through-mortise here; it's easier, and the thin wall of a stopped mortise may break off over time anyway.*



Tape on the hinge leaves to check their placement on the lid. *The lid should be flush with the back edge of the chest when closed. Tape will help you determine this placement before screwing the hinges to the lid. (Do this after angling the back edge of the lid and attaching its battens.)*

4-in.-long mending plate from the hardware store—brass if I'm feeling fancy.

Finally, attach the skids. Chamfered bottom edges—and a swipe of wax—will help them slide easily across a floor.

Top it off and add the hardware

At last, it's time for the sloped lid. Like the attached front, the lid's back edge will need to match the angle of the sides. Same for the back ends of the battens, which I install to keep the wide panel flat. I cut a fingernail profile on the top's two ends and front edge.

You can source handles and hinges from many places, but for inexpensive ones, I recommend the offset strap hinges and iron handles carried by Lee Valley. For a handmade look, Horton Brasses carries a kit of gorgeous forged hardware for this chest.

Locating strap hinges on the carcase is easy: Just measure in from each end, cut the notches, and screw the hinges to the back. Locating them on the lid requires more finesse, because the angled back edge of the lid should lie in the same plane as the back when it's shut. To do this, place the lid upside down and the chest on its back, with its top edge overlapping the angled back of the lid by about ⅜ in. That will get you close. To verify it, tape the hinges in place and gently test the fit before screwing on the hinges.

I locate the lifts just a hair forward of center, because I always pick up my chest from the front. That slight shift forward helps to balance the weight, as the taller back of the chest is heavier. If you'll use the lifts to actually lift the chest, through-bolt them for strength.

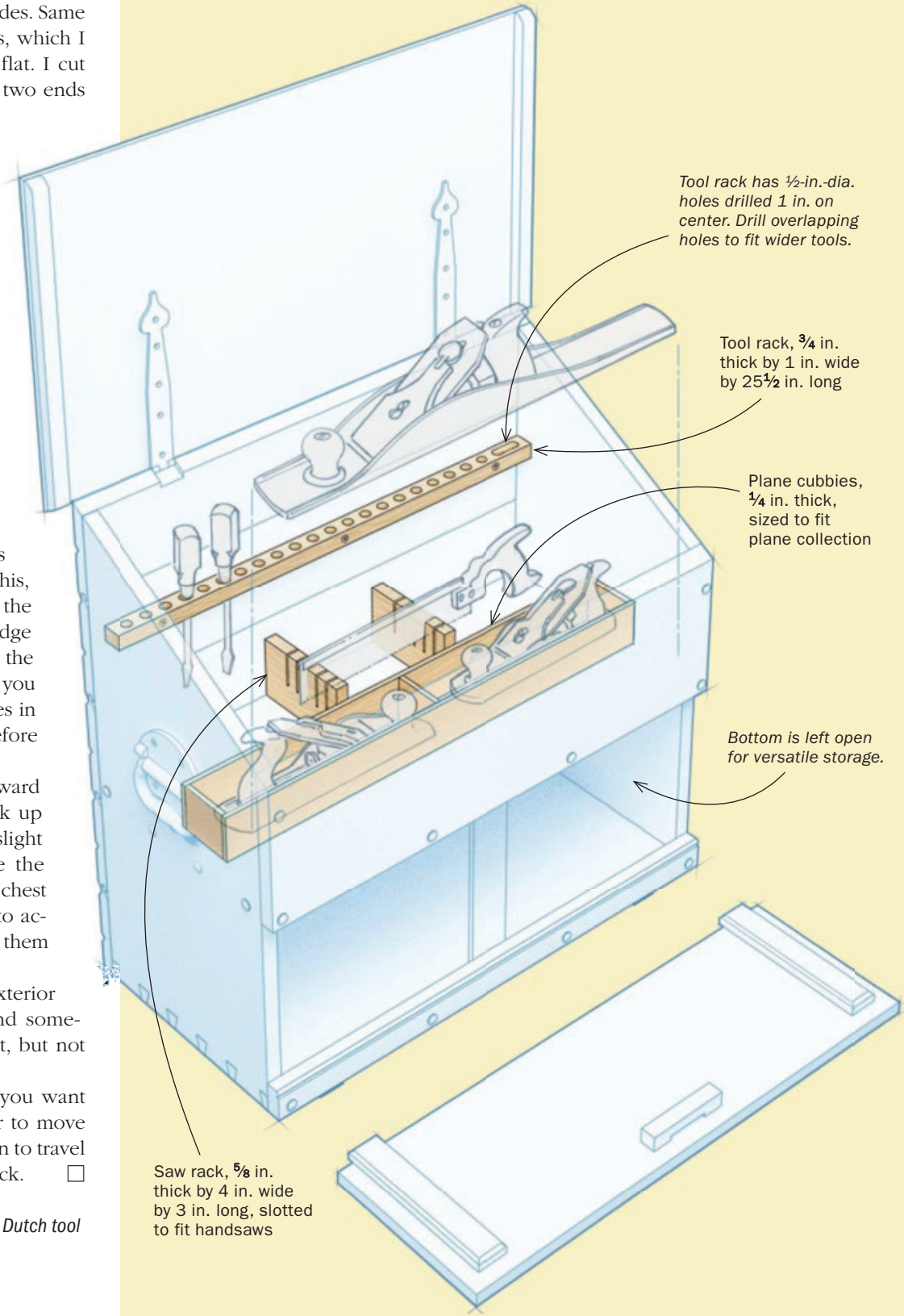
For a finish, I paint all the exterior surfaces except the bottom, and sometimes the inside of the fall front, but not the battens and catch.

Add casters to the corners if you want to make the chest a little easier to move around the shop—but if you plan to travel with it, make sure the casters lock. □

Megan Fitzpatrick is writing a book on Dutch tool chests with Lost Art Press.

A mix of simple, versatile storage options

Fitzpatrick keeps the chest's bottom compartment undivided for versatility. The top compartment, however, gets fittings for some essential tools. The holders are nailed or screwed in place. Outfit the interior for your own tool set, perhaps with cubbies from ¼-in. stock for your bench planes and block plane. You'll almost certainly also want a rack for a backsaw or two and a rack at the back for chisels. Make these from whatever hardwood offcuts you have (though pine will be fine, too).



Rack with holes gets screwed to the back. *The rack's holes make it great for storing marking gauges, dividers, screwdrivers, awls, and narrow chisels. Locate it about 7 in. below the top edge to fit the tool handles.*

Overlapping holes accommodate wide chisels. *Drill overlapping holes if you have wider chisels to store.*

Build a cubby around your planes. *After tacking together the outside of the box, add dividers to keep your planes from banging into each other.*

Tack the cubby to the chest. *Nails make the cubby easier to install and leave only small holes if you ever need to rip it out. Attach it with your longest plane in place toward the front of the chest, creating an appropriate space for it as well. (The chest is sized for a No. 8.)*

Two boards with kerfs hold your backsaws. *Space the kerfs to leave enough room for your fingers. The saw rack gets pinned to the back of the chest and to the cubbies.*

Drill-Press Table with Dust

Tearout-free drilling on a self-cleaning surface

BY MIKE GULDENSTERN

A few years ago, after years of working wood without dust collection, I finally hooked up all my stationary machines to a dust collector—all except my drill press. I searched online but couldn't find products or articles that addressed drill press dust collection. I'd seen some plastic fittings that people use on the end of their 4-in. flex hose to try to catch some chips, but that didn't seem like a great solution.

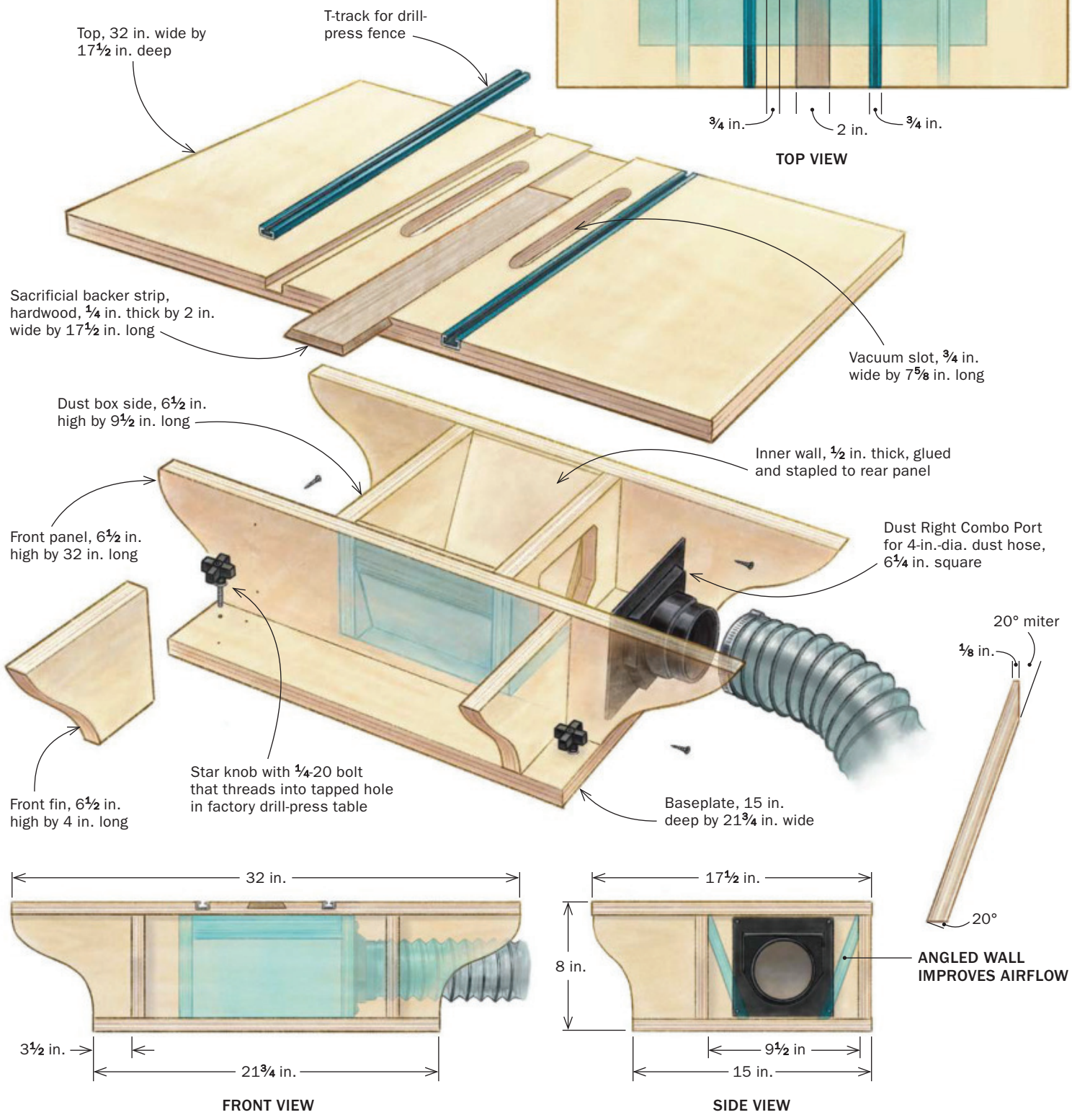
I decided to make my own drill-press table, one with a built-in dust box below the work surface. I designed it with two slots through the work surface, so chips get sucked down into the dust box and out the dust-collection hose. When I drill narrower workpieces, the chips go right down

Clean drilling. *When you're drilling narrow boards, chips disappear down a pair of slots in the surface as you work. When drilling larger sheets that cover the dust slots, like the one at left, the suction acts like a clamp, helping hold the board in place. When drilling is finished, tip up the board and the chips go down the slots.*

Photos: Jonathan Binzen; drawings: Derek Lavoie

DRILL-PRESS TABLE

All parts ¾-in. plywood, except where noted.



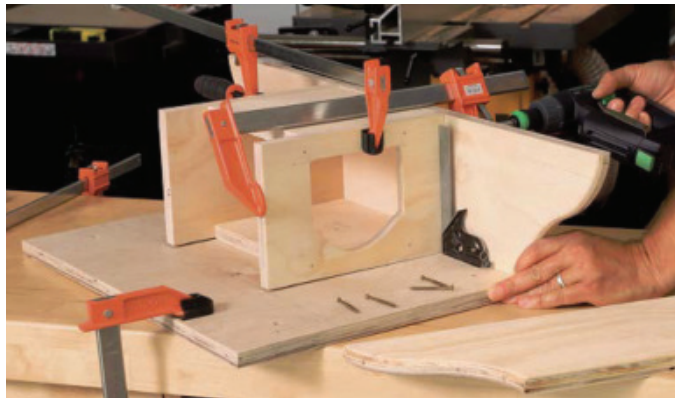
ASSEMBLE THE BASE

Glued and screwed. *Guldenstern built the drill-press table from plywood and assembled it with glue and 2-in. star-drive trim-head screws.*

the slots as I'm drilling. When I drill plywood and other large pieces that cover the slots, the vacuum force acts like a clamp, helping hold the workpiece in place while I drill. (It was a happy accident—I wish I could say I intended it.) In that case the chips stay on the panel, and when I'm done drilling I just slide the workpiece out from under the bit, tilt it up, and the mess disappears down the slots.

As I thought about my drilling process, I remembered that I almost always have a sacrificial backer board beneath the workpiece to ensure a clean, splinter-free exit on the holes I bore. That works well, but I realized that on my new table the backer board would cover the vacuum slots. To address that issue, I decided to build a narrow sacrificial backer strip into the top of my new table. I cut a shallow dove-

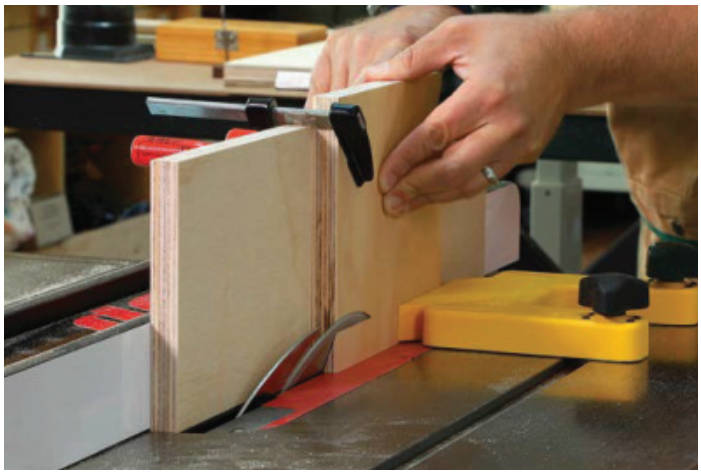
Dust opening. *Before cutting the sides of the dust box to length, he creates a window in one of them where the dust-collection port will be attached.*



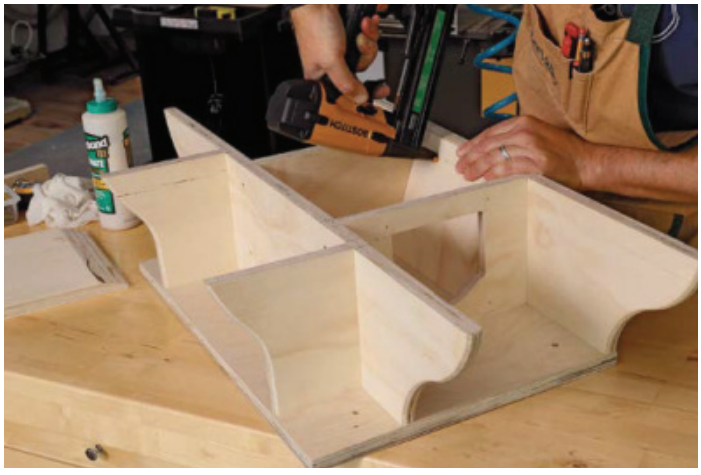
Build the dust box. *After screwing in one side of the dust box, Guldenstern uses spacers and clamps to hold the other one in position as he screws into it through the back of the fixture.*

Put the bottom on the top. *Once the dust box sides and the front fins are screwed in place, Guldenstern screws through the bottom to firm up the fixture.*

REFINE THE AIRFLOW



Angled walls funnel the airflow. *Using ½-in. plywood, Guldenstern makes a pair of angled inner walls for the dust box. He miters the top edge at the tablesaw with the workpiece held vertically and clamped to a longer, thicker board for stability. He cuts the bottom edge with the workpiece flat to produce the complementary angle.*

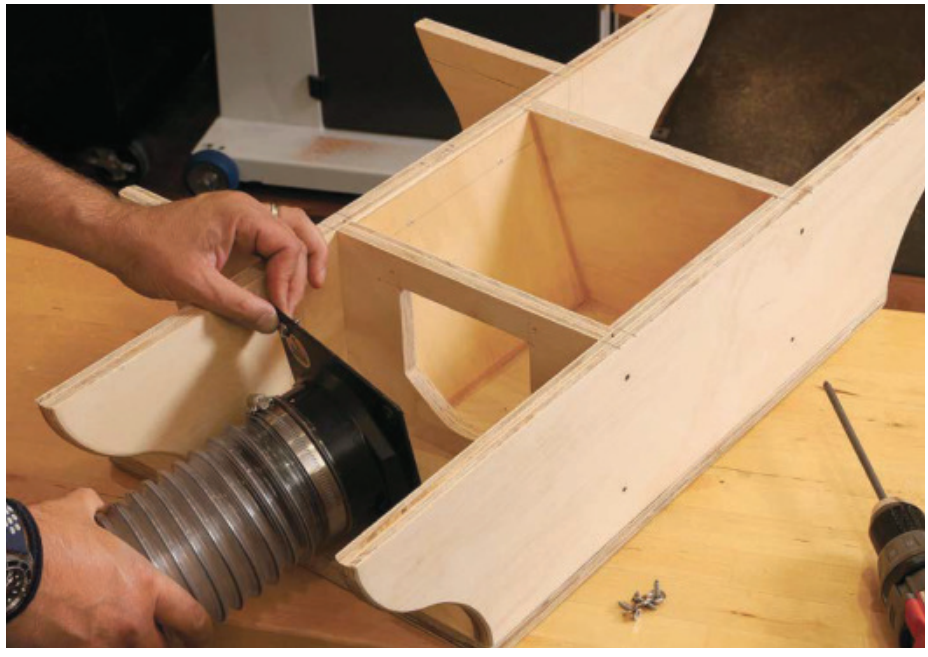


Tack on the inner walls. *Glue and staples hold the angled inner walls in place. Caulking the corners minimizes air leakage.*

tailed keyway down the center of the top from front to back, and I fitted it with a dovetailed hardwood strip. Now when one section of the backer strip has been drilled too many times, I slide the strip partway in or out—or pull it out and turn it end for end—to present a fresh section.

In addition to cutting the vacuum slots and the dovetailed keyway in the top, I dadoed it for T-tracks to accept my drill-press fence.

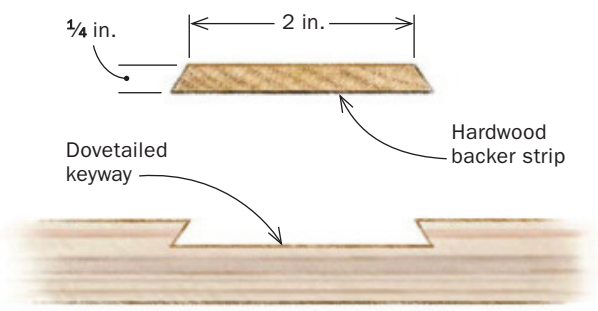
I built the table very simply: just glued and screwed, butt-joined plywood. But I was careful to make the dust box as efficient as possible. In my work running a commercial HVAC testing and balancing company, I've learned a lot about airflow over the years. The bottom line is that air performs a lot like water: It likes to conserve momentum and navigate smooth transitions. It doesn't like 90° turns. So I rounded over the vacuum slots top and



Installing the port. *Space will be tight once the top is on, so Guldenstern clamps the hose to the port and screws the port to the dust box before attaching the fixture's top.*

MACHINE AND ATTACH THE TOP

SACRIFICIAL STRIP FOR CLEAN EXITS



A trio of dadoes. *At the tablesaw, use a dado set to cut a pair of deep dadoes for the fence track and a shallower one for the dovetailed sacrificial backer strip. After cutting the center dado roughly to width, Guldenstern will angle its edges with a dovetail bit at the router table.*

Dust slot sequence. *Guldenstern cuts the dust slots by drilling at the ends with a Forstner bit, then connecting the two holes with a jigsaw. Afterward, to make the slots more aerodynamic, he routs a roundover on their edges, doing so on both faces of the top.*

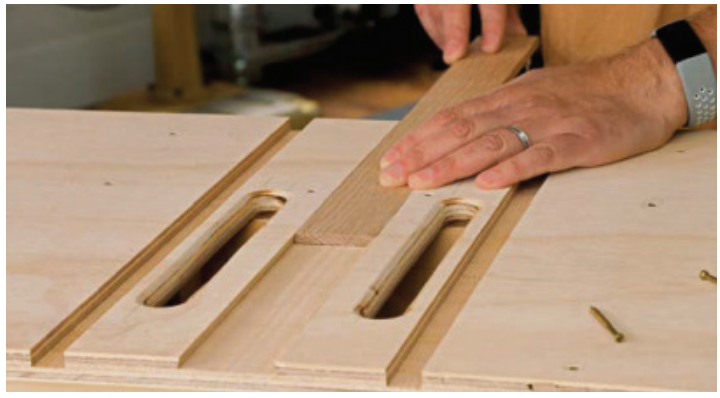
Dry assembly. *He screws on the top without glue so he'll be able to remove it in the future to access the dust box and dust hose if need be.*

ADD THE SACRIFICIAL STRIP AND T-TRACK

bottom to enhance suction and chip flow; I also rounded over the interior edges of the duct opening in the dust box. And I added angled interior walls to the dust box, converting it from a cube to something of a funnel shape, helping guide the airflow and avoiding dead spaces within the box.

I made the top of the table larger than the typical drill-press table, which makes it much nicer to work on. I built the dust box just large enough to accommodate the port for my 4-in. dust hose. And I made the baseplate of the table the same size as the factory table on my drill press. Not wanting to have to deal with clamping the new table in place, I drilled and tapped the factory table and attached my table with four ¼-20 bolts with star knobs. If I ever need extra height for drilling, I can remove my table in a few minutes. □

Mike Guldenstern works wood in Newburyport, Mass.



The sacrificial strip. *After milling the sacrificial strip to thickness, rip it on the tablesaw with the blade tilted to the dovetail angle. Be sure the fit permits it to slide easily into place. When one section has been drilled into repeatedly, slide it forward or backward—or turn it end for end—to present a fresh surface.*

Finishing up. *Guldenstern screws in tracks for the fence that came with his drill press. Before using the jig, he'll apply a wipe-on satin poly finish.*

gallery

Inspiration for our readers, from our readers

OREN HEMED
Pedaya, Israel

Oren's Japanese saw rack was designed to look more like a cabinet. He had been sketching the design on paper for a few months before getting time to build it. He says the rack holds his saws very steady in their slots with no wobbling around.

BEECH, WALNUT, AND CEDAR, 6¼D X 20W X 40½H

NEIL BROWN
Calgary, Alta., Canada

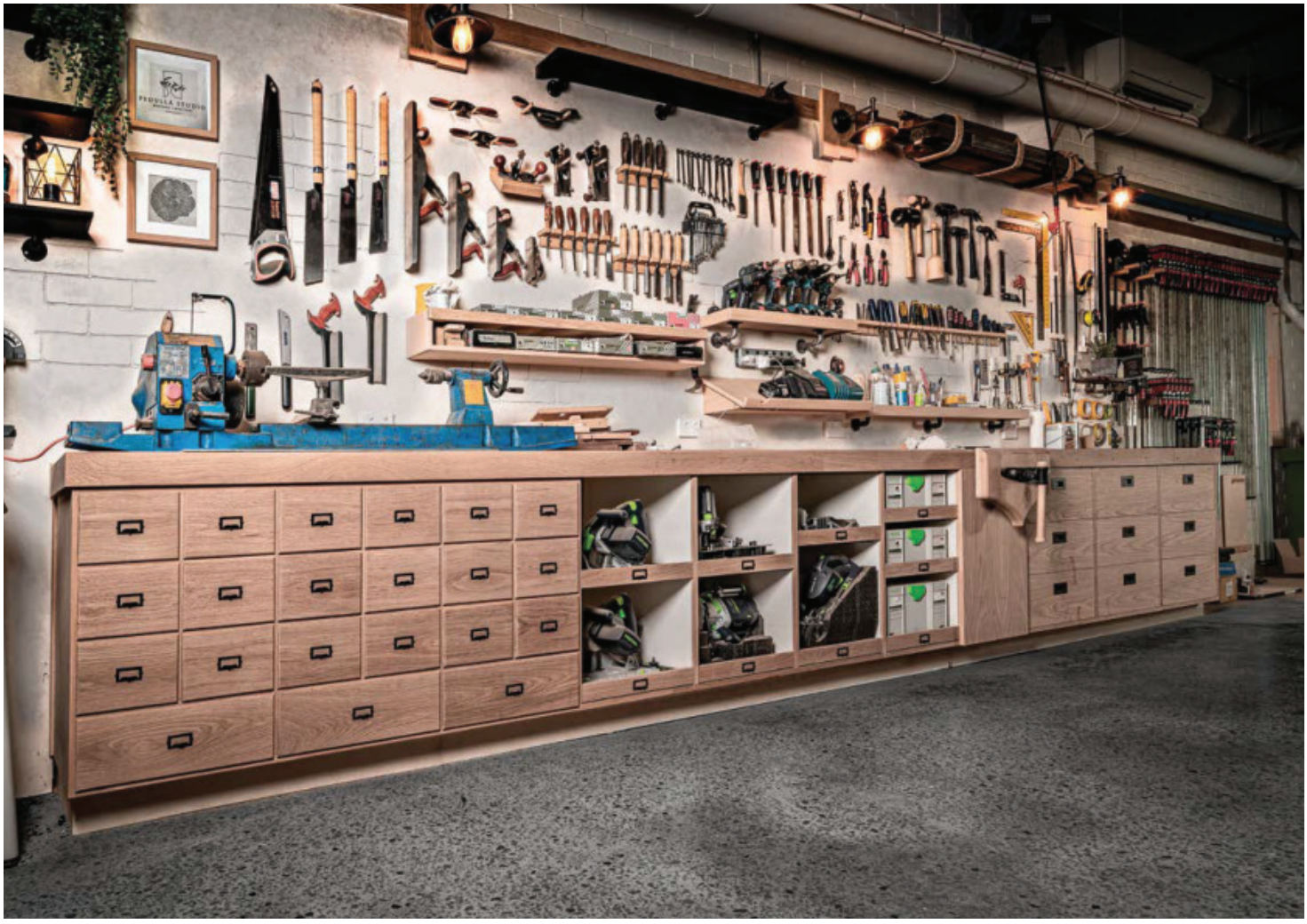
Making this tapered reamer was the first step Neil took in building a Windsor rocking chair for his son. He took his inspiration from the beautiful reamers that Tim Manney makes.

SAPELE AND RED BRASS
1⁵⁄₁₆ DIA. X 15½L; HANDLE 10½L

CHARLES KLINE
Concord, Mass.

Charles's workbench sports a repurposed Ulmia top and a 100-year-old Emmert vise on the far side. The storage area incorporates the three-way miter joint Andrew Hunter wrote about in *FWW* #227 (Master Class).

BEECH, SAPELE, MAHOGANY, POPLAR, 25D X 84W X 36H



NICK PEDULLA
Sydney, Australia

Nick uses his workshop as a showroom, where he invites potential clients to see what he's working on. So he wanted an attractive wall to show off his tools and give the right impression: "a tidy, organized, environment."

WHITE OAK AND PAINTED MDF
24D X 360W X 96H

DON CLARKE
Tamassee, S.C.

Don got started making planes after a class with David Finck. These infill planes are great for smoothing highly figured woods. The top one has a 50° bed and a very tight mouth.

PADAUK BURL, EBONY, AND ORANGE DYED BUCKEYE BURL
1⅝W X 5¾L X 2H

Show your best work

For submission instructions and an entry form, go to FineWoodworking.com/rg.

CRAIG REGAN
Jamesville, N.Y.

Inspired by European dividers from centuries past, Craig made this pencil compass for drawing circles and artisanal geometry. The hinge joint was the biggest challenge, he says. “It was a real conundrum on my first (and second) attempt.”

CHERRY, WITH MAPLE BURL KNOBS
⅞D X 2¼W X 14½L

COURTNEY STARR
Durham, N.C.

Courtney made the legs of this bench from a set of reclaimed floorboards from a North Carolina tire factory. The painted base was inspired by a Shaker design on the Benchcrafted website.

ASH AND RECLAIMED PINE
24W X 87L X 35H

JIM COLLINS
Willoughby Hills, Ohio

This hanging tool cabinet was based on the one built by Tom McLaughlin. Jim uses it to display his most-used tools; he wanted to build it after seeing Tom build it on television and finding the plans on FineWoodworking.com.

MAHOGANY, BIRCH PLYWOOD, MAHOGANY PLYWOOD
11D X 30W X 28H

STEPHEN J. PADDISON
Knoxville, Tenn.

Stephen designed this hanging saw till for his specific saws and tools, and made it with hand tools from trees sawn in the Tennessee Valley. The ziricote drawer pulls were made by B. Shinn of Maine.

VARIOUS HARDWOODS, 101/2D X 26W X 37H

Photo: Stephen Paddison and Jeff White

NICHOLAS ZACHRY
Las Vegas, Nev.

Difficulties buying tools during the pandemic spurred Nicholas to start making his own, and now he has a new hobby. This tenon saw features a hand-carved tote.

KATALOX, 1D X 41/2W X 20L

Online **Extra**

To see a larger selection of shopmade tools, benches, and storage, go to **FineWoodworking.com/293.**

CHRIS SUHRE
Gurley, Ala.

Chris says this spring pole lathe, modeled after the one in M. Hulot's L'art du Tourneur-Mécanicien (1775), "is my favorite (western) shopmade tool. It's heavy and doesn't jump all around, allowing very accurate turning." Chris has been making spring-pole lathes since he was 13.

WHITE OAK
22D X 68L X 47H

Photo: Katie Miller

handwork

Choosing and using dado planes

BY BOB ROZAIESKI

There are numerous ways to cut a dado by hand. You can saw the walls and then clean out the waste with a chisel and router plane. You can even make the joint with nothing but a sharp chisel. These methods, however, are relatively slow. While speed may be a minor concern when you need to make only a single joint, when a piece requires a dado, there tend to be several. In these situations, the most efficient method is a sharp, tuned dado plane. There's more to learn than with some other joinery planes, but a dado plane deserves a spot in your tool kit. Be forewarned, though; it's hard to stop at just one.

History, from wood to metal

The wooden-bodied dado plane has been around since the 18th century; however, the wooden form we know today wasn't common until the early 19th. They were made in various sizes, typically ranging from ¼ in. to 1 in. wide, in ⅛-in. increments, with many manufacturers also making a 13/16-in. size to match a common stock thickness. Compared to most other wooden-body planes of the time, which were rather simple tools, dado planes were quite complex, making them up to two times more expensive than the simpler wooden planes. Because of the cost, it was unlikely that most joiners and cabinetmakers of the time would have owned an entire set of dado planes. Instead, they may have made do with two or three.

By the 20th century, iron-bodied dado planes were being manufactured. They came in various widths similar to wooden versions but were significantly less expensive. Iron dado planes were manufactured by Stanley into the 1950s. As a result, these tools are still very common in good, usable condition.

All things being equal, I prefer wooden planes because they're more ergonomic. This isn't a big deal when working softer woods like walnut and mahogany, but can be quite the literal pain with really dense woods, like white oak. But,

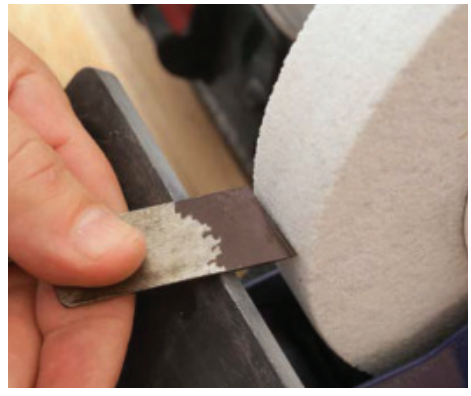
Photos: Barry NM Dima

Tuning a wooden-body plane

CHECK THE BODY

To work properly, the sides of a plane's body must be straight. If they're out more than 1mm, pass on the plane and keep looking. Anything more, and fixing the bow will negatively affect the tool. The sole should be straight and square, too. Use a very finely set bench plane to make adjustments. If the body is slightly bowed, straighten its right side for accurate reference on the batten when using the plane. Then joint the sole.

SQUARE THE BLADE



The skewed main blade should project evenly from the mouth. To verify this, color the back of the iron and place it in the plane. Scribe the iron following the sole of the plane. The scribe line will show clearly against the marker. Grind a new bevel at the proper skew angle if necessary. Begin with the blade horizontal, grinding the tip until you reach your scribe line. Then tilt the blade up to form the bevel.

DRESS THE SCORING BLADE

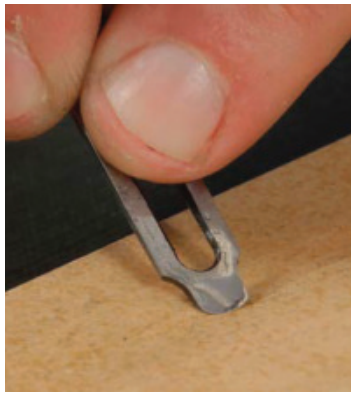
The scoring blade, which is not skewed, should be slightly wider than the body. If the blade is narrower than the body, the plane may bind in the cut. For this reason, don't remove material from the outside edges when dressing it. The soft steel is easily worked with a file. These blades don't need to be razor sharp, so touching up the blade with a file works well enough. Rozaieski also likes to form a rounded, thumbnail profile at the cutting edge.

Tuning a metal plane

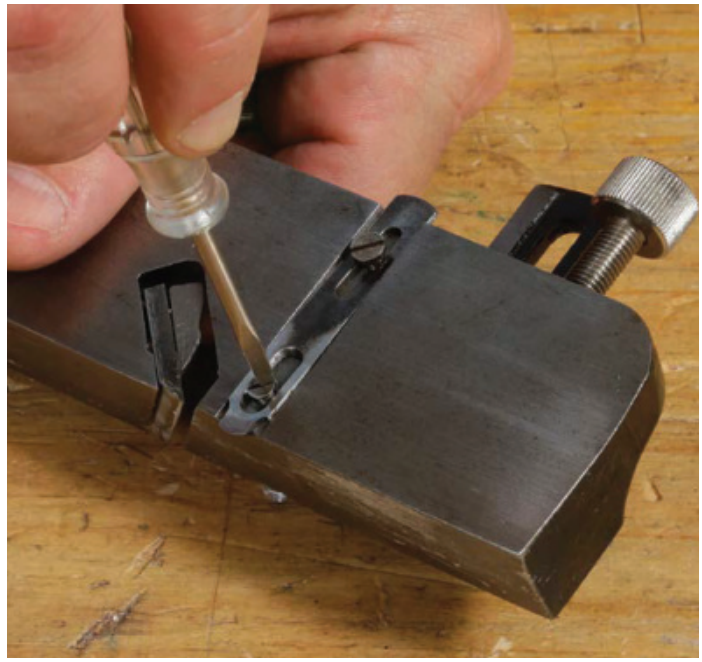
CHECK THE BODY

Metal bodies shouldn't need much work, but it's still worthwhile to make sure the body and sole are straight and square. Lap on sandpaper if necessary. Rozaieski does the majority of the work on the sole, because removing too much material from the right side of the plane can affect where the scoring blade attaches. Clamping a square reference fence to the lapping substrate helps keep the sole square.

HONE THE SCORING BLADE



Use bench stones to sharpen the backs and bevels of these thumbnail-shaped irons. Like the wooden plane's scoring blade, these do not need to be razor sharp. To keep the left-side scoring blade just proud of the body, metal planes house them in a ramped slot. As long as you don't remove a significant amount of metal from the cutter during sharpening, the ramp will position it correctly. The right-side scoring blade sits flush; this keeps it clear of the batten when the plane is in use.



unfortunately, used wooden planes are much harder to find. It's a good thing the metal ones function just as well.

Buying and tuning a vintage plane

As mentioned, dado planes are quite complex compared with bench and even some joinery planes. They have either two or three blades, the main blade is skewed, and there's a depth stop. For a dado plane to work properly, all of these parts must work together.

When shopping for a wooden dado plane, first make sure the side of the plane's body is straight. If it's bowed, the tool will bind in the cut and will not make a satisfactory joint. One millimeter or less can be planed out, but more is unacceptable. The sole can be jointed straight and square too if it isn't already.

It's uncommon for the body of a metal plane to be bowed, but it's still worth checking. If it is, there's no easy fix. A more common problem is that the sole may be out of square. You can fix this with careful lapping, but if it's severe, pass on the plane. They're too common to bother with major defects.

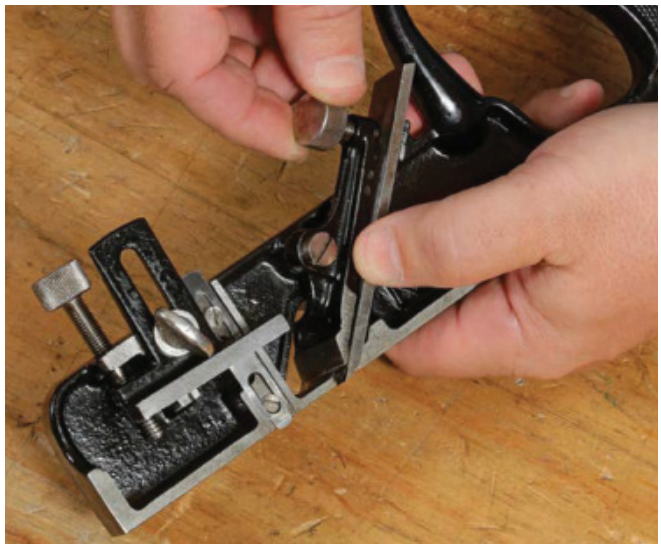
Check the blades next. A wooden plane should have two, a two-pronged scoring blade in front and the main skewed cutting blade behind. Both should be a hair wider than the body. Otherwise, they won't work. They should be secured by wedges. If a blade or wedge is missing, the plane is useless.

Most metal planes should have three separate blades: two scoring blades, one for each side; and a skewed cutting blade. Make sure that the scoring blades fit properly. The scoring blade for the left side will have varying degrees of a Z shape depending on the size of dado the plane will cut. The scoring blade on the right will be flat. The left blades are therefore

Setting up a cut

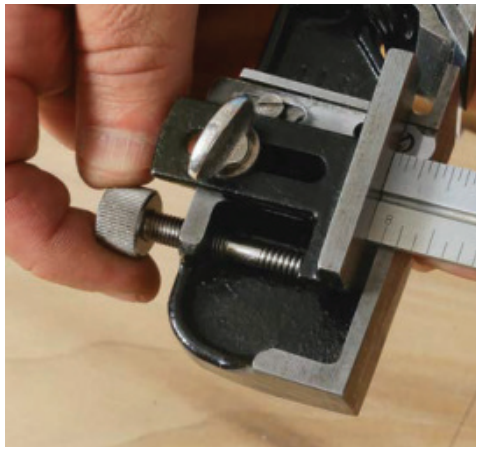
ADJUST THE BLADE

On metal-body planes the iron locks in with a thumbscrew and blade clamp; on wooden ones with a wedge. The skewed cutting iron excels at planing across the grain as cleanly as possible, but in setting the blade the user must still take into account wood hardness, grain behavior, and any knots.



SET THE DEPTH STOP

Use a ruler to adjust the depth stop. After adjusting the screw stop to your desired dimension, lock the depth stop in place with the thumb screw.



While wooden planes can employ two other styles of depth stop, Rozaieski prefers the screw stop. Typically made of brass, it's mortised into the plane body and adjusted with a thumbscrew located on top of the plane body.

not interchangeable between planes of different widths. Each scoring blade attaches to the plane with two small machine screws that easily go missing, so check for all four.

The main blade of an iron-bodied dado plane is also specific to the size of the plane. Replacements are difficult to find. The blade is secured with a blade clamp that is attached to the body of the plane with a screw. Again, these clamps are specific to the size of the plane. The size in eighths of an inch is typically cast into the bottom face of the clamp. Check the blades for pitting as well.

Lastly, verify the depth stop is present and functions properly. While the plane can be used without one, it's less efficient.

On wooden-bodied planes, there are three different styles of depth stop. The least common is a wooden block that is mortised into the plane and secured by friction or a wooden thumbscrew. The second style, commonly called a side stop, is typically made of brass or steel and secured to the outside of the plane body by a steel wood screw. The most common and most reliable is a brass screw stop, which is pictured at left.

All the iron-bodied dado planes that I'm aware of use a version of the screw stop. Replacement stops can be difficult to locate, so I pass on any that doesn't come with all the parts.

When I get a new old plane, I first disassemble, clean, and derust it. From there, I true the body if necessary. Next, I turn my attention to the scoring blades. On a metal plane, all you need to do is hone these. For a wooden plane, I lightly file the insides of the two nickers to sharpen them. I also round each nicker's cutting edge so it cuts on both pull and push strokes.

With the nickers addressed, verify that the main blade's skew angle is such that the blade projects evenly from the mouth of the plane. Having a skewed blade helps the plane cut cleanly

Planing a dado

SCORE FOR A CLEAN CUT

Draw the plane backward while holding it tight to the fence. Pulling the plane toward you lets the scoring iron knife the dado's walls, limiting tearout. Because dado planes don't have an integral fence, a batten clamped to your layout line keeps the plane on track.

START AT THE FAR EDGE

Form the dado in successively longer strokes until you're planing the width of the board. Start with a short pass at the far edge, then move the starting point toward you with each pass until you're planing the board's full width. This enables you to keep the plane vertical and tight to the batten, leading to a square joint.

across the fibers, so you want the geometry to be right. If it isn't, grind a new bevel at the proper angle. Then, hone the edge. I find this easiest to do freehand.

Now set the blades into the plane. The nickers should project just a hair more than the main iron, which itself should project evenly across the mouth of the plane and not past the edges of the nickers. The main blade should line up between the nickers, so it cuts evenly between the scored lines.

Batten keeps things in line

Unlike some other joinery planes, dado planes do not have an integral fence; most dadoes are too far from the ends of a board for one to be useful. So to guide the plane, we attach a batten to the workpiece. The batten is simply a stick of wood with a jointed edge and face. It can be clamped to the workpiece, or, more traditionally, affixed with a couple of finish nails.

With the batten attached, start the dado by drawing the plane backward while holding it tightly to the fence. Do this two or three times to score the sides of the dado. Then, starting about 6 in. from the far end, make a forward pass with the plane. Back up 6 in. more and again plane to the far edge. Back up again and make a third pass. Do this until you are planing the full width of the board. Plane until you reach your depth stop.

Troubleshooting

When you are using a dado plane, there are three common maladies you might run into. Luckily, most involve simple fixes.

The first is that the sides of the dado aren't vertical. This comes from tipping the plane. To fix this, slow down and focus on keeping the plane tight to the batten, and thereby vertical. A thicker batten can be helpful; double-check that it's square.

Another problem is the plane binding in the cut. Several things can cause this. First, a scoring iron may not be proud

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Dado planing tips

PAIR UP CASE SIDES

Two pieces receiving dadoes can be clamped together and planed at the same time, ensuring the joint in the two panels will line up perfectly come assembly. By putting the two front edges to the inside, this method also limits blowout.

CUT WIDE DADOES IN TWO PASSES

Tap the batten over after the first dado to widen the joint. *To create a dado wider than your dado plane, first plane a normal dado. Then move the batten over the distance you want to widen the joint before planing again.*

of the plane body. Another possibility is that you are tipping the plane. If you start nice and vertical but then tip the plane as your dado progresses, the front corner of the plane will rub on the wall of the dado, causing the plane to bind. Again, slow down and focus on holding the plane plumb.

The third common issue is the dado's walls chipping and tearing out. Use this checklist to figure out the cause. First, the nickers should be sharp. Next, they need to be aligned with the main blade, so see that the main blade doesn't protrude beyond the nicker on one side. If they are aligned, make sure the iron isn't too wide. This is extremely rare but can happen. If it does, lightly grind the sides of the iron to narrow it. Finally, be sure you're not tipping the plane, causing the side of the cutting iron to rub the corner of a dado wall, leading to tearout. □

Bob Rozaieski teaches traditional woodworking and is based in southwestern Virginia.

RABBET A SHELF TO FIT A DADO

If you don't want to widen the dado or thin the shelf to fit, you can rabbet the shelf. An argument can be made that the rabbet's shoulder strengthens the joint.

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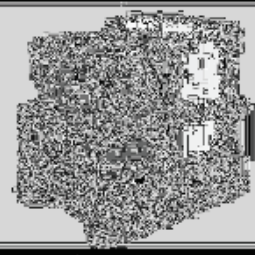

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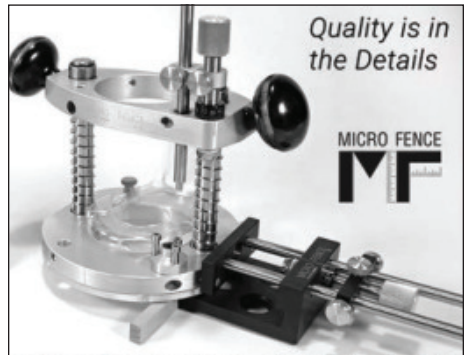

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The postage stamp

BY KELLEY FRANCO THROOP

"It's small, but it could work." I looked at my husband, Tom, as he stood in the corner of the shop, hand on a copper waste pipe. He gazed pensively around at the 1,220-sq.-ft. space dotted with cabinet-shop detritus. Outside, the rain poured down. I briefly reflected on the odyssey that had brought us to this 0.05 of an acre—a postage stamp of a property.

We had been looking for a studio to buy for his furniture-making business for years. Tom had long rented shop space in Connecticut, first in South Norwalk, then in Bethel. Both were solid spaces: plenty of room, good natural light, affable and dependable shop mates. However, these spaces were in industrial areas, and he had always dreamed of having his shop in a village. We needed to find something permitted by zoning laws and within our means.

While we had both grown up in New Canaan, neither of us knew this small, worn building tucked away by the railroad station lot, right near town. As Tom stood there, saying it could work, I believed him.

Then, in November 2005, our realtor called saying there was a building for sale at 26 Grove St. in New Canaan that used to be a cabinet shop. It was owned by Mrs. Pustella, who still lived in the apartment over the shop, where Mr. Pustella, now deceased, had made cabinetry. Our realtor said 26 Grove would sell quickly, so we drove over that night. While we had both grown up in New Canaan, neither of us knew this small, worn building tucked away by the railroad station lot, right near town. As Tom stood there, saying it could work, I believed him. But the building needed vast interior and exterior renovation. It was borderline dilapidated.

We could not view the second floor that night because Mrs. Pustella was in residence, and it was late. We returned in a few days and met her—this memory is now a precious link to the past. But the apartment was so run-down it would need to be taken back to the studs. And then the financial component reared its head—how would we outbid others for this property, save funds for the renovation, but keep it affordable?

We immediately worked on the numbers. I am an attorney with some real estate background, which helped. Tom had the knowledge to estimate the renovation cost. We figured out what we could afford, talked to banks, and submitted our bid.

Shortly after, the realtor called saying that the building had received nine offers, and the winning offer was a quantum leap above ours. We were crestfallen. But as time went by the building did not seem to close. Word got out that the sale fell through. The building went off the market.

And then, four months later, it came back on. We got our financial ducks in a row again. We bid again. We lost again to a higher bidder.

That summer we heard that the second-round winning bid fell through. It turns out that the dearth of parking (two spaces with no room for more) was a fatal impediment to a higher use. We met with the town planner, and he said that the best and highest use for the property was truly just to continue the present use—with a woodshop on the first floor and an apartment on the second. Zoning was on our side. But was fate?

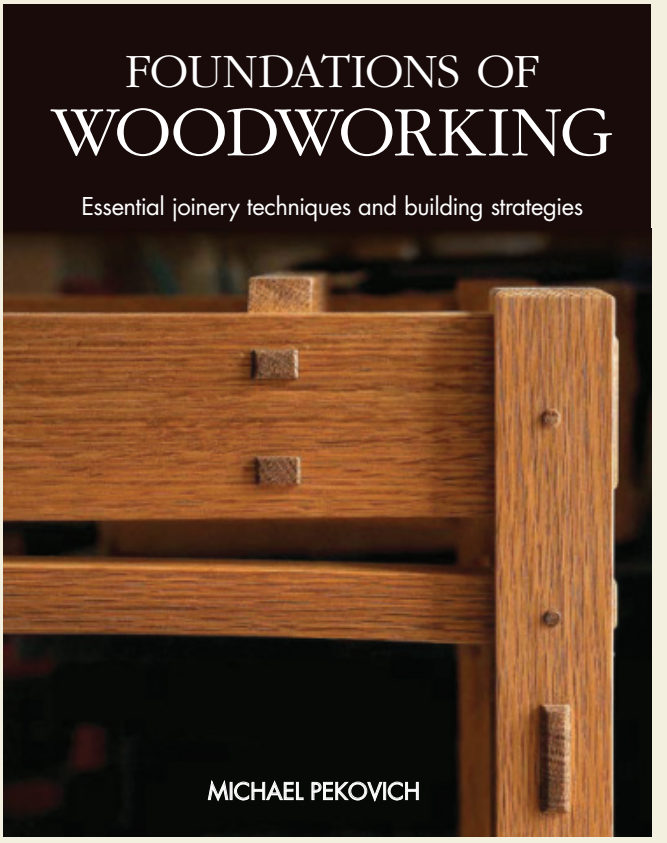
A third round of bids ensued. We bid. We got it. Nothing in this world can take the place of persistence. We closed, almost a year after we first saw the shop, on our ninth wedding anniversary in September of 2006. Just a week before the closing I left law firm life to start a practice with my brother a short walk from 26 Grove St. in New Canaan.

After the closing, Tom and I suited up in our best and went out to dinner to celebrate new beginnings. The next day we suited up in our worst, donned masks, and began the interior demolition. The postage stamp was ours. □

Kelley Franco Throop practices law in New Canaan, Conn. Read more about Tom's shop in Shop Design, pp. 22–26.

Photo: Jonathan Binzen

NEW FROM MICHAEL PEKOVICH



Foundations of Woodworking gets to the very core of the craft of woodworking: laying out, cutting, and assembling joinery for furniture and other treasured wood objects. Michael Pekovich dives into a step-by-step, project-by-project description of the essential wood joints, from rabbets and dadoes through mortise-and-tenons to dovetails and miters. Master these joints and the door is open to create just about any design you can think of.

The book concludes with a selection of inspiring projects, including a wall cabinet, a chimney cupboard, an arched entry table, a desk divider, a dining chair, and many more.

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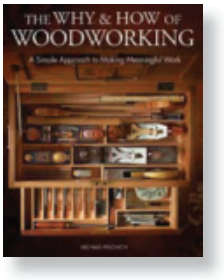

Michael Pekovich's first book, *The Why & How of Woodworking*, was the woodworking event of the year when it was published in 2018. *Foundations of Woodworking* is sure to pick up where *Why & How* left off, inspiring and instructing thousands of woodworkers worldwide.

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