Fine WoodWorking

Sawblade caddy for safe storage, p. 74

Tools & Shops

ANNUAL ISSUE



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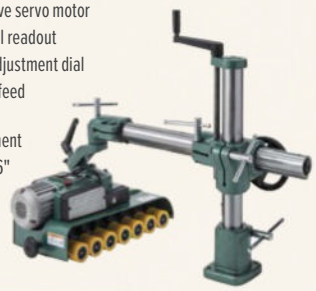

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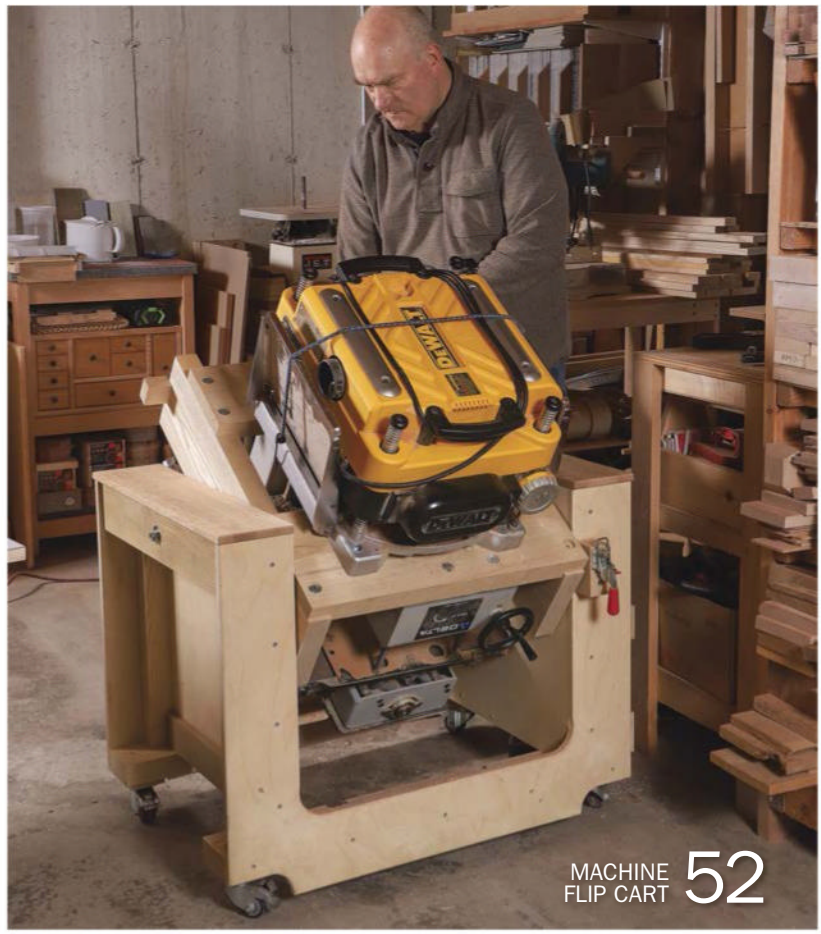

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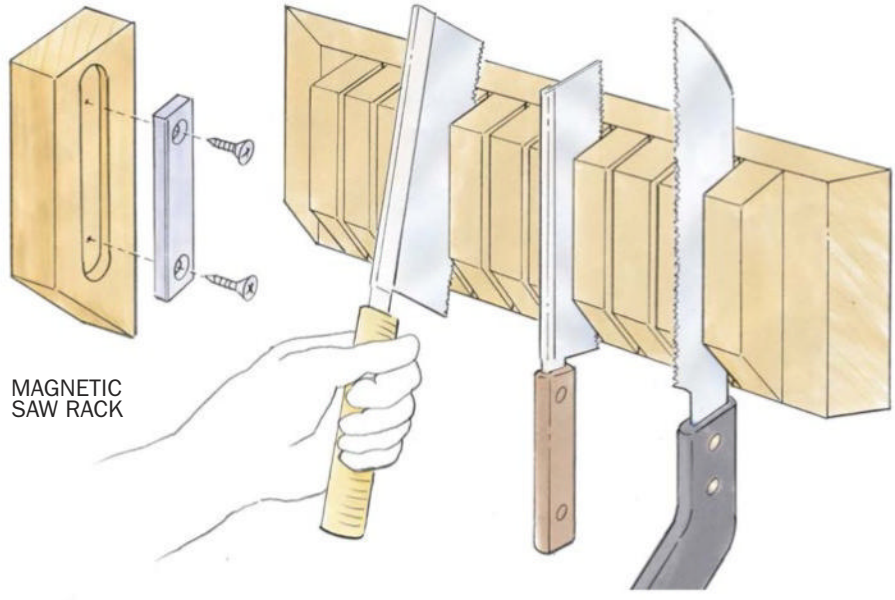

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VIDEO

How to cut a lock rabbet joint

Owain Harris demonstrates his method for cutting this functional joint, perfect for utility drawer boxes.

VIDEO

Howes's favorite tools

Bill Howes shows off two of his favorite shopmade woodworking tools, including the reproduction coffin plane featured on pp. 58–67.

VIDEO

How to sharpen a thread box

Learn the ins and outs of sharpening and setting this one-of-a-kind tool.





Creating a torsion-box work surface

Read how Owain Harris keeps his rolling cart's top totally flat, even while it's parked on uneven surfaces.

VIDEO WORKSHOP

Shaker oval box

Follow along as Chuck Thorne from Hancock Shaker Village demonstrates how to construct this quintessential Shaker object. In this series you'll learn how to:

- Carve the box fingers
- Prepare the stock for bending
- Create an oval bending form



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contributors



Don Burgard reached his zenith as a woodworker with a rocking dinosaur he made for his nephew in 1992. Fortunately, when *Fine Woodworking* was looking for a new copy/production editor in 2024, grammar and magazine production skills were considered more essential than woodworking experience. Having previously worked for *Fine Homebuilding* and *Fine Gardening*, he was glad for another chance to hang around with skilled enthusiasts. An enthusiast himself when it comes to the band Rush, Don lives in Rochester, N.Y., a short distance from his two sons.



Growing up in Ohio, **Ryan Schemrich** spent much of his time on his hands and knees, turning over rocks to see what bugs he could find. Although exposed to woodworking as a boy through his father and his grandfather, he didn't take an interest in it himself. Bugs remained top of mind, and he moved to California to study entomology at UC Davis. But the unexpected gift from an acquaintance of a bounty of woodworking tools and books helped spark his desire to create things, and he dived into the field. He now builds furniture and boxes in Woodland, Calif., working as much as possible with logs that he finds, has milled, and air dries in his shop.



Neal Walden enjoyed shop class in high school, so after dropping out of college, where he had been studying business, he decided to try working in a local cabinet shop. While there, he says, "I met Willy Ekstrand, a Swedish cabinetmaker who opened a whole world to me." Not long after, he opened his own shop in a backyard garage, borrowing money to buy a Rockwell table saw and a Makita jointer/planer. Today he runs Walden & Co., a thriving cabinet and millwork company amid the vineyards in Healdsburg, Calif.

Mike Wilkie, an engineer in the aerospace industry who lives in Ellington, Conn., embraces woodworking as a creative outlet that balances his logical side. Years ago he and his father took a woodworking course at a local community center, and, he recalls, "a lifelong passion was born in both of us." Whenever he travels, Mike folds in woodworking-related stops, and he has found inspiration on the road in "sawmills in Tennessee, backyard shops in California, and homegrown lumber dealers in Pennsylvania and Florida."



We are a reader-written magazine. To learn how to propose an article, go to FineWoodworking.com/submissions.

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letters

From the Editor



Getting better all the time

To me, there is something special about the *Tools & Shops* issue. It could be that it only comes out once a year. It could also be because it was the first issue put in my hands at the perfect time in my career. I fondly remember my first boss, who on a whim took the new 19-year-old kid to the hardware store to pick up some things. At checkout, my boss saw me browsing that year's *Tools & Shops* (*FWW* #188) and said to the clerk, "Oh, and that magazine too." In that moment he inadvertently shifted my trajectory from punk laborer to punk woodworker. I read that magazine front to back, studying everything. I pointed to Asa Christiana's article on setting up a shop for $5,000. The shop we worked out of was fine, but I thought the upgrades described in the article could take us a step further. There was another article where all the editors put different workbenches through their paces in a head-to-head comparison. The winner that year was the Lie-Nielsen bench, which is the same brand I work on now. Before I knew much about woodworking, *FWW* #188 and subsequent issues held so much influence over what I would do in the shop and how: how to organize my space for the task at hand, or how to tune up the neglected bandsaws in the shop (a surefire way to solidify my employment). The magazine gave me the advantage of seeing how all the pros operated, and with some effort, I tried my best to mimic what I read.



I have had the pleasure of working with many authors since starting at the magazine, all of whom graciously invite me into their shops, where I begin to ask a litany of questions: "What do you like about that? Why is the jointer over there? What's this do?" I would ask these same questions in my head while reading the magazine, but now an answer follows.

In this issue, Bill Howes is represented twice: "Make a Pocket-Size Coffin Plane" and Handwork. Both of those pieces came from one of my interrogations. I was at Bill's shop in Nova Scotia shooting photos for an entirely different article ("Replacement Gouge Handles," *FWW* #323) and noted his love for shopmade wooden tools. They are all over his shop—wooden hand screws, mallets, even a shave horse with a hoof! Bill is an extremely prolific furniture maker (alongside his full-time career as a neurosurgeon, now retired), but I could tell that a lot of his joy came from making the things that make things, so a couple of new articles were born.

Along the same lines, Owain Harris's article "Shop Cart Shines With Dead-Flat Torsion Top" is derived from his beautiful furniture. A staple of much of his work is the impeccable, sometimes mind-bending veneering he does. You can only achieve that level of work by understanding all the variables, one of the most important of which is having a solid ground to start building upon. The cart he builds is the foundation to his complex work but is itself very simple. When it comes to a shop fixture, "simple" is the highest compliment I can give.



Every article in this issue has something I'm earmarking to add to my own shop—flip carts, backsaws, wooden clamps, sawblade caddies, color coordinating—and what inspires me may not be directly in the text but in the background of a photo. Many elements in my shop have already been influenced by this magazine and by people I've worked with. Now that the two have combined, I'm excited to see where my shop goes from here.

—Owen Madden
Assistant Editor

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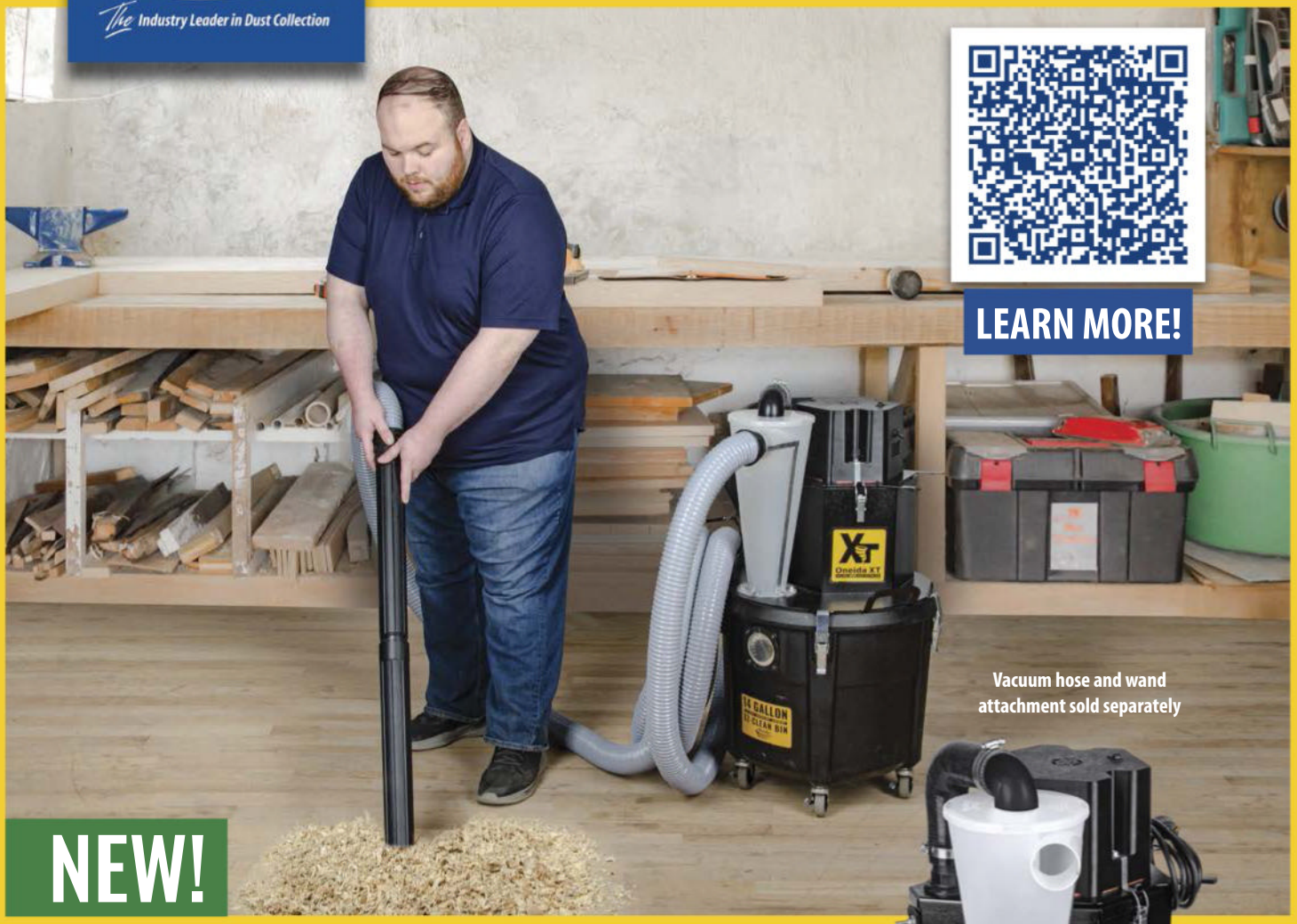

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workshop tips

Magnet catches make blast gates more convenient

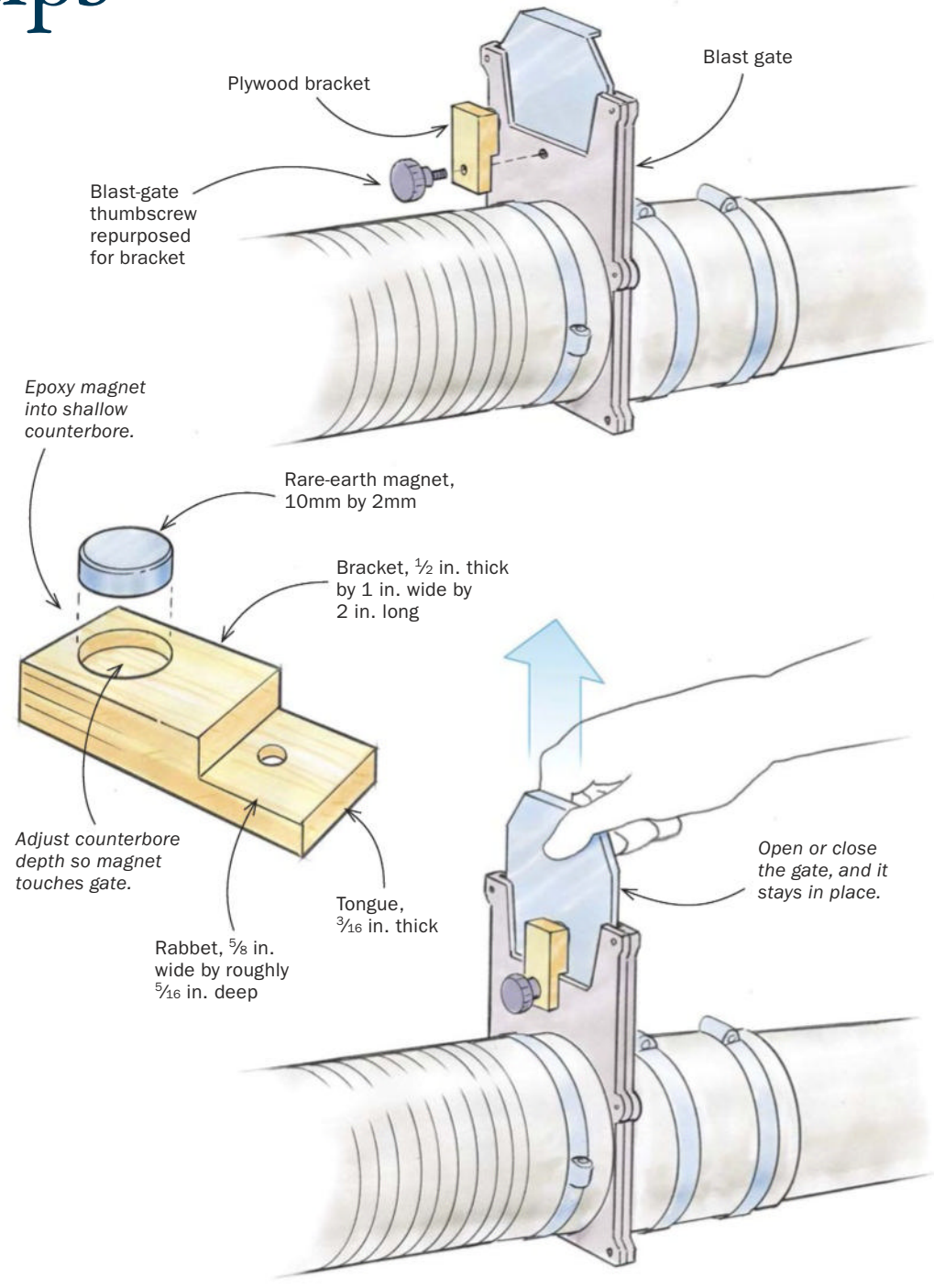
Most of the metal blast gates for dust collection have a thumbscrew that holds them open and closed. The screw forces you to use two hands to open the gate—one to loosen/tighten the screw and the other to manipulate the metal flap. This is inconvenient when you're reaching down from a standing position.

I added a simple plywood bracket to my blast gates that holds a rare-earth magnet. The magnet exerts the perfect amount of drag on the gate, keeping it in place when I pull it open or push it closed. I repurposed the thumbscrew to hold the plywood bracket in place.

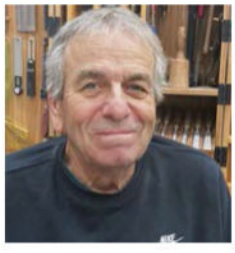
The critical dimensions for the bracket are its ½-in. thickness and the 5/16-in.-deep rabbet. The rabbet leaves a 3/16-in.-thick section that the thumbscrew passes through, holding the bracket in position while stopping it short of hitting the gate.

The magnet needs to protrude a bit from the bracket to rub against the metal gate. I used a Forstner bit to bore a hole to just the right depth and then used epoxy to hold the magnet in place. I went with a 10mm rare-earth (neodymium) magnet, but the 12mm size may be even better. Either way, your magnet catches will save you a lot of time and fiddling.

—JEFF COLLA, Glenwood, Minn.



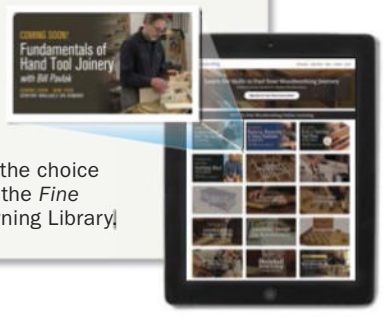
Best Tip



When he was studying engineering in the 1970s at the University of Wisconsin, Jeff Colla discovered a woodworking shop at the student union. He bought the first issue of *Fine Woodworking* soon after, and the rest is history. He builds projects for family and friends, including furniture, kitchen cabinets, staircases, decks, and the saltbox-style workshop at his lakeside retirement home.

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 the choice of an online course from the *Fine Woodworking* Online Learning Library.

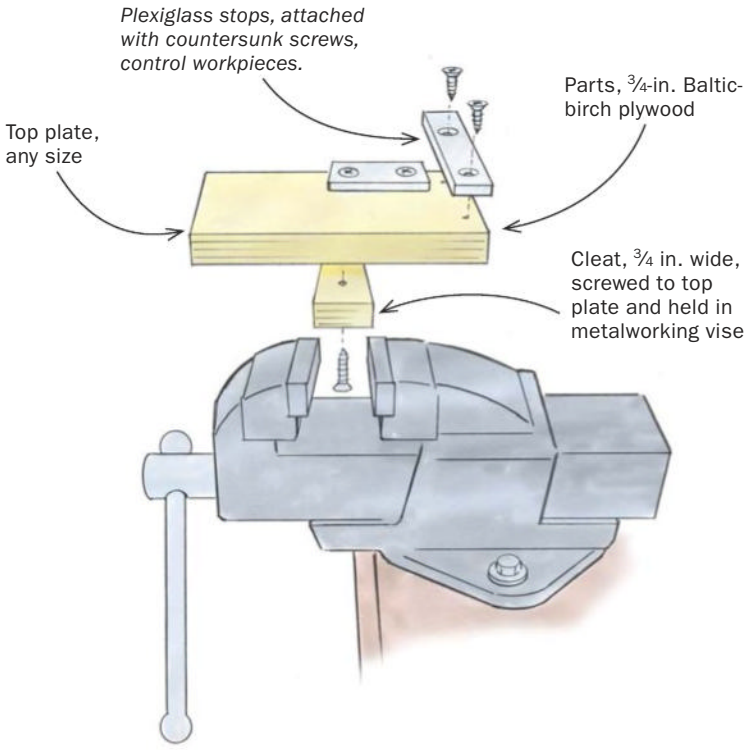


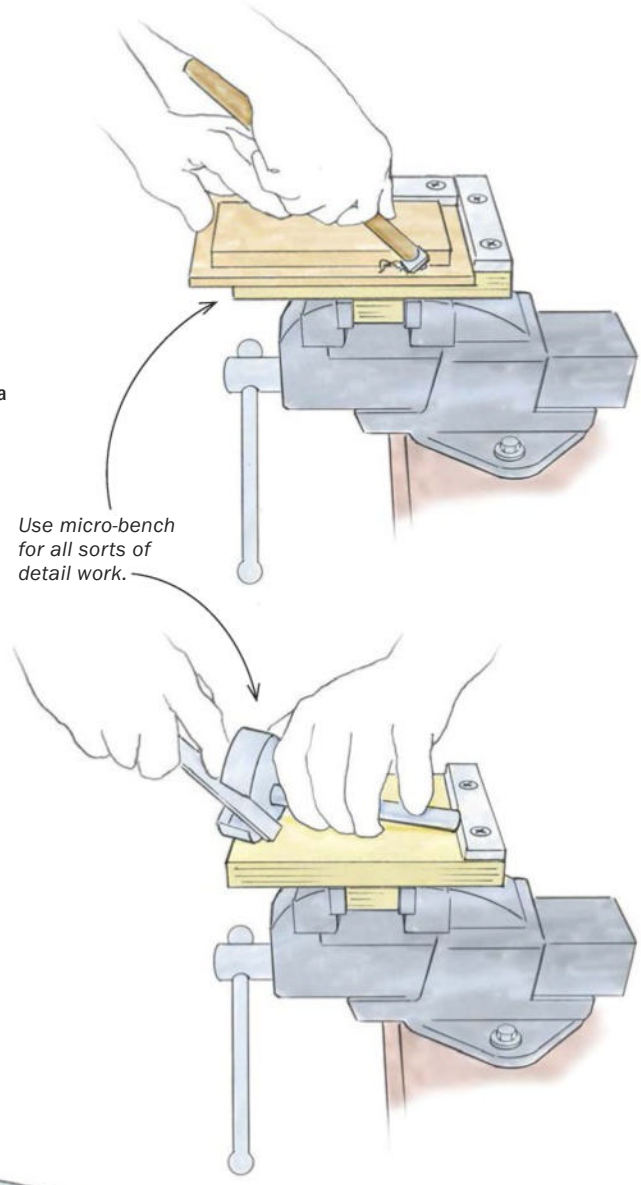
Drawings: Dan Thornton

Micro-bench raises work to comfy height

I call this little work platform a micro-bench. Held in the jaws of my metalworking vise, it raises small tasks to a more comfortable height. I made stops out of plexiglass to help me control workpieces. My micro-bench stays in the vise almost all of the time. I use it for a variety of tasks—anything from holding a small part or project for measuring or marking, to fine-tuning joinery or sharpening drill bits with a diamond file.

—PIERRE AVARD, Toronto, Ont., Canada

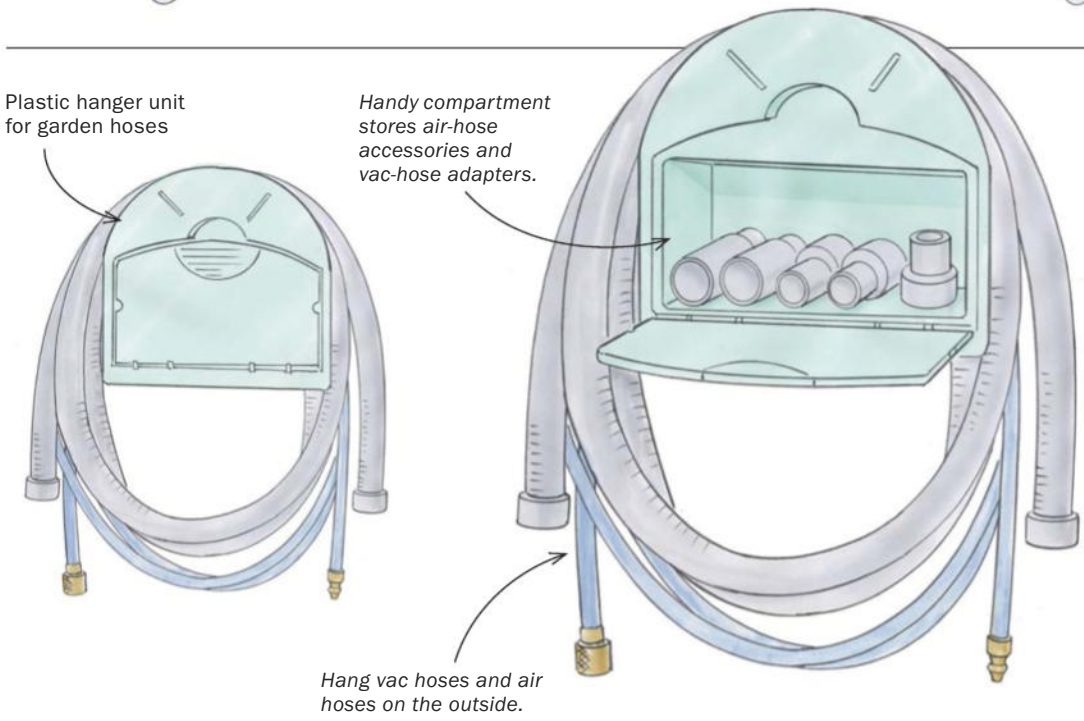




Garden-hose hanger stores vac hoses, air hoses, and accessories

I have a variety of dust hoses and not much room to store them. To keep them from underfoot, I use an inexpensive hanger unit from Vego Garden that's designed for garden hoses. There's a built-in storage box where I put the hose adapters for various tools. The same hanger stores air hoses and air accessories as well.

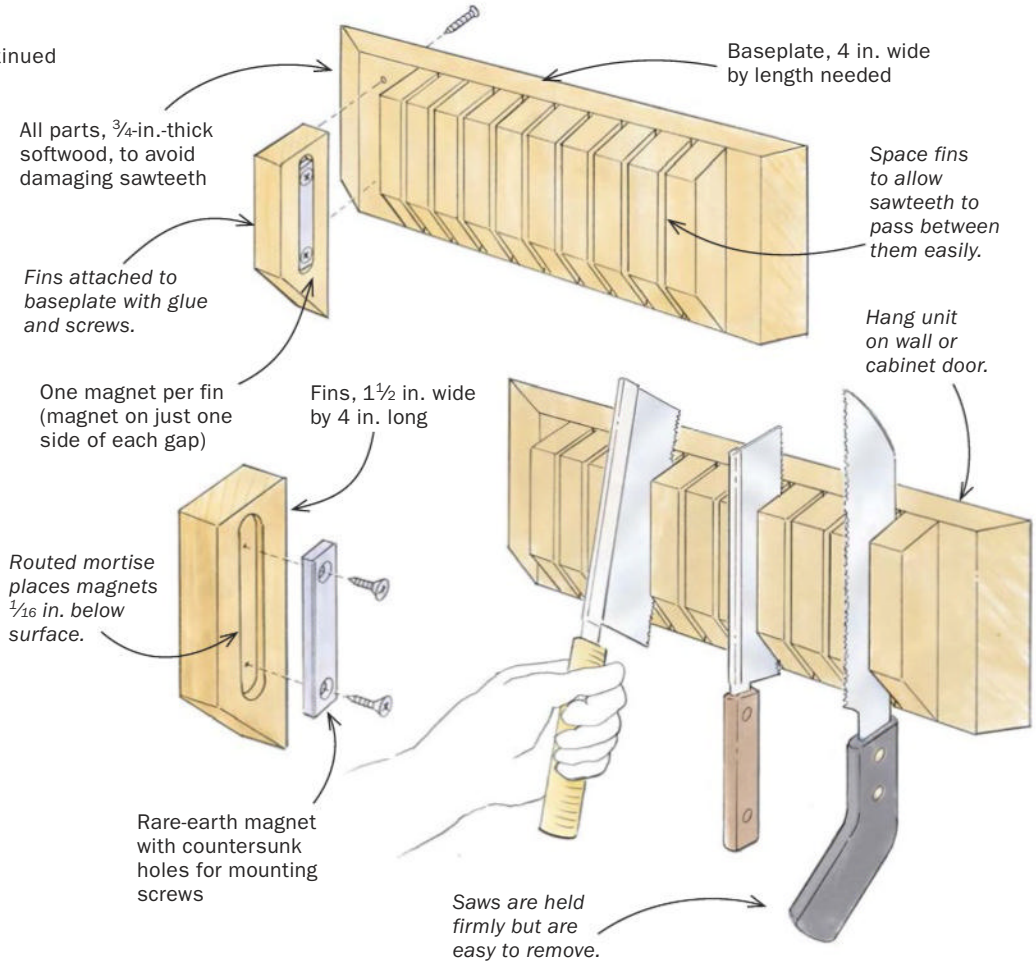
—HARVEY BROTMAN, Lyme, N.H.



Quick-access handsaw holder

I have a number of handsaws that I use on a regular basis, so I built this unit for quick and easy access. It's really nothing more than a series of wood fins with rare-earth magnets embedded in them. The bar-shaped magnets are designed to hold kitchen knives on the wall. They are 5mm thick by 13.5mm wide by 60mm long, with countersunk holes for mounting screws ($20 for 10 at Amazon). To allow the saws to slide in easily, I beveled the ends of the fins and spaced them just wider than the saw thickness at the teeth. I embedded the magnets slightly below the surface of the fins, so the magnets don't contact the saws. The saws are held firmly but can be removed easily.

—JOHN VAN VLIET, Tucson, Ariz.

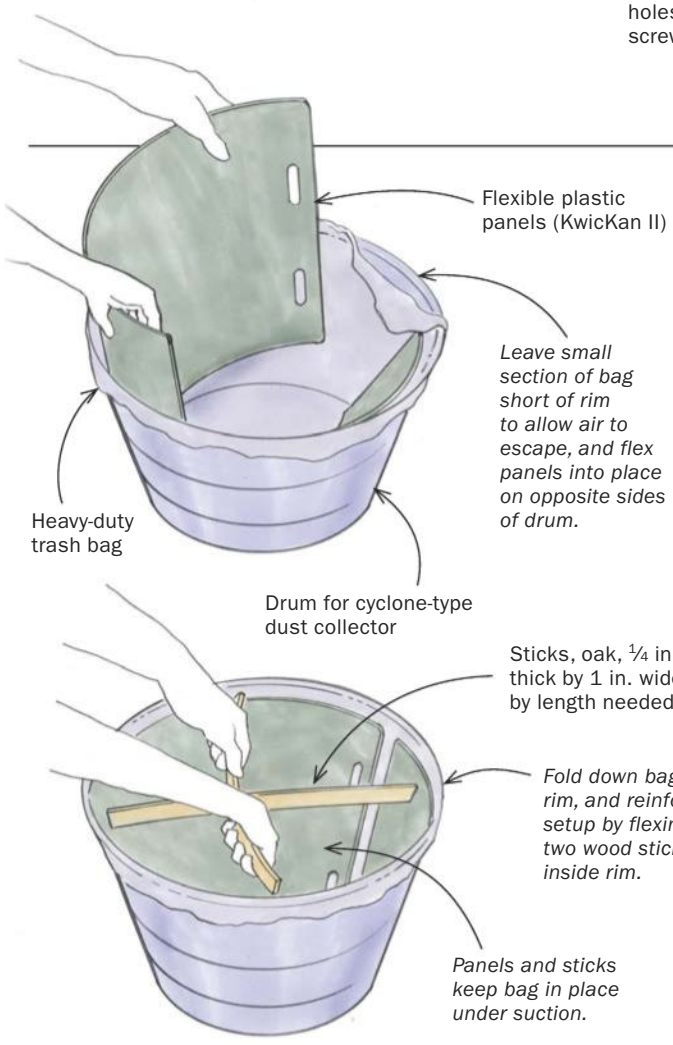


Plastic panels prevent cyclone bags from collapsing

Cyclone-style dust collectors drop chips and dust into a drum. To make it easier to empty the drum, many woodworkers place a heavy-duty trash bag inside. The cyclone, however, will suck the bag upward. There are a few solutions, but mine is simple: After placing the bag inside the trash can, I insert two flexible trash-bag holders. (I recommend KwicKan II Portable Instant Containers, available at HomeDepot.com for $17 each.) You'll need two for a 55-gal. drum like mine, but one will work for smaller-diameter drums. If your drum is shorter than the full 55-gal. height, you can cut down the plastic bag holders with tin snips or a garden pruner. With the bag in the drum, simply flex the plastic sheets into place. For additional stability, I flex two oak sticks into the top of the drum as shown. The setup keeps the bag firmly in place under suction, yet it is very easy to remove when emptying the bag.

Additional tip: When installing the bag, leave one small section a bit short of the top of the drum. This will let air escape when you are pressing the plastic sheets into place. Then fold that last bit of the bag over the top, and you are good to go.

—WILL WANG, King City, Ont., Canada

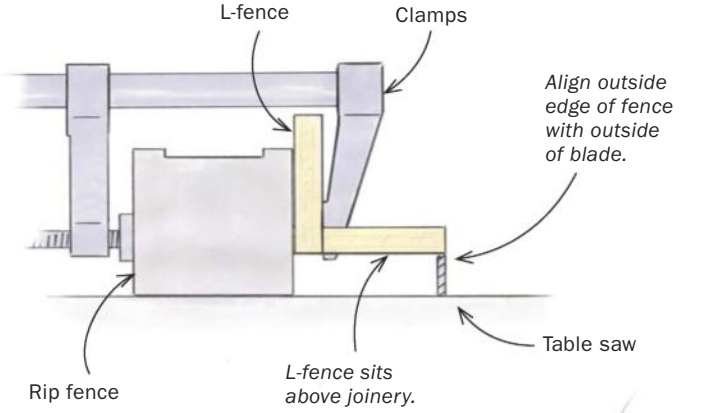


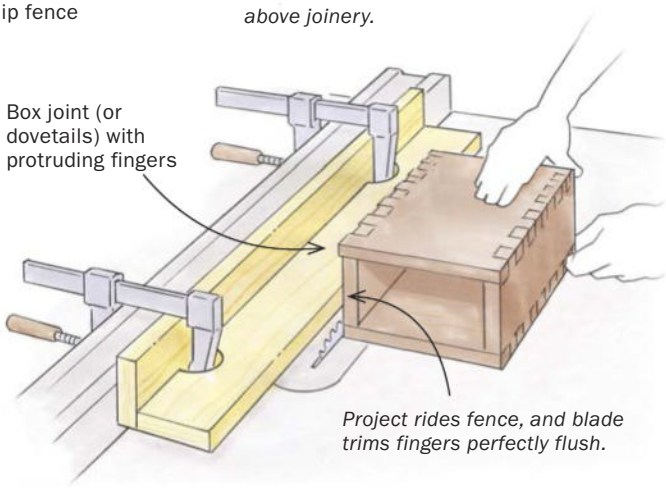


L-fence trims proud joints perfectly flush

To make clean box joints, I leave the fingers a little bit proud and then trim them flush afterward. I've tried sanding them flush but have found that to be both tricky and time-consuming. Instead, I use an L-fence on the table saw—just like the ones chronicled in this magazine. When properly adjusted, the fence setup cleans up the joint very quickly, leaving a perfectly flat joint. And it works just as well on dovetails.

—RICKEY L. WILLIAMS, Tucson, Ariz.



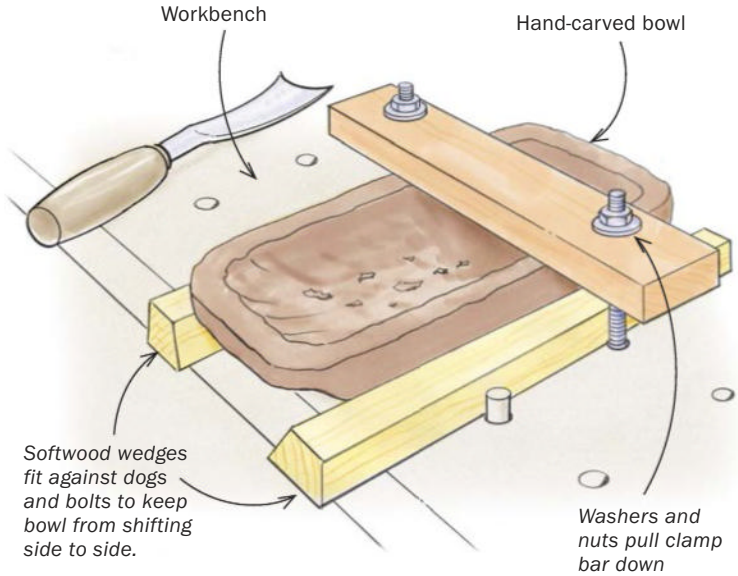


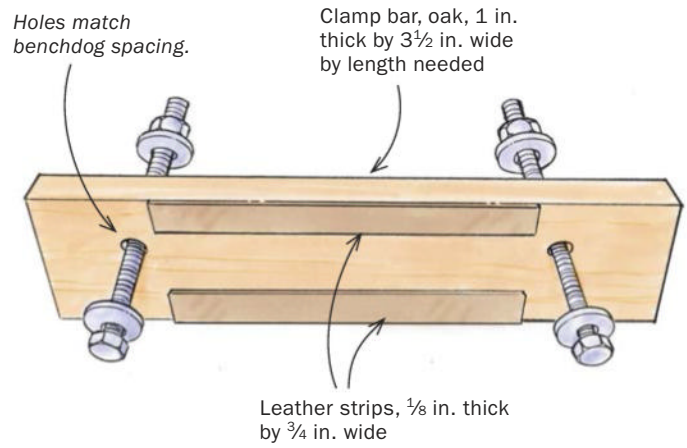
Quick Tip

Wax your Vix bits

Like many woodworkers, I use a self-centering, spring-loaded bit (Vix is a popular brand) to drill pilot holes for hinge screws and other hardware. I've always been frustrated with how quickly these bits become packed with chips, which causes them to heat up and the spring-loaded section to jam. When I was waxing some screws before installing them, I realized that I could also wax the bit. I did it simply by drilling a hole in a block of paraffin wax. The bit's performance improved dramatically.

—JOSH HARRIS, Franklin, Ind.





Bowl-carving vise is simple and effective

For me, the trickiest part of making a hand-carved bowl is holding the workpiece steady. I don't carve bowls frequently enough to justify a specialized shave horse, so I improvised a simple benchtop bowl vise that works very well. I started with a length of oak and bored holes through it to match the spacing of my benchdogs, which is 12 in. Under the bar I applied two leather strips to protect the edges of the bowl and provide extra holding power. Glue, epoxy, or double-stick tape will hold them fast. Two ½-in.-dia. by 10-in.-long bolts come up through the benchtop to pull down the wood bar. I added washers to the bolt heads to keep them from getting stuck in the dog holes. I usually also place long pine wedges on both sides of the bowl to keep it from shifting side to side. This clamping setup is useful for holding other objects against the benchtop as well.

—JOSEPH M. CHALOVICH, Greenville, N.C.

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MAKERS CHALLENGE 2026

Meet our contest winners!

The Grizzly Makers Challenge invited woodworkers to share their projects and showcase personal craftsmanship and creative innovation.

1st PLACE WINNER

Trey DeWolf

Floral Table

$4,000 Grizzly gift certificate & featured article





Trey DeWolf's winning *Floral Table* features an intricate design inspired by nature and vaulted cathedral ceilings, created with traditional and hand-held woodworking tools. The project plays on the contrast of mahogany, walnut, and maple, and uses no straight lines for the ultimate challenge.

"A detailed and complex piece made to catch the hearts of novice woodworkers and inspire creativity." **- Shabir Balolia**

RUNNER-UP

Nicole Kazmierczak

Curiosity

$2,000 Grizzly gift certificate

The unique art of intarsia comes to life in this project that highlights colors from cherry, poplar, tree of heaven, and five other wood varieties to create the fox design. No dies, stains, or paints are used on individually hand-cut and shaped pieces.



Photography by Vikrant Tunious



"This piece shows the skill of the maker in working with the natural color of materials. I appreciate the craftsmanship in fitting all the parts together so well." - Phil Huber





Superior craftsmanship shines through as Trey checks smooth grain transitions by hand.

"The complexity of the joinery and the beauty of the patterns the intersecting curves create make this a truly stunning piece! I'd love to see the drawings and jigs that went into making this table base." - **Larissa Huff**

Photography by Eric Glenn

GMC 2026 JUDGE PANEL



Shiraz Balolia
Grizzly Industrial
Founder & CEO



Shabir Balolia
Grizzly Industrial
President & COO



Logan Wittmer
Editor-in-Chief,
Popular Woodworking &
Woodsmith Shop TV Host



Phil Huber
Woodsmith Shop
TV Host



Larissa Huff
Fine Woodworking
Contributor &
Content Creator

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POWER TOOLS

Festool Domino now available in a cordless version

I USED THE NEW BATTERY-POWERED DOMINO DFC 500 E-BASIC while leading the 12-week summer furniture intensive at the Center for Furniture Craftsmanship. If ever there was a place to put a tool through its paces, this was it! I put it in the hands of all sorts of makers—from newbies to professionals and everyone in between.

I bought a Domino back in 2010 and have considered it an important part of my kit ever since. Both the original and the new version create all the same predictable mortises, especially if you have the attachments (which the new one includes fewer of, sadly). We used it out of the box as is and loaded it onto some of the school's shopmade jigs. Some used it for carcase construction and framed miters, and others used it to join aprons to curved surfaces.

Perhaps the best upgrade is the more ergonomic D-handle, which is similar to the one found on the Domino XL.



More than a handle. *The D-handle, an obvious upgrade, provides a foot that makes the DFC 500 more stable when the base of the tool is used as a reference.*

Festool Cordless Domino DFC 500 E-Basic
$1,279
festoolusa.com





Locked in. *If you don't want to use them, the built-in reference pins retract into the base and lock in place.*

After using it for a bit, Noam Wise found that the new handle was more comfortable for repetitive mortising. And the handle adds a foot that makes the tool more stable when you're using the base as a reference. For Megan Remington, the new location of the on/off button was a game-changer. The original Domino switch made it easy to accidentally plunge into the workpiece as you were trying to turn it on, especially when the tool was in the vertical position. This issue is alleviated with the new switch.

David Rothstein appreciated that the alignment pins can be retracted on the fence, while Owain Harris and Adrian Ferrazzutti noticed the more robust vertical posts that the flip-down fence travels up and down on.

As for the battery, most users said it wasn't much of an upgrade, since you still have to be tethered to the vacuum to collect dust. And unless you have a newer Festool dust extractor with the Bluetooth module, you'll need to manually turn on the cordless Domino and the vacuum individually, which is more of a time suck than an upgrade. Of course, if you need to use the system off-grid on a jobsite, the battery setup is a winner.

Given how I work and my access to electricity, the battery-powered feature has more drawbacks than advantages for me. If Festool offered the same machine with all the new upgrades and a power cord, I would absolutely upgrade. If you don't already have a Domino and you're wondering which version to get, I think that newer upgrades on the cordless version outweigh the hassle of the battery.

—Libby Schrum is a lead instructor at the Center for Furniture Craftsmanship.



A tail as old as time. *You'll always want a dust extractor hooked up to the DFC 500 and have its hose to contend with. That made the lack of a cord on the new Festool seem like less of a boon to Schrum and Co.*

Photo this page, bottom right: Libby Schrum. Other photos this page: Ben Strano. Photos facing page: Ben Strano (bottom); courtesy of the manufacturers (top).

■ ACCESSORIES

Wider baseplate adds stability to cordless trim routers

THE PROLIFERATION OF CORDLESS TRIM ROUTERS HAS BEEN SURPRISING TO ME. One downside of just about every cordless trim router I have found is that the addition of the battery generally makes the tool more top-heavy than its corded version.

The Kreg Trim Router Base Plate is a welcome and affordable addition to one of my most-used tools. The wider base and sturdy handle can compensate for a top-heavy tool and make it far easier to rout with confidence.

The baseplate worked well with both my Ryobi and Makita routers, but the mounting put the adjusters of my Makita right where I wanted to hold the tool while in use.

—Ben Strano is the former editor of FineWoodworking.com.



Kreg Trim Router Base Plate
$25
kregtool.com

■ TOOL NEWS

New tools at IWF point to the future of woodworking



AT IWF IN AUGUST, SAWSTOP REVEALED A 14-IN. PROFESSIONAL BANDSAW that is equipped with the company's new Sensic active safety technology. The bandsaw safety cartridge operates on a "cut and capture" method. The instant the blade senses skin contact, the cartridge slices through the bandsaw blade and clamps down, thus stopping the blade within a fraction of a millisecond. In addition to the active safety technology, the saw features an e-brake that stops the blade within two seconds of intentionally turning off the saw. No foot brake is required.



Harvey made some waves this year at IWF with the release of a new table saw that features contactless safety detection. This saw has integral sensors that create a "force field" around the blade. If they sense skin, even without contact, the blade will immediately drop into the body of the saw. The blade drop does not damage the sawblade or require any component replacements.

Both of these tools are currently slated for a 2027 release.

—Bridgid Gruber is the associate editor of FineWoodworking.com.



Can't hide in the shadows. *The SawStop bandsaw has an integral light, mounted just above the guides, that brings high visibility to the workpiece.*



Big reveal. *Harvey's booth was filled with IWF attendees lined up to test the Dream Saw's force-field-activated safety system.*

MARKING AND MEASURING

The best marking tools for dark wood

RECENTLY A FRIEND GAVE ME A SILVER PENCIL and declared that it's the best tool for marking up dark wood. It got me wondering if this were really true. I decided to gather the different pens and pencils people have told me they use and to test them on walnut, a domestic hardwood we all know and love, and katalox, a much darker wood often called "Mexican ebony."

I've been testing pencils on dark woods for over a year now and have concluded that these three pencils and one pen are worth trying if you find yourself working with dark wood.

Next time you're in an art supply store, pick up a few colored pencils and try them out. A few dollars could easily make your shop time more enjoyable when you're working with dark wood. If you're into feature-rich gadgety writing implements, the line of Pica pencils is worth a look next time you're at a woodworking supply store.

—*B. S.*



Pica-Dry automatic
$18 each
White lead refill pack
$13
woodcraft.com

Sakura Gelly Roll white pen
$2 each
michaels.com

Prismacolor Premier silver
Premier ultramarine
$2 each
michaels.com

Pica-Dry automatic
The first time I tested pencils (see "The Best Pencils for Marking on Dark Wood" at FineWoodworking.com), I had quite a few responses from folks telling me I had missed their favorite option: the Pica-Dry automatic pencil with yellow or white lead refills. To my eyes, the white was more visible than the yellow, but I've heard many say the yellow is their go-to color. The form factor is hard to ignore. Some folks love it, and some don't. The sheath (not shown) makes it a fantastic option if you're apt to keep a pencil in your pocket or apron. Lastly, the sharpener built into the sheath keeps you ready to go, but you're going to need it because the white and yellow leads are both very soft. By feel, they compare more to a grease pencil than the others.

Sakura Gelly Roll pen, white
If you need a truly fine line, get a Gelly Roll pen. I bought a three-pack with a variety of line widths and have used them often. My go-to has been the 0.5mm pen, which makes a nice, crisp line that is perfect for marking out precise joinery.

Prismacolor Premier silver
The Prismacolor Premier silver was a standout. The lead was harder than that in the other silver pencils I tried, which allowed for a finer line. The reflectivity was also the best. If I had to pick one pencil to have in my toolbox for use on dark woods, this would be it.

Prismacolor Premier ultramarine
While barely visible from a distance, the line made by this Prismacolor Premier ultramarine pencil popped when I looked at it up close. This pencil's line was by far the most intense and easiest to see when focusing—like during a bandsaw cut.

Photo: Ben Strano

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BRIWAX Hard Wax Oil brings out the natural beauty of the wood and makes wood colors become richer and warmer.

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Big-shop woodworker sets up a small shop at home

BY NEAL WALDEN

Photos: Jonathan Binzen

For 25 years I've been running a busy architectural millwork and cabinet shop. I'm involved with woodworking every day, but you won't find me at the bench very often; my workspace is the office. I was inspired to create this little shop at home when I started worrying that the pressure of my day job would spoil the thing that I loved—the whole creative process of hands-on woodworking. I think I timed it just right.

Fixing the space

My home shop is 247 sq. ft., a slightly oversize single-car garage. The garage was pretty derelict when I bought the house. The roof was sagging, so I raised the ridge beam with three car jacks, bumping it up ¼ in. at a time over several weeks. With some creative bending, I managed to slip in new LVL horizontal truss chords. The open trusses proved convenient for running ductwork for my dust collector out of the way. I used Nordfab dust collection pipe, which snaps together like Legos and is infinitely reconfigurable. I also sometimes use the open trusses for overhead lumber storage.

There was no underroof insulation, so I installed 3½-in. rigid foam panels. I paneled the interior with ½-in. plywood and drywalled over it, giving me the finish I wanted along with ease of attachment for items to be hung on the walls.

Not knowing exactly where light would be needed before I had the space fully set up, I had an electrician install some switched outlets on the ceiling; these permitted me to add light fixtures once the space was truly occupied.

The kingpin machine

The centerpiece of my shop's machinery is a 1990's-era Robland X31. When I was starting out in the 1980s, working alone in a small space, I relied on a Makita jointer/planer and then later a Robland combination machine. As the business grew and I acquired employees and dedicated machines that duplicated the



Storage solutions. *A step or two from Walden's Robland combination machine hangs a custom cabinet holding an array of Robland accessories. Beside it is a panel of F-clamps, and to the right of that is a hardware chest whose drawers pull right out.*



Roblandia. *A 1990s-era Robland X31, which combines five powerful machines in a compact package, gives a small shop great versatility. Here, Walden rips a board on the Robland's sliding table saw.*

Robland's functionality, I sold it, a little reluctantly. But when I thought about the size of my new shop and the great versatility of that machine, I bought another. Incorporating a sliding table saw, a 12-in. jointer and planer, a 1¼-in. shaper, and a horizontal mortiser, all of them robust and built to exacting standards, the Robland gives me great capacity without a large footprint.

I designed a custom base for the machine that permits it to roll around or to spin in place if extra infeed or outfeed is required. The German company Aigner makes really useful stock-support tables, and I created brackets for the ends of the table saw and jointer tables to attach extended supports when needed. I also added a 90° stop on the jointer fence and a zero-clearance insert for the table saw.

All five of the machine's functions work well. As with all combination machines, there is a time factor in reconfiguring the Robland from one function to another, but it is not onerous. I've found the horizontal mortiser excellent for mortising, of course, but it is also quite handy when I have lots of dowel holes to



Jointing station. *A 12-in. jointer is a rarity in a small shop, but the Robland has one. Without much fuss, the table-saw fence makes way for the jointer fence.*



Robland makes like a Murphy. *The hinged jointer beds swing upward, and a dust collection hood flips up to convert from jointer to 12-in. planer mode.*



The boring is exciting. *With the jointer beds back in place, Walden has attached the X-Y table for the Robland's horizontal mortiser. When it's not in use, the table hangs on a dedicated rack on the wall.*



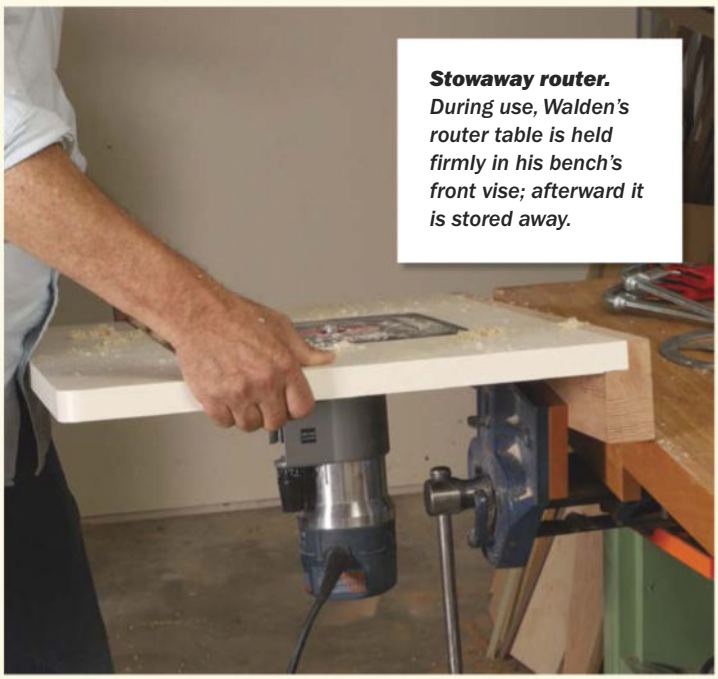
Tool 5—the shaper. *Tucked in beside the table saw is the Robland's professional-duty 1¼-in. shaper, which has a split fence and a series of concentric inserts for use with cutters of various-sizes.*

drill. The shaper is quite smooth and has a quality fence system. I use it for many things: rabbets, door making, and more.

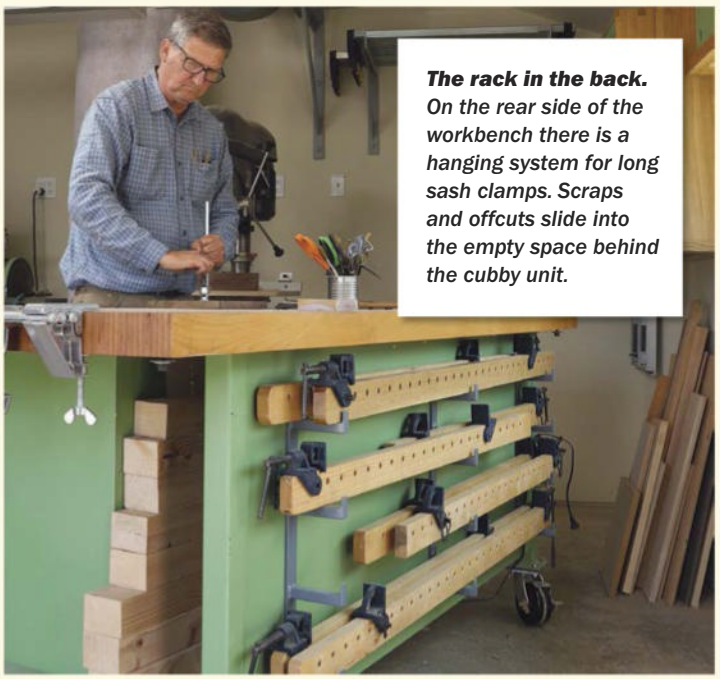
My other stationary machines include a restored pre-1965 Delta 14-in. bandsaw; a Magnum drill press with a ⅝-in. chuck that is a direct copy of a machine in the old General line of tools from Canada; and a U.S.-made Conquest disk-and-belt sander. All roll on custom mobile bases.

I travel fairly widely to shows as I scout out industrial-scale machinery for my company, and I always take note of the smaller tools and equipment as well. Along the way I've picked up a spectrum of interesting clamps. Heavy bar clamps from the German company Richa hang on brackets above my bandsaw, sparing space while leaving the walls clear. On the back of my workbench you'll find a collection of old-fashioned wooden sash clamps made in India by Groz. I have a small collection of American-made Kant Twist clamps, a scissor-action device made to improve on C-clamps, whose tightening screw can twist the workpiece. To store my F-clamps I have a wall-hung panel that

Hybrid workbench. *Walden had a welder build the tubular steel frame for his workbench, which houses a plywood cubby unit designed to store power tools. The benchtop is an industrial counter material made from laminated strips of beech veneer. The seat of the swing-out stool is made from the same stuff.*



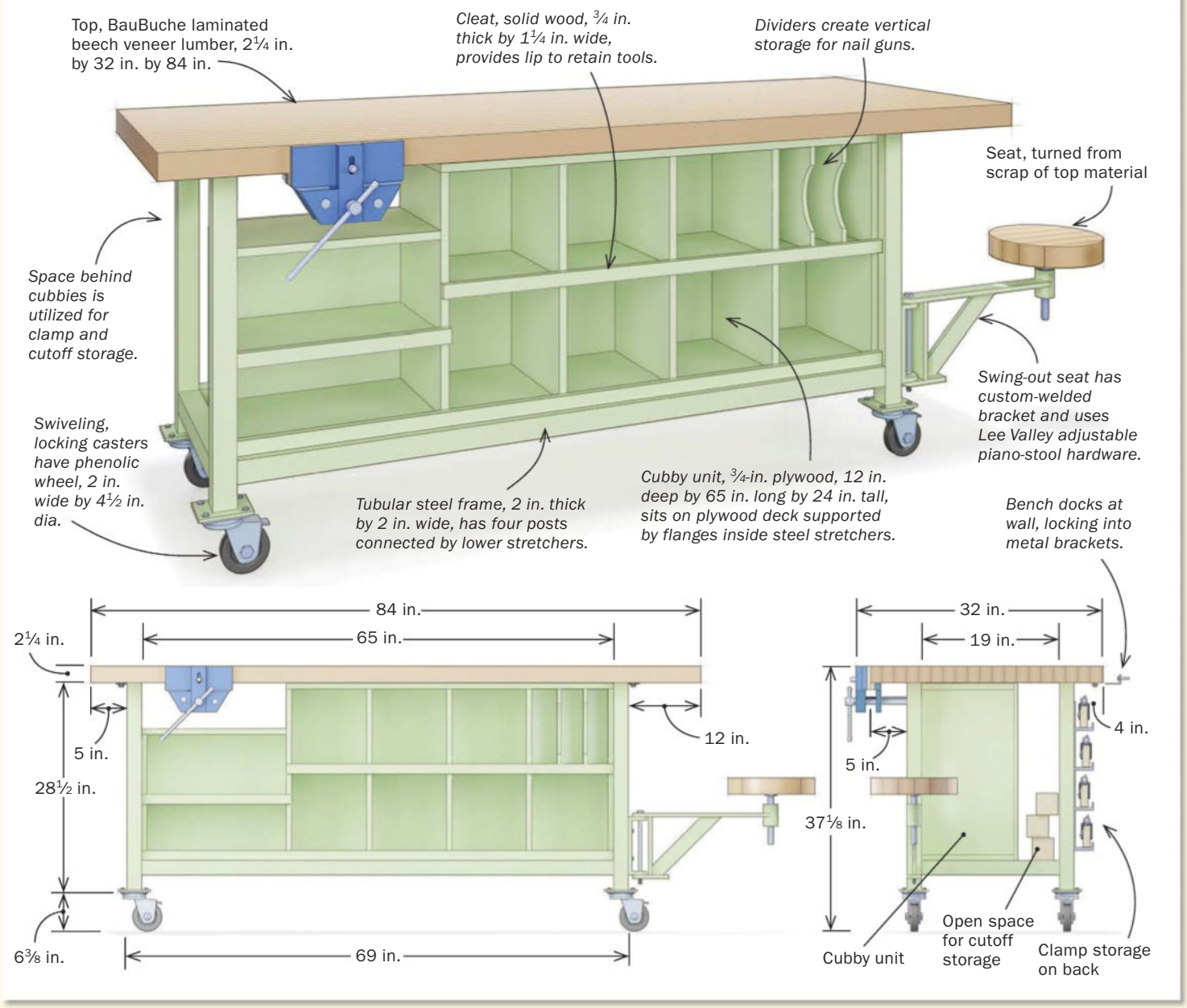
Stowaway router. *During use, Walden's router table is held firmly in his bench's front vise; afterward it is stored away.*



The rack in the back. *On the rear side of the workbench there is a hanging system for long sash clamps. Scraps and offcuts slide into the empty space behind the cubby unit.*

Drawings: Dan Thornton

HYBRID WORKBENCH WITH A STEEL FRAME AND POWER TOOL STORAGE



holds a great many in a compact vertical footprint. Testing their tipping angle permitted me to design and place metal supports so the clamps stay organized.

A hybrid workbench

For years before I designed my workbench I pored over articles and nearly memorized Scott Landis's *The Workbench Book*. Looking with envy at all the beautiful European-style workbenches, I was struck by the realization that this type of bench would take an epic amount of time to make.

I thought long and hard about what type of workbench I would want to build. I like to use hand tools in my woodworking, but I'll readily grab any number of power tools to accomplish a task. I knew I wanted a wall-hung cabinet for hand tools, so I set about designing a bench that could accommodate power tool storage and had other features that would make my woodworking easier.

Wanting a bench as robust as traditional wooden ones but simpler and quicker to build, I decided on a hybrid design. I had a welder fabricate the structure—four heavy tubular steel posts connected near the bottom by steel stretchers. A plywood deck would sit on brackets inside the stretchers, and I would build a plywood cubby unit for power tool storage that would slide right in between the legs. Rather than gluing up a traditional top from thick planks, I purchased some BauBuche, a German-made countertop material composed of laminated beech veneer. You can think of it as a furniture-grade version of LVL (laminated veneer lumber), which is widely used in buildings. I like being able to clamp things to the workbench top, so I designed deep unobstructed overhangs on all four sides.



Planes designed the hand tool cabinet. *The workbench stores power tools, but hand tools are also an arm's length away. The cabinet door holds Walden's hand planes. With the door open, the case bottom provides a temporary landing spot for tools in use on the bench.*

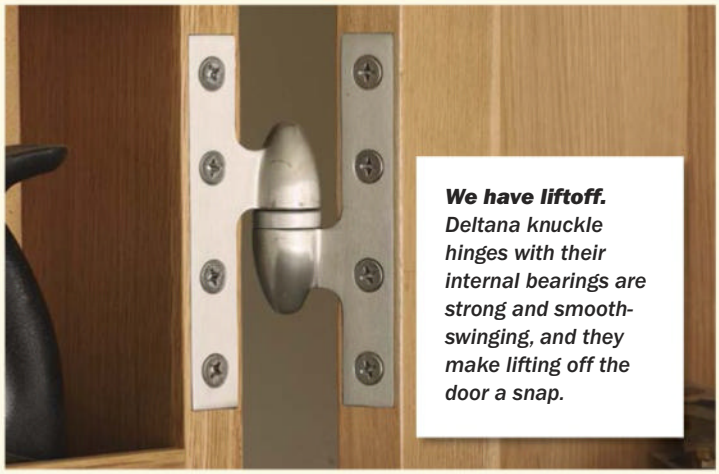




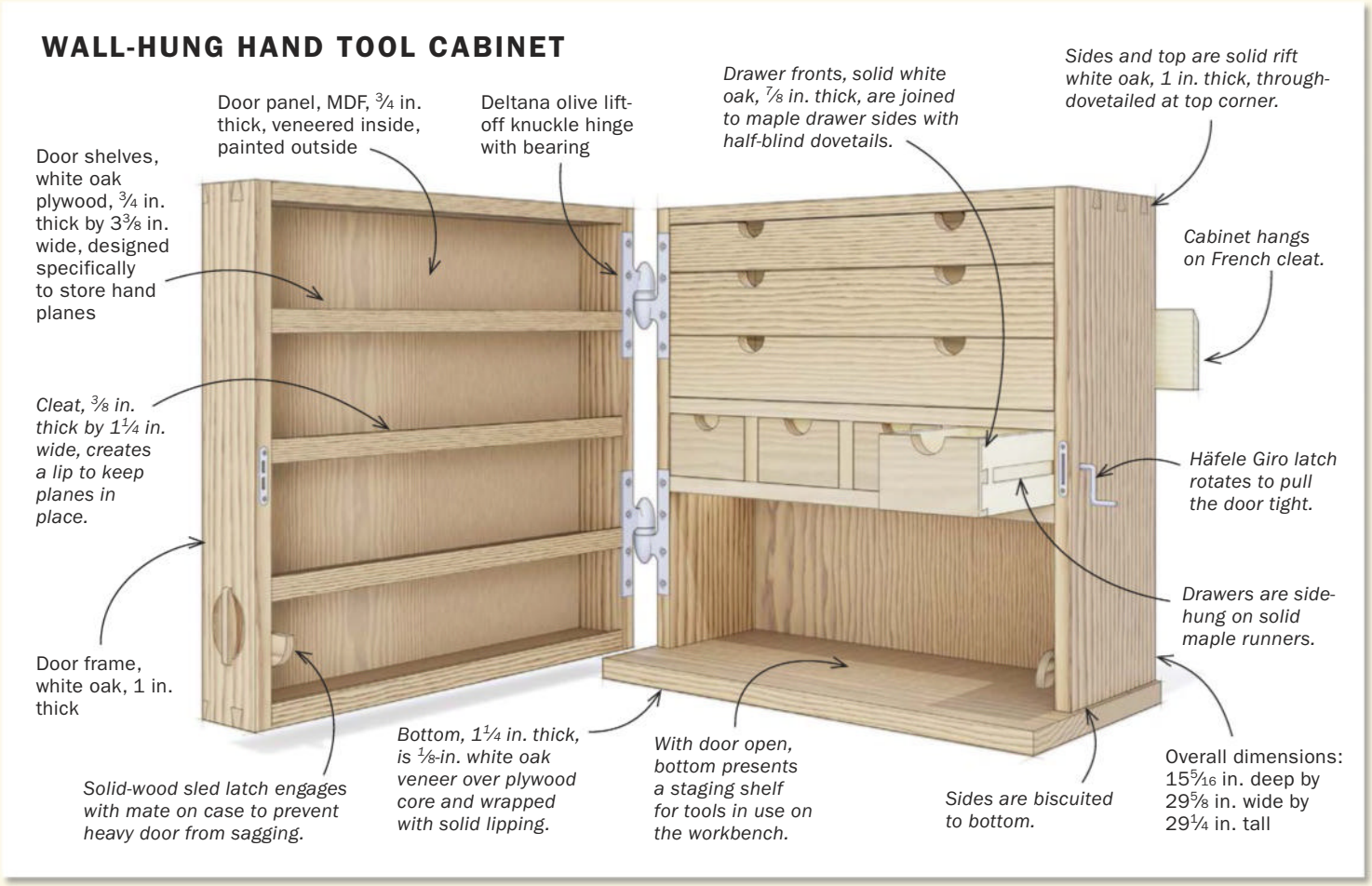
Chisels chock-a-block. *For one drawer of the hand tool cabinet, Walden built trays to fit his set of Swedish Bahco chisels.*



Attractive opening. *The pull, made by dishing the solid white-oak door frame with a router, draws the hand and the eye.*



We have liftoff. *Deltana knuckle hinges with their internal bearings are strong and smooth-swinging, and they make lifting off the door a snap.*



I designed the cubby unit with a space at the top left to allow room for a Record face vise mounted to the front edge of the benchtop. The cubby unit is 12 in. deep, and a useful dividend of the design is a gap behind it that turns out to be a good space for storing offcuts and more, which keeps my shop tidy.

Lastly, I designed a swing-out stool for the bench, using a mechanism from Lee Valley for an adjustable piano stool. A substantial overhang at the right of the bench gives me knee space when I'm seated to do work. The stool tucks out of the way when not needed.

Heavy-duty casters permit the bench to roll when I need to access the back or use the bench as an island. For stability in its home position, the bench docks into metal brackets affixed to the wall framing. These prevent any rolling under heavy work, and they unfasten easily when I need to move the bench.

Wall-hung toolbox for hand tools

Shortly after becoming a cabinetmaker, I built a rolling tool box that was all drawers, with many fitted details for organizing tools. On balance it worked OK, but I found it tedious bending to return each tool, and my hand planes were buried under layers of fitted trays. This is the weakness of many tool-box designs that are at first appealing, then become torture to use.

When I was planning my new wall-hung tool cabinet, I started by placing my hand-plane collection on the workbench, laying the planes out with scraps of wood between the rows as spacers. Since I intended to store all the planes in the cabinet's door, this exercise determined the door's size. And I designed the carcase to match those height and width dimensions.

The door swings on olive knuckle hinges by Deltana that, besides being extremely smooth-swinging and strong, are a lift-off design, so the door can be removed in a moment if I need to move the cabinet. The back of the case is inset ¾ in., permitting a substantial French-cleat hanging system.

The case bottom extends out beneath the door, creating an open area when the door is open that is really useful for staging tools as you work at the bench. My previous tool box had no such landing zone, so whatever tools I was working with either had to be tediously put away or were left on the benchtop, creating chaos there.

The unique pull on the edge of the door was made with a router and jig. The router was suspended in a frame so it could swing like a bell, cutting a straight divot out of the wood. But the frame could also be rotated incrementally, resulting in the router cutting a complete circular dish. A small block of wood mortised into the dish provides the fingertip engagement. The door closes with a Giro latch from Häfele, which is perfect for this application, as it rotates and grabs the strike, cinching it tight to the parent case.

Neal Walden works wood in Santa Rosa, Calif.

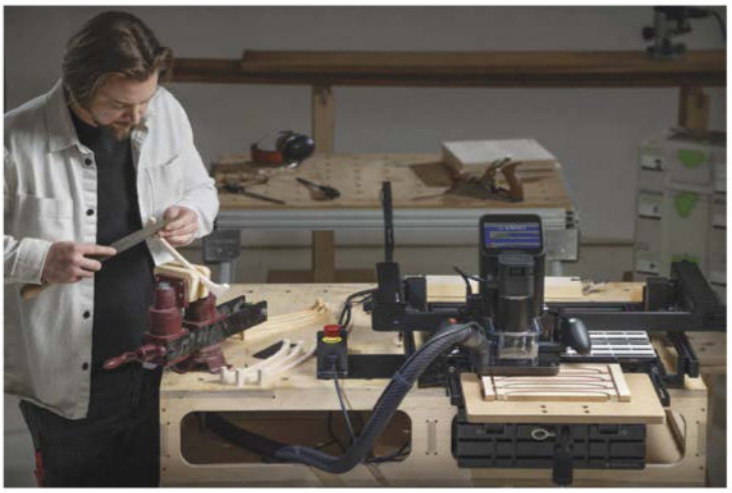
On the Horizon

A selection of some of the best new tools on the market.

Go Hands-Free, Stay Hands-On

The world's first handheld CNC router now has a hands-free mode. Like autopilot for Shaper Origin, simply clip Origin into BenchPilot to turn it into a hands-free milling machine, capable of vertical or horizontal cutting. Let BenchPilot drive Origin so you can focus on other tasks at hand. Then simply unclip Origin to take it where you need it and cut at virtually any scale. There's no computer programming required and no complicated software to learn.

SHAPER





POWERMATIC

Powermatic Planer

Powermatic's 209BHH stationary thickness planer delivers serious capacity for demanding shops. Its 5 HP, 230V motor drives a 20-in. cutting width and 8-in. thickness capacity through wide panels and dense hardwoods with ease. A four-row helical cutterhead with 68 carbide inserts spins at 5,200 RPM for smooth, low-tearout finishes, while a digital readout and dual-feed speeds (16/28 FPM) dial in precision or throughput. Backed by a five-year warranty and Gold-Glove Service.



Powermatic Benchtop Lathe

Powermatic's PM2014B brings Gold Standard performance to the benchtop. This 14-in. by 20-in. variable-speed lathe pairs a 1 HP inverter-driven VFD motor with three selectable speed ranges from 15 to 3,600 RPM for everything from aggressive roughing to fine finish work. A rigid cast-iron bed, headstock, and tailstock minimize vibration, while the sliding headstock enables outboard turning. Expandable with a bed extension and adjustable stand, and backed by a five-year warranty and Gold-Glove Service.



Grizzly Open-End Wide-Belt Sanders

Take the efficiency of production-grade sanding and bring it directly to your shop without giving up valuable floor space. Designed for woodworkers who demand flawless finishes on panels, cabinet doors, and wide glue-ups, the Grizzly G0415 and G0416 Open-End Wide-Belt Sanders deliver uncompromised consistency and speed. The open-end design allows you to double your sanding capacity by running wide workpieces through in two smooth passes. Both models feature digital readouts for fast, precise table-height adjustments, a variable-speed conveyor to match your stock and feed rate, and smart load-sensing technology that automatically prevents overloads. An advanced internal plenum chamber ensures balanced, high-efficiency dust collection right at the source, keeping your air clear and your abrasive belts performing at their peak. Equipped with internal LED lighting, a convenient viewing window, and an integrated mobile stand, these sanders offer a heavy-duty, professional-grade solution built for expanding workshops.

Grizzly PRO Tool Cabinets

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Transform your shop into a high-efficiency workspace with the Grizzly PRO Series Tool Cabinets. Available in 61-in., 72-in., and 96-in. configurations, these heavy-duty mobile workstations combine massive, organized storage with built-in power to keep your tools protected, charged, and always within reach. Constructed from rugged steel with a sleek, black, powder-coated finish and signature green anodized aluminum pulls, each cabinet is topped with a gorgeous UV-coated Hevea butcher-block work surface ideal for project assembly, repairs, and layout. Full-extension ball-bearing drawers featuring protective EVA liners open effortlessly even under heavy loads, while deep bottom drawers easily accommodate large power tools. An integrated power strip equipped with 110V outlets and USB ports allows you to charge tool batteries right where you work. Supported by heavy-duty locking casters and secured with a single key system, these tool cabinets offer the ultimate blend of mobility, capacity, and modern convenience.





KNEW CONCEPTS

Knew Concepts Marquetry Saw

Knew Concepts introduces a new member of its family of modular marquetry saws. After many requests, we listened and have introduced a new, larger 12-in. version of our modular marquetry saw. The increased depth lets you handle larger projects and reach deep into panels for precision cuts a scrollsaw just can't handle. For those who need even more depth, there's always the Lee Marshall edition marquetry saw, which starts at 12 in. and goes all the way out to 24 in. of unequaled control.

With either version, a tilting guide tower, precision ball bearings, and a counterweight system keep the blade cutting at exactly the angle you want, without the weight of the saw getting in the way. It lets you pay attention to the cut, not the saw. Go to knewconcepts.shop/products/modular-marquetry-saw to order.

Choosing a Backsaw

Which to buy first, second, and third, and why

BY MARK HARRELL

Buy backsaws in this order

While most woodworkers start with a backsaw designed specifically for dovetailing, Harrell suggests they save that one for last.



1. CARCASE



Carcase saws can do it all. *A 14-in.-long carcase saw, with the teeth filed "hybrid" for ripping and crosscutting, will handle everything from basic crosscuts to dovetails, tenons, rabbets, dadoes, and more.*

Photos: Asa Christiana

While some woodworkers prefer to use Japanese-style handsaws, which cut on the pull stroke, others prefer Western-style saws, which cut on the push. Because a push cut puts the blade in compression, Western saws need thicker blade plates to prevent them from buckling, and they often add a spine, or sawback, to increase stiffness further.

Their beefier build makes Western-style saws pricier, but it also makes them much easier to sharpen. Most woodworkers who use Japanese sawblades simply replace them when they become dull, while users of Western-style "backsaws" can maintain their blades for life. This means that you can find very good backsaws on the used market and restore them to their former glory. See my article in last year's *Tools & Shops* on rehabbing and maintaining a vintage-style backsaw (*FWW* #320), as well as my earlier step-by-step sharpening guide (Handwork, *FWW* #250), for everything you need to know.

The advice in those articles holds true for both new and vintage backsaws, as does my advice in this article on choosing the right Western-style backsaws for your needs.

I'm the founder and former owner of Bad Axe Tool Works, a manufacturer of high-quality Western-style backsaws. In that role I helped thousands of customers navigate the world of traditional handsaws. After retiring and selling the company to its employees in 2022, I started a part-time business repairing vintage saws and teaching saw-maintenance seminars. I've learned a lot about matching makers with saws.

There are quite a few different handsaws in manufacturers' lineups, and the choices can be overwhelming. For a variety of reasons, users tend to go with a dedicated dovetail saw as their first backsaw. This is a mistake, in my opinion.

Cutting tight dovetails is a skill that comes later in the journeys of most woodworkers, after they've mastered a variety of more



2. TENON



Buy a tenon saw for bigger cuts. *For deeper, wider cuts on larger workpieces—for a workbench build, for example—you want a 16- or 18-in.-long tenon saw. It makes a great miter saw too.*



3. DOVETAIL

The dovetail saw is a specialist. *Wait to buy a dedicated dovetail saw until you have mastered the hand-cut dovetail and are ready to assemble all of your drawer boxes that way.*

Anatomy of a backsaw

As you dive deeper into each of the three recommended saws, it's helpful to understand the basic characteristics of a Western-style handsaw and how they contribute to the saw's performance.

PLATE THICKNESS VS. POINTS PER INCH (PPI)

All of these specs except those in the last column are for backsaws, which are the saws used most often for joinery cuts. As blade plates get thicker, teeth get coarser, helping these saws to remove sawdust and generate less friction in deep cuts, and to dissipate the heat those cuts produce.

CATEGORY	DELICATE	THIN	SLIM	REGULAR	THICK
Plate thickness*	0.015 in.	0.018 in.	0.020 in.	0.025 in.	0.032 in.
Points (teeth) per inch (ppi)	15 to 17	14 to 16	13 to 14	10 to 12	9 to 10
Cut depth/ width	Up to ½ in.	Up to 1½ in.	Up to 3 in.	Up to 4 in.	Over 4 in.
Saw types	Fine dovetail saws	All-purpose dovetail saws, carcase saws	Carcase saws, tenon saws	Tenon saws	Timber-framing saws, panel saws

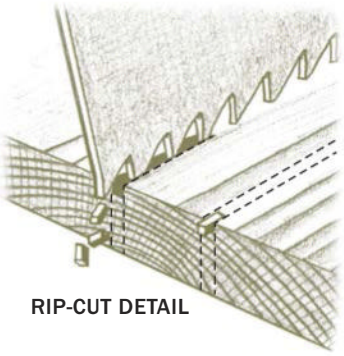
*These are average measurements, not necessarily exact numbers.

RIP VS. CROSSCUT SHARPENING

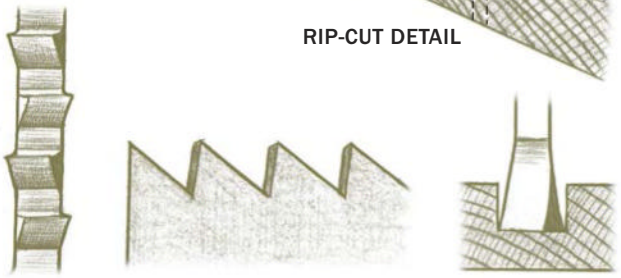
Saws can be sharpened (filed) for rip cuts, crosscuts, or a combination of both (hybrid).

RIP-FILED TEETH

Cutting edges face forward. This helps teeth remove material efficiently but can cause significant chipout on crosscuts. Chipout isn't a problem with rip cuts, which are in line with the grain.



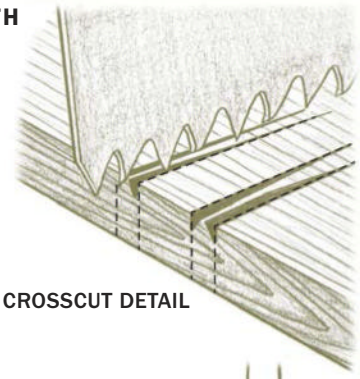
RIP-CUT DETAIL



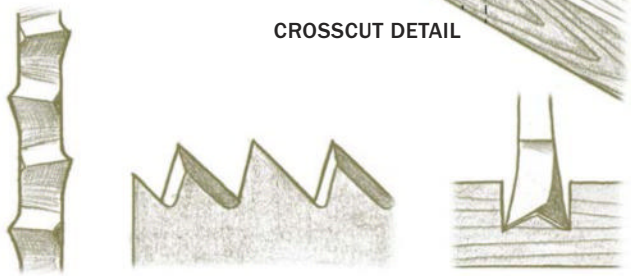
TOP VIEW SIDE VIEW FRONT VIEW

CROSSCUT-FILED TEETH

Cutting edges are angled sideways, helping them sever fibers cleanly when cutting across them, reducing chipout on back edges of cuts. But material is removed relatively slowly.



CROSSCUT DETAIL



TOP VIEW SIDE VIEW FRONT VIEW

HYBRID IS THE MOST VERSATILE

Hybrid-filed teeth are angled a bit less acutely, which helps them remove material relatively efficiently on all types of cuts while still preventing chipout when cutting across the grain.





Drawings: John Tetreault

basic hand-tool tasks. Therefore, most users will derive more value from a larger, more versatile backsaw—one that can cut dovetails and much more. That is the carcase saw, which stays on my bench for about 75% of my cutting requirements. After that I recommend a tenon saw, and—finally—the dedicated dovetail saw that most folks start out with.

Start with a long, hybrid-filed carcase saw

A carcase saw is sizable enough to handle large crosscuts and big miters, yet it is refined enough for fine joinery cuts. It's the workhorse of the backsaw arsenal. Hybrid-filed teeth cut beautifully across the grain, and they rip quite efficiently as well.

To make your carcase saw as versatile as possible, look for a longish one that has a relatively thin blade. A longer saw allows you to lengthen your cutting strokes, which will help you cut straighter, and it also distributes wear along the toothline, keeping the teeth sharper for longer.

A number of saw makers—including Bad Axe, Lie-Nielsen, and a few smaller operations—offer a 14-in. saw (with the specs cited at right) rather than the usual 12-in. model.

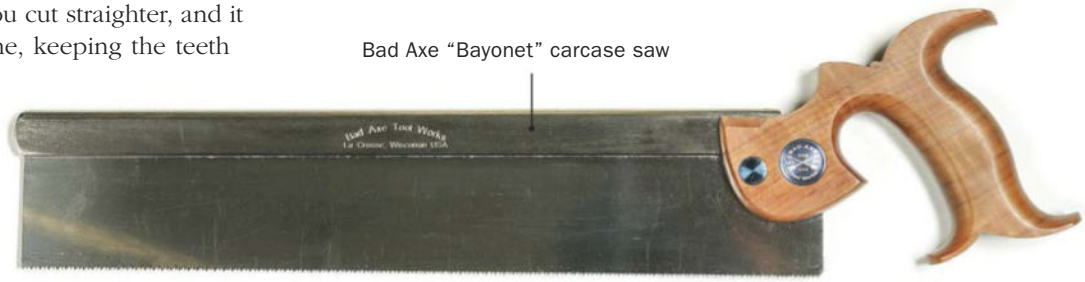
Buy a large tenon saw next

That brings us to the tenon saw, which is designed to cut deep, long, accurate tenons, dadoes, rabbets, and miters. There are 14-,

1. Carcase saw

Whether you buy a new or vintage carcase saw, here's what to look for, as well as a few examples of what this versatile tool can do. I recommend hybrid sharpening, but you can do this yourself, so the teeth don't have to be filed this way to start.





What to look for. *Go for a 14-in.-long saw with a 0.018- to 0.020-in.-thick, 13- or 14-ppi blade, filed in a hybrid pattern. There are quite a number of new and used saws with these specs.*







Good for almost everything. *This saw can make basic crosscuts, rip cuts, and miter cuts, and it can handle most of the joinery you'll cut, from dovetails and tenons to rabbets, dadoes, and more.*

2. Tenon saw

The tenon saw is a larger version of the carcase saw, with a thicker plate and slightly coarser teeth, helping it make deeper, wider cuts on larger workpieces. For best results on both rip cuts and crosscuts, the teeth should have the same hybrid filing pattern as your carcase saw.





What to look for. *Go for a 16- or 18-in.-long model (these might be called sash, tenon, or miter saws) with a 0.025- to 0.032-in.-thick, 11-ppi blade, filed hybrid. New saws might be filed for ripping, but you can change that when you resharpen the blade.*

16-, and 18-in. options here, with some of them called carcase, sash, or miter saws. Don't get caught up in the names. What you're after is a larger saw with a thicker plate.

I recommend an 18-in. model. It does everything the shorter versions do but also cuts deeper and wider—say, for a big hefty project like a workbench. I've used my 18-in. saw to cut tenons as large as 5 in. wide and 4 in. deep.

When to buy a dedicated dovetail saw

Your hybrid-filed carcase saw will cut dovetails in all sizes. When you have managed to cut several stacks of tight dovetails with your carcase saw and are prepared to start dovetailing all of your drawer boxes by hand, you are ready for a dedicated dovetail saw. I recommend one filed for rip cuts, as the majority of dovetail cuts run parallel to the grain, where rip filing will work more efficiently than hybrid filing.



Deep cuts. *The tenon saw specializes in deeper, longer cuts. Harrell uses his for cutting larger tenons, rabbets, and dadoes, and for cutting large miters with the help of his Stanley No. 150 miter box (see below).*





If you can find a 12-in.-long model, grab it. A 0.018-in.-thick plate, filed at 15 ppi, will deliver elegant pins and tails but still offer enough of a heat sink to handle long dovetailing sessions in stock as thick as 5/4.

Making sense of saw specs

As blades get thicker, the spacing of their teeth, known as pitch and expressed as points per inch (ppi) or teeth per inch (tpi), becomes coarser. That's because a deeper, wider cut generates more sawdust, and you need larger gullets between the teeth to carry that waste away efficiently. If you try to make these types of cuts with a finer blade, the gullets will pack with dust, the blade will cut less efficiently, and it will heat up. Unable to dissipate that heat effectively, the thinner blade plate is likely to buckle and to drift in the cut.

But you don't want to use a thick, coarse blade for fine cuts in thinner stock. A thinner, finer blade is easier to use in those situations and will be less prone to blowout at the far end of the cut.

The sharpening profile matters too. A handsaw's teeth can be filed in a number of ways to make them a little better at ripping with the grain, cutting across it, or doing both relatively well. You can learn to sharpen your own handsaws, as I demonstrated in *FWW* #250, so you can change the filing pattern on any saw you buy. A handsaw-sharpening pro can do the same thing for you.

If you think of the teeth as a row of chisels, a blade filed specifically for rip cuts has its little chisels facing forward. A rip cut runs parallel to the wood fibers, and the forward-facing teeth scoop out those fibers very efficiently.

When the cut goes across the fibers, however, blowout is more of an issue at the back and bottom edges of the cut. So saw sharpeners turn those little chisels slightly sideways—with that angle referred to as "fleam" or "bevel"—to sever the fibers cleanly on both sides of the kerf.

As those chisels start to turn sideways, however, the saw becomes less efficient at scooping out material. So a saw sharpened purely for crosscutting requires a lot more strokes to cut as deep. It's also a bit less accurate and dulls more quickly.

Fortunately, it doesn't take much side angle to prevent blowout. Therefore, I recommend a hybrid sharpening approach—with the side angles landing somewhere between rip and crosscut—for most saws. This balances clean cuts and efficient stock removal perfectly for most tasks. I've therefore come to believe that pure crosscut filing isn't worth the loss of efficiency.

As for rip-filed teeth, I recommend those only for the dedicated dovetail saw.

Although there are plenty of other backsaw models out there, the three mentioned here are the most valuable for fine woodworkers. If you are just starting out, follow the sequence outlined here as you grow into the craft. If you already own a backsaw or two, this article will help you decide what to buy next. □

The former owner of Bad Axe Tool Works, Mark Harrell now repairs vintage saws and teaches saw-maintenance seminars. To learn more, go to SawSharp.com or visit his YouTube channel @sawsharp6.

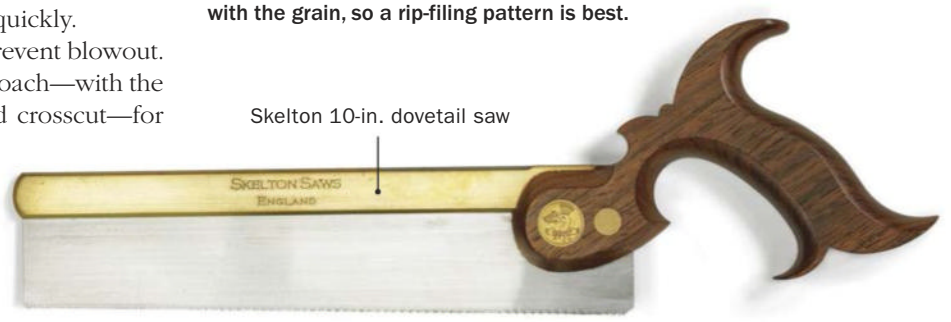




Compact and easy to control. *The thinner blade and finer pitch of a dovetail saw work better in thinner stock (above) and provide excellent control when cutting half-blind dovetails (left). And the rip-filed teeth cut more efficiently than hybrid-filed.*

3. Dovetail saw

When you are ready to start dovetailing on a regular basis, it's time for a dedicated dovetail saw. This saw will be making most of its cuts in line with the grain, so a rip-filing pattern is best.





What to look for. *Go for a 10- or 12-in.-long model, with a 0.018-in.-thick, 15-ppi blade, filed for rip cutting.*

Shop Cart Shines With Dead-Flat



Photos: Owen Madden

Torsion Top

This portable work surface is superb for vacuum veneering, assembly, and general woodworking

BY OWAIN HARRIS

A lot of my work involves veneering. From large dining tables to cabinet doors to more complex sculptural pieces, my daily workflow in the shop often revolves around the vacuum press. For years I made do with a makeshift rolling cart that had limited storage for my vacuum pump and many accessories. I was so tired of struggling to find the things I needed and of supplies spilling out onto the shop floor that I finally decided to design and construct a purpose-built cart to manage all my veneering supplies and provide a flat platform for pressing veneers.

Now that the new cart is built, I find it's excellent for veneer work, but for much more as well. Whether I'm assembling a cabinet, veneering a panel, or rolling a finished piece out the door, this cart has become a daily-use fixture in my shop.

Flat, convenient, affordable

When you're veneering a panel, it will take the shape of whatever it is pressed on, just like a bent lamination takes the shape of a bending form. I wanted to make sure my new cart's top was dead flat, and I decided the only option for a truly flat surface would be a torsion box: a grid of ribs and braces glued between top and bottom panels that inexpensively produces a light, perfectly rigid structure.

In the cart itself, I included a dedicated open cubby for the vacuum pump so I had easy access to adjust settings and clean out the filters regularly. And I added drawers to hold all my veneering odds and ends.

A cart with purpose

Vacuum veneering is an important part of Harris's workflow. From its rigid, dead-flat torsion-box top to open storage for a vacuum pump and drawers for accessories, each element of the cart is designed with veneering in mind.



A specific dimension. *This top is designed to fit the exact dimension of Harris's 4-ft. by 4-ft. vacuum bag, making his veneering process as seamless as possible with no wasted space.*



Clutter control. *Plywood drawers with quality slides keep veneering accessories in their place and off the bench, but still within arm's reach.*

I decided to use construction-grade lumber for the cart's frame components. Big-box stores usually have a "premium-grade" lumber that is perfect for shop fixtures. With judicious selecting you can assemble some nice material that is strong and easy to work with. I run the 2x4s over the jointer and quickly pass them through the planer to make sure they are flat and straight.

In the stack of sheet goods, I found ¾-in. radiata-pine plywood. It's less expensive than veneer-core cabinet-grade plywood, but flatter and easier to machine than run-of-the-mill construction sheet goods.

Start with the sides

For ease of assembly, I designed the cart as two frame-and-panel sides connected with stretchers. Each side is composed of two frames, one filled with a plywood panel and one left open to provide access to storage. Since I was leaving one panel out, the groove for the plywood panel stops midway on the rails.

I find the safest and most accurate way to cut stopped grooves is on the router table using a ¼-in. wing cutter buried in a sacrificial fence and with a stop block in place to start the cuts. I set the height of the cutter so the ¾-in. panel would sit flush to the inside edge of the 2x4 frame. Once the panel was cut to size, I created a tongue around the perimeter to fit into the groove using a dado stack in the table saw. With the wing cutter still set up, I also cut a ¼-in. groove on the interior face of the center stile to accept the rear divider.

With not too many joints to fight at once, gluing up the frame-and-panel sides was simple. While those pieces were drying, I moved on to the rest of the framework.

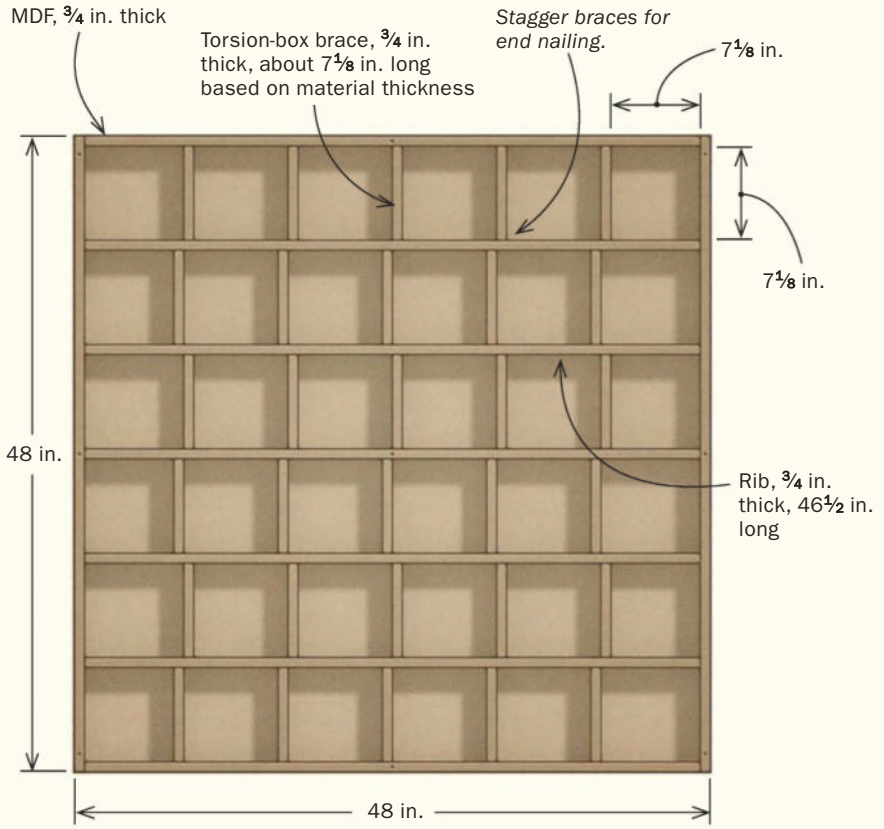
Stretchers and dividers

The bottom stretchers that connect the two side panels are rabbeted to accept the ¾-in. plywood bottom. With a dado stack on the table saw, I cut the rabbet along the length of the stretchers. I glued and screwed the bottom to the two stretchers using 1¼-in. screws, creating a nice platform on which to set the dividers.

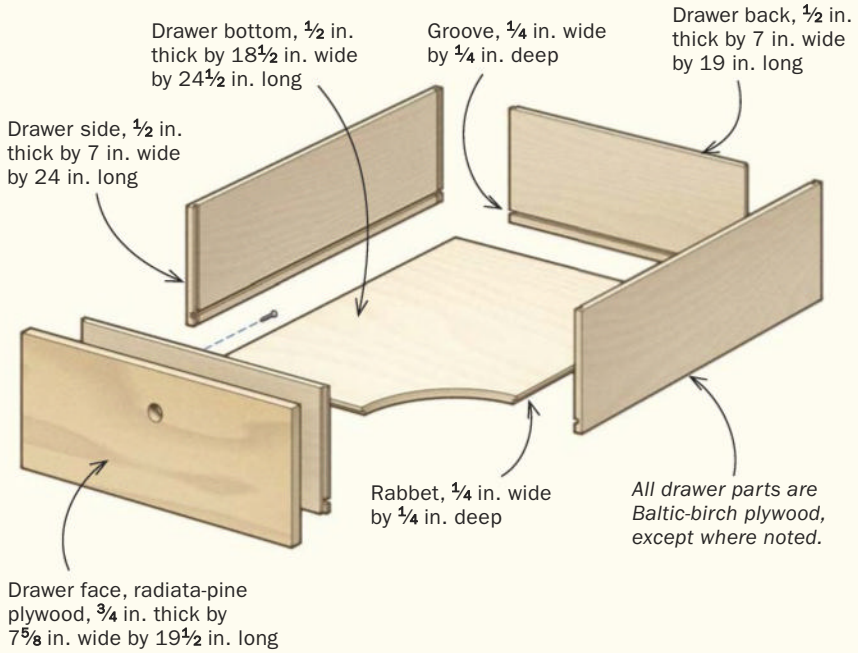
To connect the rear divider and the drawer divider to the bottom, I used 6mm Domino tenons for alignment and pocket screws to hold things tight. To simplify cutting the mortises, I laid the rear divider down onto the plywood bottom and, with some clamps holding it on the layout lines, used it as a fence for the Domino machine. I cut mortises into the bottom edge of the rear divider with the

SHOP CART WITH A TORSION TOP

Crafted from readily available construction-grade materials with a sensible mix of traditional and modern joinery solutions, the cart's design allows adjustment of the dimensions, making it suitable for a shop of any size.

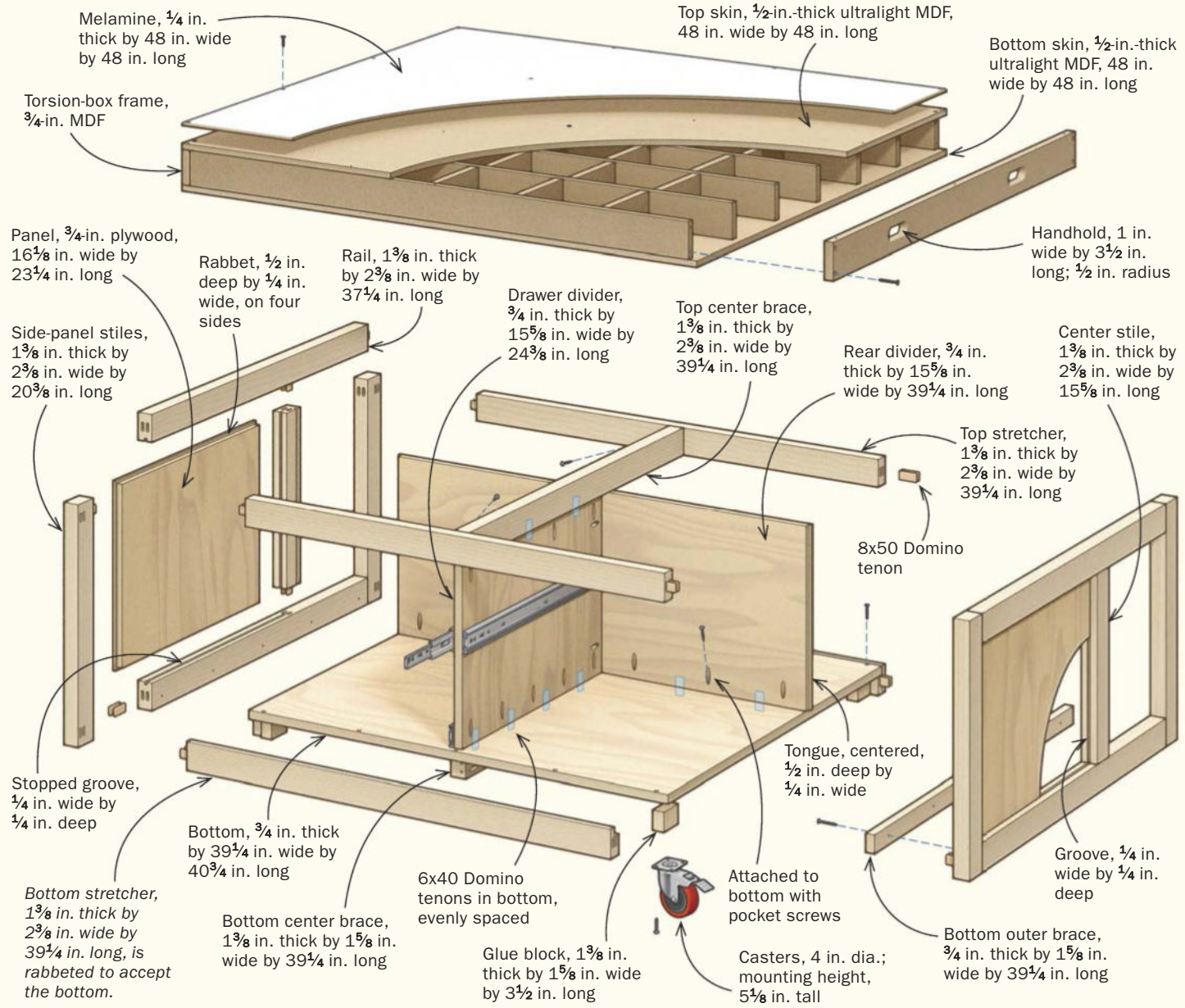


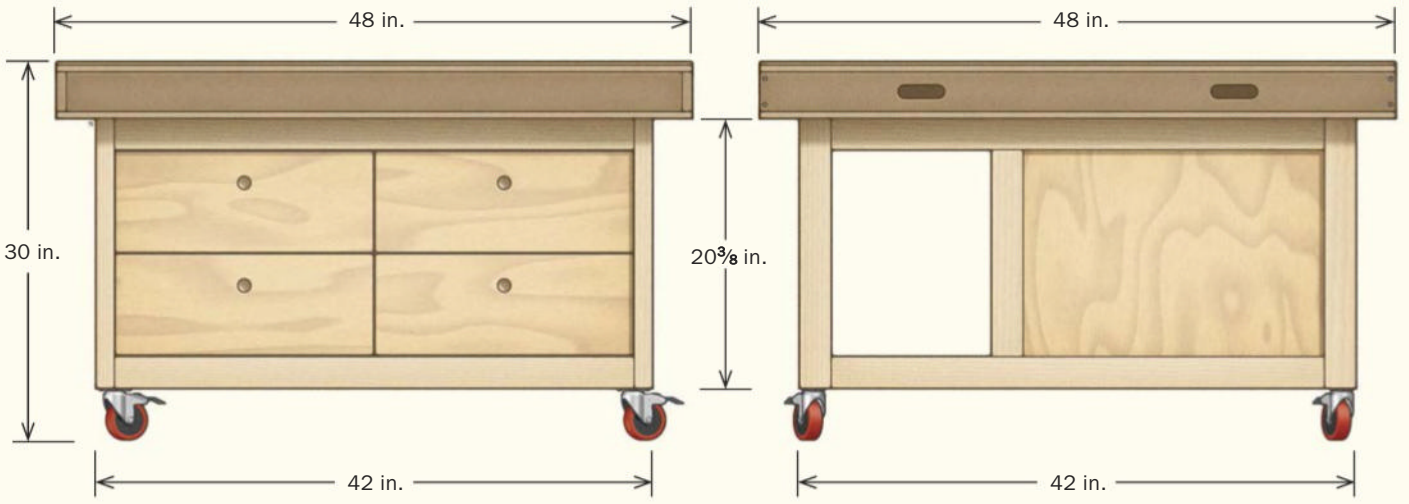
TORSION-TOP TOP VIEW



DRAWER DETAIL

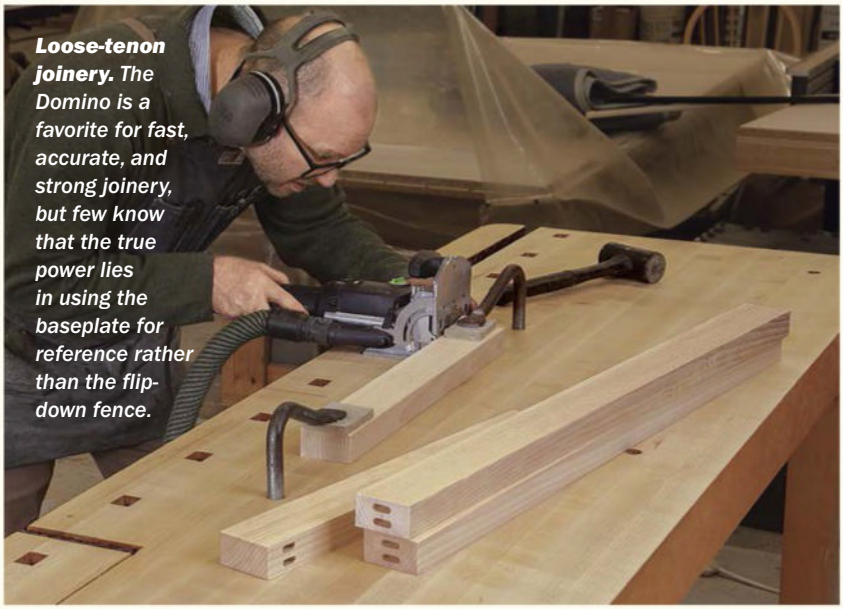
Drawings: Christopher Mills


Melamine, ¼ in. thick by 48 in. wide by 48 in. long
Top skin, ½-in.-thick ultralight MDF, 48 in. wide by 48 in. long
Bottom skin, ½-in.-thick ultralight MDF, 48 in. wide by 48 in. long
Torsion-box frame, ¾-in. MDF
Handhold, 1 in. wide by 3½ in. long; ½ in. radius
Panel, ¾-in. plywood, 16⅛ in. wide by 23¼ in. long
Rabbet, ½ in. deep by ¼ in. wide, on four sides
Rail, 1⅜ in. thick by 2⅜ in. wide by 37¼ in. long
Drawer divider, ¾ in. thick by 15⅝ in. wide by 24⅜ in. long
Top center brace, 1⅜ in. thick by 2⅜ in. wide by 39¼ in. long
Rear divider, ¾ in. thick by 15⅝ in. wide by 39¼ in. long
Center stile, 1⅜ in. thick by 2⅜ in. wide by 15⅝ in. long
Side-panel stiles, 1⅜ in. thick by 2⅜ in. wide by 20⅜ in. long
Top stretcher, 1⅜ in. thick by 2⅜ in. wide by 39¼ in. long
8x50 Domino tenon
Stopped groove, ¼ in. wide by ¼ in. deep
Tongue, centered, ½ in. deep by ¼ in. wide
Bottom, ¾ in. thick by 39¼ in. wide by 40¾ in. long
Groove, ¼ in. wide by ¼ in. deep
Bottom stretcher, 1⅜ in. thick by 2⅜ in. wide by 39¼ in. long, is rabbeted to accept the bottom.
Bottom center brace, 1⅜ in. thick by 1⅝ in. wide by 39¼ in. long
6x40 Domino tenons in bottom, evenly spaced
Attached to bottom with pocket screws
Bottom outer brace, ¾ in. thick by 1⅝ in. wide by 39¼ in. long
Glue block, 1⅜ in. thick by 1⅝ in. wide by 3½ in. long
Casters, 4 in. dia.; mounting height, 5⅛ in. tall


48 in.
30 in.
42 in.
FRONT VIEW
48 in.
20⅜ in.
42 in.
SIDE VIEW

Utility doesn't mean ugly

Construction-grade materials cut with fine-furniture finesse lead to a shop fixture you'll be proud to use every day.



Loose-tenon joinery. *The Domino is a favorite for fast, accurate, and strong joinery, but few know that the true power lies in using the baseplate for reference rather than the flip-down fence.*



Sacrifice the fence, not the part. *For the cleanest cuts, clamp a ¼-in. piece of MDF to the router table's fence and slowly plunge the spinning bit into the fence until the winged cutter comes through. The zero-clearance fence makes for crisply cut edges.*



Stopped grooves made simple. *Strike vertical lines where the cutter enters and exits the MDF fence to make a quick reference for the stopped grooves in the rails and stiles.*



A large rabbet for the bottom. *With a dado stack, cut a rabbet the exact thickness of the bottom plywood into the bottom stretcher, seating it flush for a sturdy, snag-free bottom.*

Domino resting on its baseplate and then cut down into the bottom using the edge of the divider as the guide to rest the baseplate against. Because I referenced both cuts from the same edge, once I stood the divider upright and installed the Domino tenons, the edge lined up with the layout line. Before gluing the divider in, I cut a tongue on each end to fit into the groove in the side panels. I cut the Domino mortises in the drawer divider using the same technique; once I had all the mortises cut, I drilled out for pocket screws along the edges, making sure to keep the pocket holes away from the mortises.

I glued and screwed the rear divider to the bottom at this point, clamping on an L-bracket to keep the two parts square to each other. I left the drawer divider aside for now.

Assemble the base

Preparing the subassemblies ahead of time allowed me to quickly tackle an otherwise complicated glue-up with little stress. I assembled the cart on low sawhorses that I had leveled; this kept things from twisting or racking while being glued up and provided a comfortable working height.

I started by laying one of the side panels on the horses, applying glue and knocking in the upper stretchers. Then I set the bottom assembly into place on the side panel, aligning the stretcher tenons and then fitting the rear divider's tongue into the groove on the side panel's center stile. (This can be cumbersome, so have a friend give you a hand.)

Next, I dropped the remaining side panel on top, drove the pocket screws, and threw on some long clamps for extra hold. Once the glue was dry, I added the drawer divider and

some extra bracing beneath the bottom with pocket screws. The bracing ensures that the case won't sag.

This was a good time to apply some additional blocking on the bottom for the casters. I used a set of locking swivel casters with 4-in. polyurethane wheels. The casters' plate is larger than my bottom stretchers, so I added a piece of fir stock in each corner with some glue and screws.

Build the drawers

For the drawers, I used ½-in. Baltic-birch plywood, which has more laminations and fewer voids than standard veneer-core cabinet plywood, making it more stable and better for joinery. It's a great choice for utility drawers and is even attractive enough to be used for cabinetry if you like the look of its exposed edges. To keep things simple, I made all four drawers the same size. I was going to be using 24-in. side-mount drawer slides, so the sides of the drawer needed to be cut to 24 in.

For utility drawers like these, I like to use a simple lock rabbet joint that consists of a tongue on the fronts and backs and a dado in the sides. It's extremely fast to cut using a single router-table setup with a stackable wing cutter set to exactly half the material thickness. The trick is to get the height set so that when a piece is run through the cutter with the face down on the table, it cuts a tongue that is the same size as the kerf cut by the router bit. I ran the drawer sides standing up with the inside face against the fence and cut a dado on each end. I used a backer block to help keep the narrow pieces square to the table.

The side-hung drawer slides require ½ in. of clearance on each side of the drawer, so

Assemble in sections

A cart of this size is a formidable task to tackle all at once. Breaking it down into subassemblies keeps the work accurate and stress-free.



Square from the start. *Because the side panel is the foundation on which the case is constructed, it's important to glue the frame as square as possible.*



Secure the bottom. *In creating the bottom subassembly, countersunk screws are used to attach the bottom to the bottom stretchers.*



Pocket screws where clamps can't reach. *With loose tenons establishing alignment, pocket screws hold the rear divider tight to the bottom while the glue dries. Hide the screws in the drawer side of the cabinet for a cleaner finish.*



Divide and support. *The drawer divider and top center brace glue together easily with only a couple of clamps.*

Bring it all together

What could seem like a heavy lift is made easy with diligent preparation, sturdy support, and a couple of long clamps. Harris practices with a dry run before tackling this oversize glue-up.





Assemble the framework. *On a pair of level low sawhorses, add a piece at a time, starting with the upper stretchers. Drop the bottom assembly into place, aligning the rear divider's tongue with the groove in the side's center stile. Place the other side on top, and use long clamps to draw all the joints together.*





Add bracing for strength. *The bracing adds rigidity to the cart and will prevent racking or sagging. Wedge in the braces, and draw in the joints with a couple of well-placed pocket screws. For the bottom brace, add screws through the bottom panel for maximum strength.*

my drawers needed to be built exactly 1 in. narrower than the drawer box opening. To calculate the length of the fronts and backs, I put two drawer sides together, outside face to outside face, and measured the web of wood between the bottom of one dado and the bottom of the other. This number got subtracted from the drawer's intended width. I cut all the fronts and backs to that length, then cut their tongues on the router table, placing the inside face of the piece down on the table.

For the bottoms, I used ½-in. plywood because ¼-in. seemed a bit flimsy. I cut a ¼-in. by ¼-in. groove in the drawer box parts to hold the bottoms.

I cut the bottoms to size and milled a tongue around them using a dado stack. I glued the bottoms in to make the joinery stronger; since these pieces are all made of plywood, movement isn't a concern.

Mount the drawers to the case

The slides I used separate into two pieces for easier installation. The wider portion gets screwed to the inside of the case, and the skinny portion to the drawer. I attached the upper slides first using a spacer block to locate them. I cut the spacer block the full length of the slide and made its height half of the drawer box opening plus ¼ in. for the reveal. I clamped the spacer block in place and set the slide on top. I used a



Online Extra

To learn how to set up your router table to cut the perfect lock rabbet joint for this drawer, go to **FineWoodworking.com/326.**

Utility drawers

Made from Baltic-birch plywood and mounted on quality slides, these drawers are meant to be loaded to the brim with tools and accessories.

Simple drawer joinery. *Use a lock rabbet joint to assemble the drawer. With a precise setup on the router table, both sides of the joint can be cut without moving the fence or cutter.*



Use a spacer block. *When mounting the upper drawers, use a scrap piece of material to rest the slide on. Using the block lends consistency, which will prevent the drawers from racking or sticking.*



Side-mount drawer slides. *A quality slide made of heavy-duty metal parts is important for ensuring a smooth glide and a nice soft close.*



Applied drawer fronts. *Use shims to set equal reveals for your drawer fronts, and hold them in place using double-stick tape. Remove the shims, and with the drawer open, add mounting screws from the inside.*

self-centering bit to drill a pilot hole and then screwed in the slide with ½-in. pan-head screws; four per slide was sufficient. The lower slides sit directly on the bottom panel of the drawer box and were installed in the same manner.

The narrower of the two slide components was attached to the drawer sides flush to the front. I wanted to leave ¼ in. between the drawer bottom and the cabinet bottom, so I offset the center of the slide downward ¼ in. to lift it up. I set the drawers in the case and opened and closed them to make sure the slides were working smoothly and easily. Stiff movement could have meant that the tracks were not fully engaged with each other or that the drawer width was incorrect.

For a finished look, I added applied fronts to the drawers. I cut ¾-in. plywood to size for these so there was a consistent reveal all the way around. Using some shims to set an even gap and a few pieces of double-stick tape for a temporary hold, I slid the drawer open and put two screws through the back into the applied front.

Start flat, stay flat

The beauty of the torsion box is the interior gridwork's ability to resist bending without introducing significant weight (or cost). This is the same technology used in building things like hollow-core doors

Build the gridded top

The heart of the torsion box lies in the gridwork—39 individual pieces of MDF glued and nailed together to create the hollow core of this torsion-box top.



Set the perimeter. *To ensure a nice square top, start with the perimeter. Work around the bottom skin, flushing the frame to the edges.*



Tack in place. *Glue and nails hold the grid together. As ribs and braces are added, their weight works as a press, matching the flatness of the cauls beneath.*



Screws for the high-stress points. *The corners of any cart are in constant danger. A couple of screws will reinforce these weak points.*



Stagger the seams. *To avoid toenailing, stagger the braces so that you can nail straight into their ends, which will ensure a solid hold.*



Cut to fit. *Measure and cut the last row of braces to fit. This may not end up at 7⅛ in. exactly, because material thickness can vary even within a single sheet of MDF.*

and airplane wings. The paradox of building a torsion box is that in order to build something flat, you must start with something flat to build it on.

I started by setting up sawhorses and beams in an area big enough to let me move around the torsion box as I worked. I leveled the beams and ensured that they were completely parallel to one another. I used a laser level for this, but a bubble level would have worked too. I took my time here, making sure the setup was flat. That was the most important part.

Assemble the gridwork

Once the building platform was level, I could begin constructing the box. I used ½-in. ultralight MDF for my top and bottom skins (regular MDF will also work but will make the completed torsion box heavier) and ¾-in. MDF for the grid. I started by cutting the skins to size and laying the bottom skin onto the beams. I added some layout lines in pencil as a map to follow when installing the gridwork.

I ripped 3-in.-wide strips for all the grid pieces and started by creating a frame at the perimeter of the skin. I applied a bead of glue to the frame pieces and tacked them in place from below with a brad nailer and 1¼-in. nails, making sure they were flush to the outside edge of the skin. I screwed the frame pieces to each other at the corners.

Next, I cut all the interior ribs and braces to length, leaving the last row of braces long so that I could cut them to fit in case of material-thickness inconsistencies.

The first step in assembling the interior grid was gluing and nailing a 7⅛-in. brace to the left-hand side of each layout line across one side. Once those five braces were in place, I installed a 4-ft. rib across them, nailing through it into the braces and into the rib through the frame. For the next bay, I installed the 7⅛-in. braces on the other side of the layout line and repeated the process. Offsetting the braces on either side of the layout line let me easily get the nail gun into position. I repeated the process for each bay of the grid, making sure that there was always a bead of glue at each point of contact. I worked slowly, checking that at each





Add the MDF top. *Securing the top well with a mix of glue, brad nails, and screws is crucial to its flatness. Laying out the grid in pencil on the top side of the MDF ahead of time prevents missing the bracing with the fasteners.*

Final assembly

The double-layer top adds the final bit of rigidity to the torsion box. The interchangeable melamine top makes general clean-up a snap, and it is easily replaced with a few screws if it is completely damaged.

joint the ribs were flush. When I got to the final bay, I measured the remaining distance, cut the last five braces to length, and installed them.

On to the top—and the topper

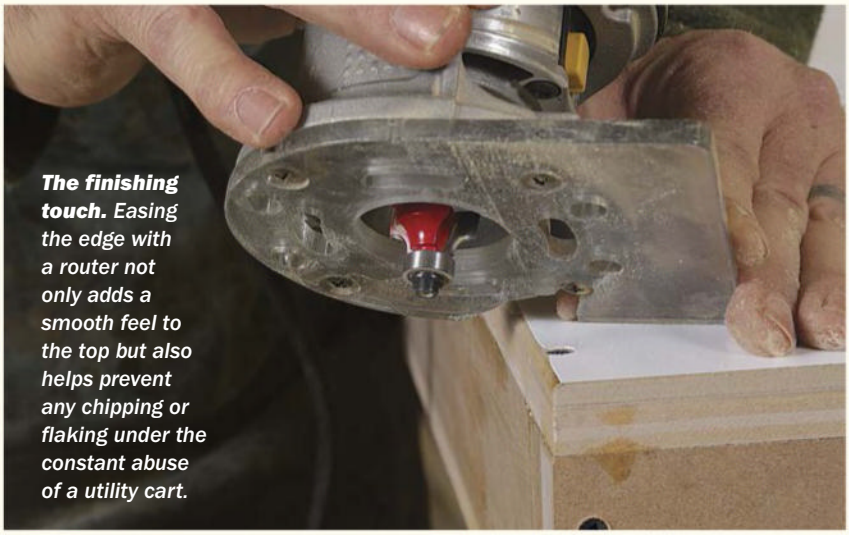
Before adding the top, I did a final inspection to make sure the grid had remained flat. Any spots where the ribs weren't flush would telegraph through the skin, so I addressed them now. Layout lines on the top skin were needed to indicate where the ribs are. I just marked the long ribs and didn't worry about the braces. When everything was ready to go, I put a bead of glue across the top edge of the entire grid and placed the skin on top. I tacked the corners of the top skin in place, making sure that everything was flush, and then countersunk 1¼-in. assembly screws. I screwed the top down rather than relying on just the brad nails to make sure it had full contact with the grid. I let the glue dry completely before moving the torsion box from the building platform.

At this point I had a fully functional torsion box, but I added a final layer of ¼-in. melamine that I just screwed (not glued) to the top. This enables the box to be used as an assembly table without worrying about glue spills. And when the surface wears over time, the melamine can easily be replaced. I routed a small roundover to eliminate the sharp edges of the melamine and prevent any chipping if an edge is snagged. After attaching the torsion-box table onto the cart (an extra set of hands helps), I had a reliably flat workstation. □

Owain Harris builds custom furniture in Gonic, N.H., and teaches at the Center for Furniture Craftsmanship in Rockport, Maine.

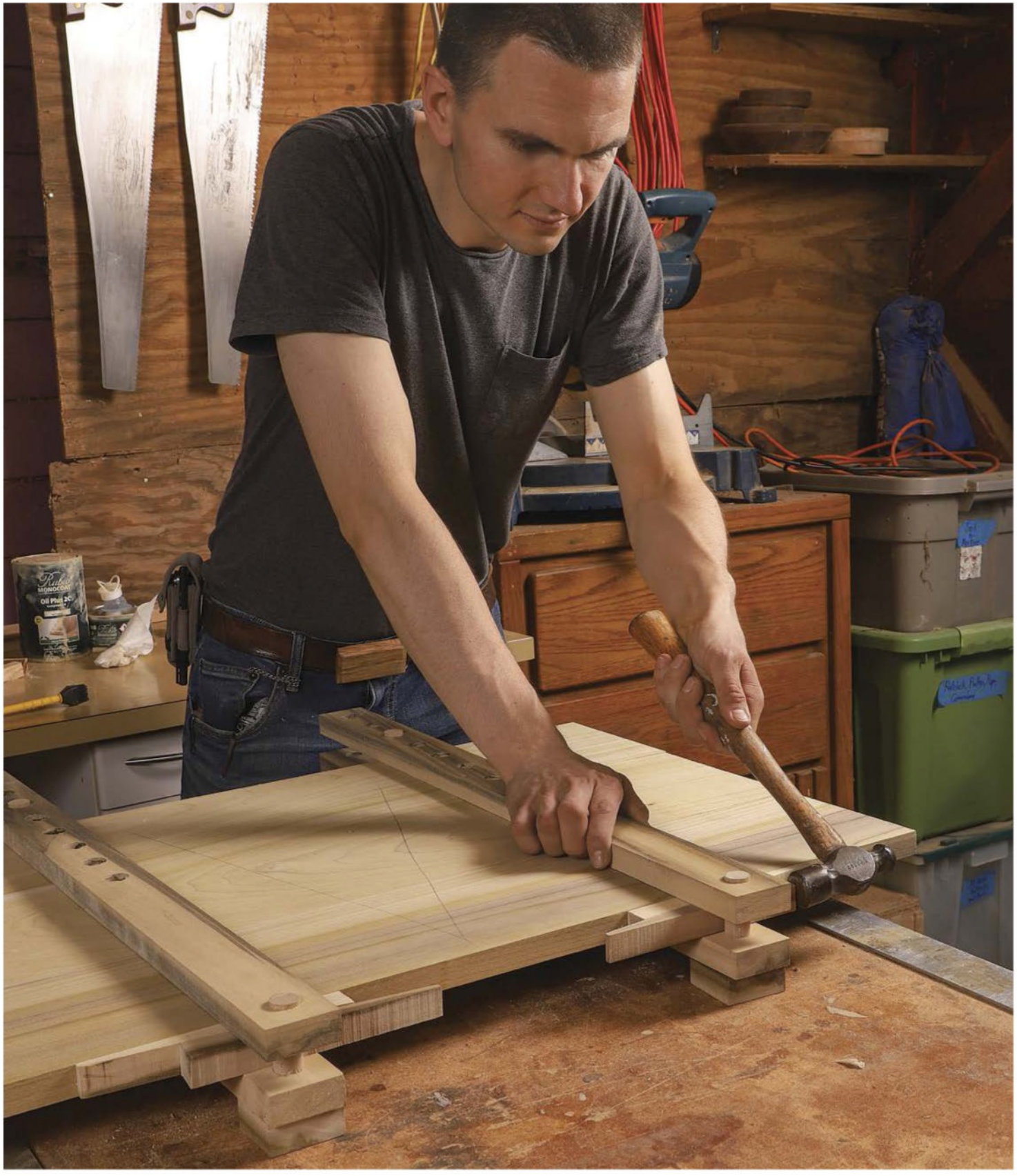


Protective layer. *A final sheet of ¼-in. melamine is meant to be replaceable, screwed down evenly but left unglued for those days you forget to check the track saw's cut depth.*



The finishing touch. *Easing the edge with a router not only adds a smooth feel to the top but also helps prevent any chipping or flaking under the constant abuse of a utility cart.*

Time-Tested Panel Clamps



Photos: Jonathan Binzen. Drawings: John Tetreault.

Made From Scrap

Pegs and wedges produce clamps of any length

BY RYAN SCHEMRICH

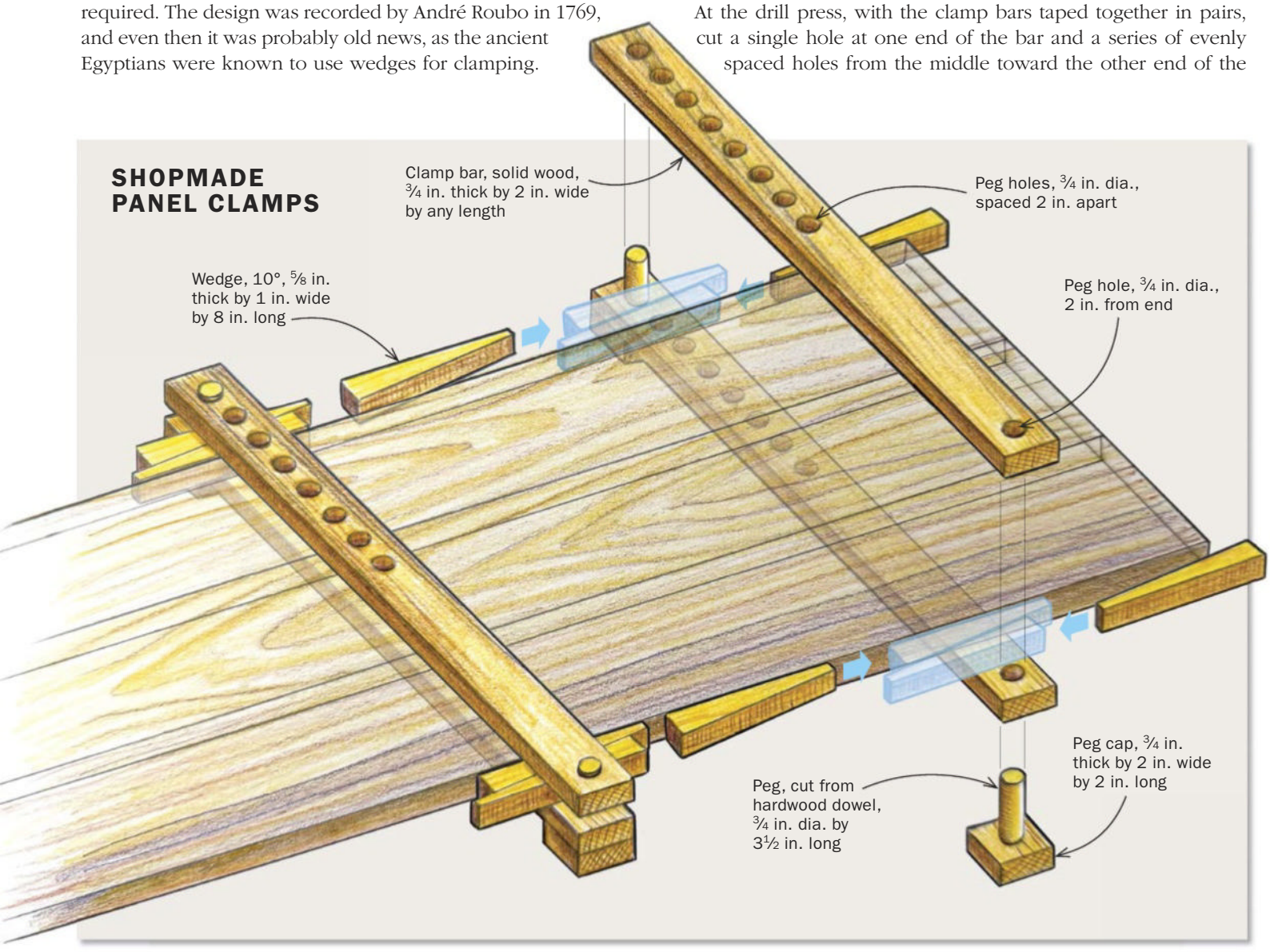


There will come a day when your clamps fall short—literally. To paraphrase Chief Brody in *Jaws*, "You're gonna need a bigger clamp." You might be tempted to head to the nearest hardware store to buy some monster clamps you'll rarely use, but there is an easy way to make your own without spending a dime or leaving your workshop. These clamps can be built in a few minutes using basic materials and can be made to any length required. The design was recorded by André Roubo in 1769, and even then it was probably old news, as the ancient Egyptians were known to use wedges for clamping.

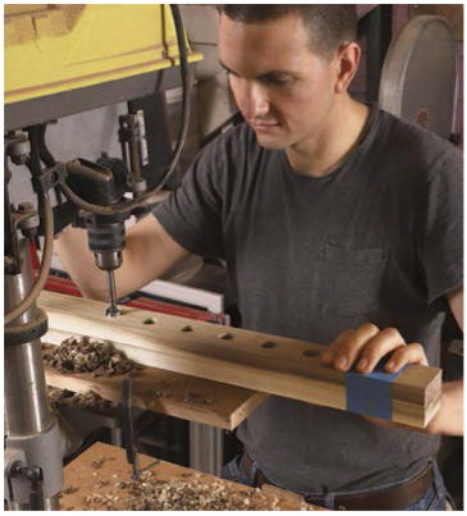
Quick to make

Each clamp consists of two ¾-in. thick, solid-wood bars, 2 in. wide by whatever length is required. The only other parts are ¾-in.-dia. pegs fitted with a square cap, and a set of wedges cut from scrap wood.

At the drill press, with the clamp bars taped together in pairs, cut a single hole at one end of the bar and a series of evenly spaced holes from the middle toward the other end of the



Make your clamps . . .



Paired up for peg holes. *Tape together the two bars for each clamp to drill ¾-in.-dia. holes for the pegs. To make the peg caps at the same time, use overlong bars and drill extra holes at one end.*



Bar chopping. *Cut the bars to length at the chop saw. Then cut several 2-in.-long pieces from one end; already drilled, they will be caps for the clamping pegs.*



Cap the pegs. *Glue a square cap on the end of each peg. The caps serve as feet for the clamp bars.*



Out to get the glue. *Apply a film-forming finish to the bars so they will resist glue squeeze-out.*



Wedge work. *At the bandsaw, cut pairs of wedges from rectangular stock, aiming for an angle of 10° or less.*



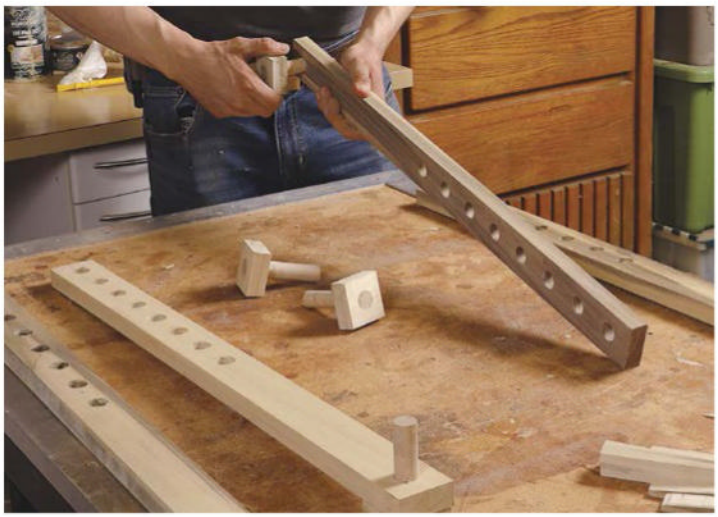
bar. The solitary hole will house a peg for the wedges to push against, and the other holes will allow for adjustability.

The pegs are segments of a ¾-in.-dia. hardwood dowel. To make the peg caps, drill a ¾-in. hole through a 2-in.-square block and glue it onto the end of the dowel. This block will serve as the foot of the clamp.

Then cut a set of 8-in.-long wedges. Make sure the slopes of the wedges are smooth, straight, and less than 10° so they can be set easily but won't slip.

Lastly, it is important to coat the broad surfaces of the clamp bars with a film-forming finish to prevent glue squeeze-out from sticking the clamps. And that's it! Your clamps are ready to use.

. . . and use them



Peg the bars. *Begin a panel glue-up by inserting pegs in the bottom bars and proceeding to dry-assembly.*



On with the glue. *After dry-fitting, wipe on the glue and lay the planks in place.*



Complete the pairing. *Put the top bars in place on the pegs, and press them flat against the glue-up.*



Knock it in. *The wedges go in first by hand, then with taps from a hammer or mallet.*

Dead simple to use

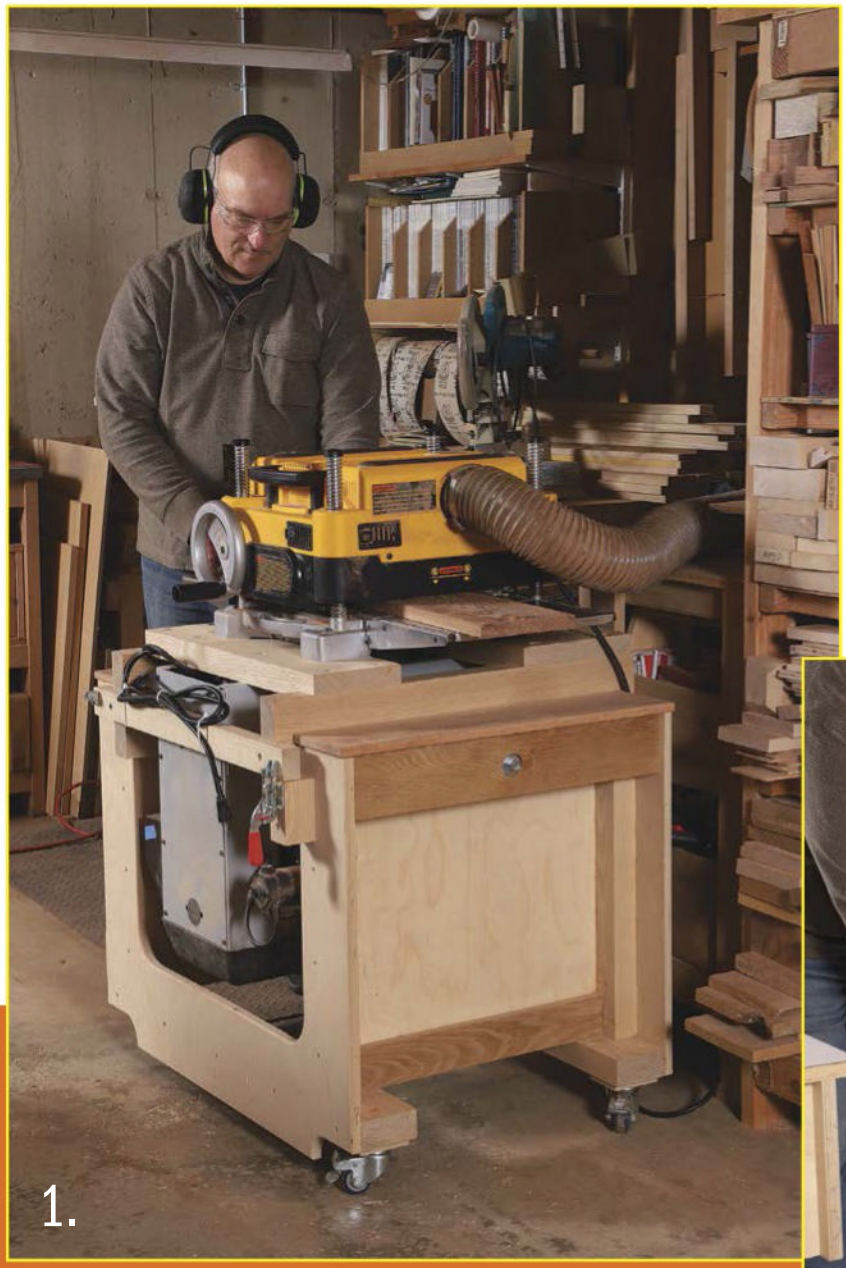
To use the clamps, place two bars on your work surface, and insert pegs appropriately spaced for the panel you will be clamping. Lay the boards for your glue-up across the bars, adjusting the pegs as necessary. Then lay the two mating bars on top. To be sure that your peg spacing is correct and that the joints are closing, do a dry-fit, using hand pressure with the wedges. If everything looks good, it's time for glue. Use a hammer to tap in the wedges, and apply pressure to the joints. Adding heavy spring clamps at the ends of the boards can help keep neighboring boards flush.

So take a couple of minutes and make a set of these clamps. You'll be surprised how often they come in handy, saving you time and money. □

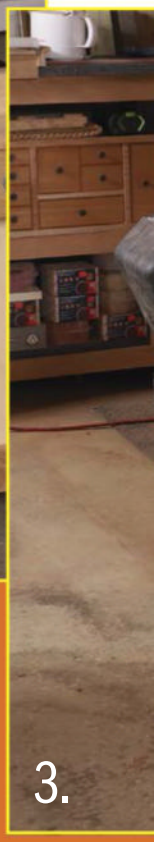
Ryan Schemrich builds custom work from wood in a 1934 carriage house in Woodland, Calif.



Careful at the gluelines. *Spring clamps placed at the joints between clamps keep adjacent boards flush.*







Solid stand with a quick, smooth flip. *Mike Wilkie's flip cart provides a stout base for his DeWalt planer (1). In just a few seconds, unlatching a toggle clamp (2) releases the cart's rotation frame (3) and lets him swing his Delta thickness sander into position (4).*

Build a Robust Flip Cart

Fit two machines in the space for one

BY MIKE WILKIE

When I started thinking about building a flip cart for my shop, I had several goals in mind that might be familiar to many woodworkers: Make the best use of limited floor space, improve machine mobility, and avoid the physical challenge of repeatedly lifting heavy machines. My benchtop planer needed a new home off the bench, and my thickness sander would get more use with improved accessibility.

The planer is compact and just over 90 lb., while the sander is taller and about 160 lb. I set about designing a flip cart that would accommodate mismatched heavy equipment and employ an eccentric pivot axis that would keep the load balanced and easy to control during the rotation. The design on these pages is tailored to my specific machines, but I'll describe a method of finding the center of gravity for any pair of machines and basic design elements to allow adjustment for different equipment.

Photos: Jonathan Binzen

Design parameters

Select the machines to be mounted on the flip cart with care. Think twice about equipment with lots of loose accessories, fragile parts, or adjustable features that could move if inverted. Plan for power cords, dust ports, machine controls, and access points to make sure they are accessible in the working position and clear of the swing path when inverting.

The weights of your machines don't need to be similar, but there are practical limits to the heights of the machines. You'll probably find that pairing two tall machines results in a pivot point too high off the floor to be comfortable during use. Better to pair a tall machine with a shorter partner. The DeWalt 735 planer I installed is relatively short, and it paired well with a comparatively tall Delta 18/36 thickness sander.

For machines that feed the working stock, like planers and thickness sanders, it's important to make the feed direction parallel to the rotation axis. This orients the feed with the long dimension of the cart, improving stability and reducing any inclination to tip as a heavy workpiece extends past the cart's footprint.

Once you've selected the machines to be mounted and know their orientations, consider their working heights—usually the bed that the workpiece rests on.

Calculating the center of gravity

Before proceeding with the design of the cart, you'll need to determine the center of gravity (CG) for each machine—as well as the CG for both machines together as a "system." Once you know the position of the system's CG, you can design your rotation axis to pass through it, resulting in a balanced assembly. And that's the key to a safe and controllable flip cart.

Finding a machine's CG is easier and safer with a partner. Place the machine on a stable, level surface at a comfortable height. With the assistance of your partner (I recruited my son Josh), carefully tip the machine to the left until it reaches the point of equilibrium. Be sure to tip the machine in the direction you'll want it to rotate on the cart. (If your machine does not have four feet at the corners



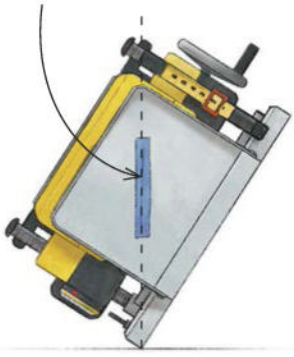


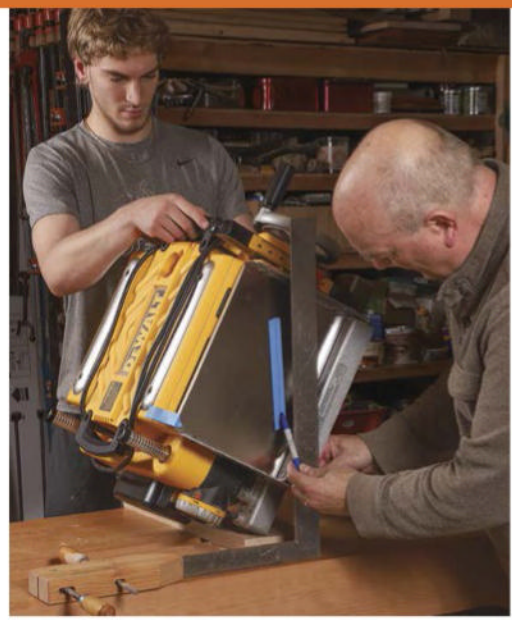
4.

Three steps to the center of gravity

Step 1: With a partner, tip the machine to its balancing point, apply a strip of tape, and draw a vertical line on the tape.

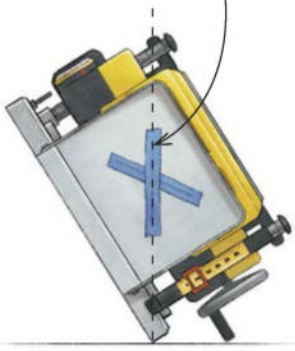
Strike a vertical line with the machine tipped to the left.





Step 2: Tip the machine in the opposite direction and draw a second line.

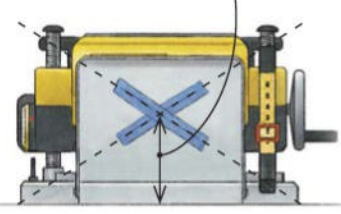
Strike a vertical line with the machine tipped to the right.





Step 3: With the machine on all four feet, measure and record the vertical distance from the benchtop to the lines' intersection. That point is the machine's center of gravity.

Measure vertically from work table to lines' crossing point.





or a square/rectangular base, this technique won't work.) When it's in this balanced position, place a framing square so it defines a vertical line upward from the machine's contact point with the table. Apply a strip of tape to the machine and draw a vertical line.

Repeat this step while tipping the machine in the opposite direction. When you tip the machine back onto its four feet, you'll have a pair of intersecting diagonal lines. Congratulations—X marks the spot, and you've found the CG for the tool. Using the same technique, find the CG for the other machine.

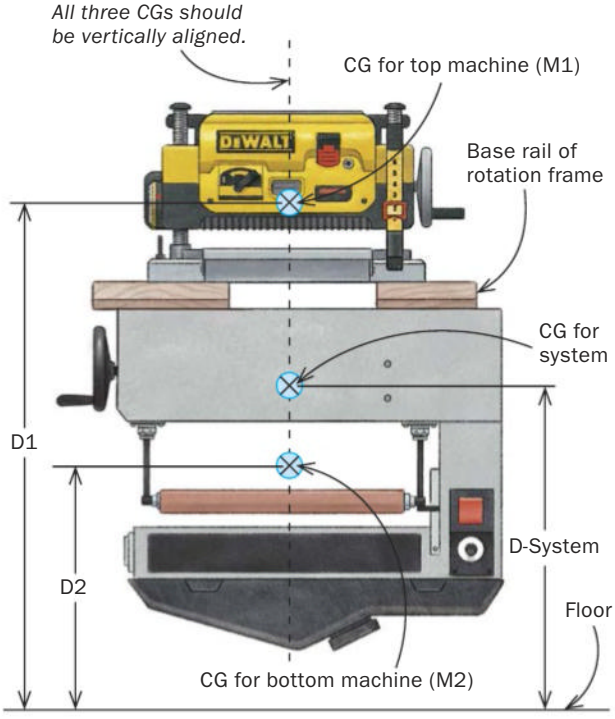
Now you are ready to establish the CG for the machines paired as a system. You can locate the system CG using a simple sketch of your two machines as they'll be mounted on the cart, and a calculation. For each machine, you'll need to know the vertical distance from the table to its CG, and the side-to-side position of the CG. And you'll need its weight, which you can find with a scale, owner's manual, or the internet (but don't use a "shipping weight"). Any heavy accessories that won't be installed during rotation should be removed and their weight excluded.

Decide which machine's exact working height is your priority. In my case, I wanted the planer bed

PINPOINTING THE AXLE

To locate the axle, you need to find the center of gravity for the two machines together as a "system." A simple drawing representing your two machines, one above the other, and a straightforward equation will get you there. In the equation, D is the distance from the floor, and M is the weight of the machine.

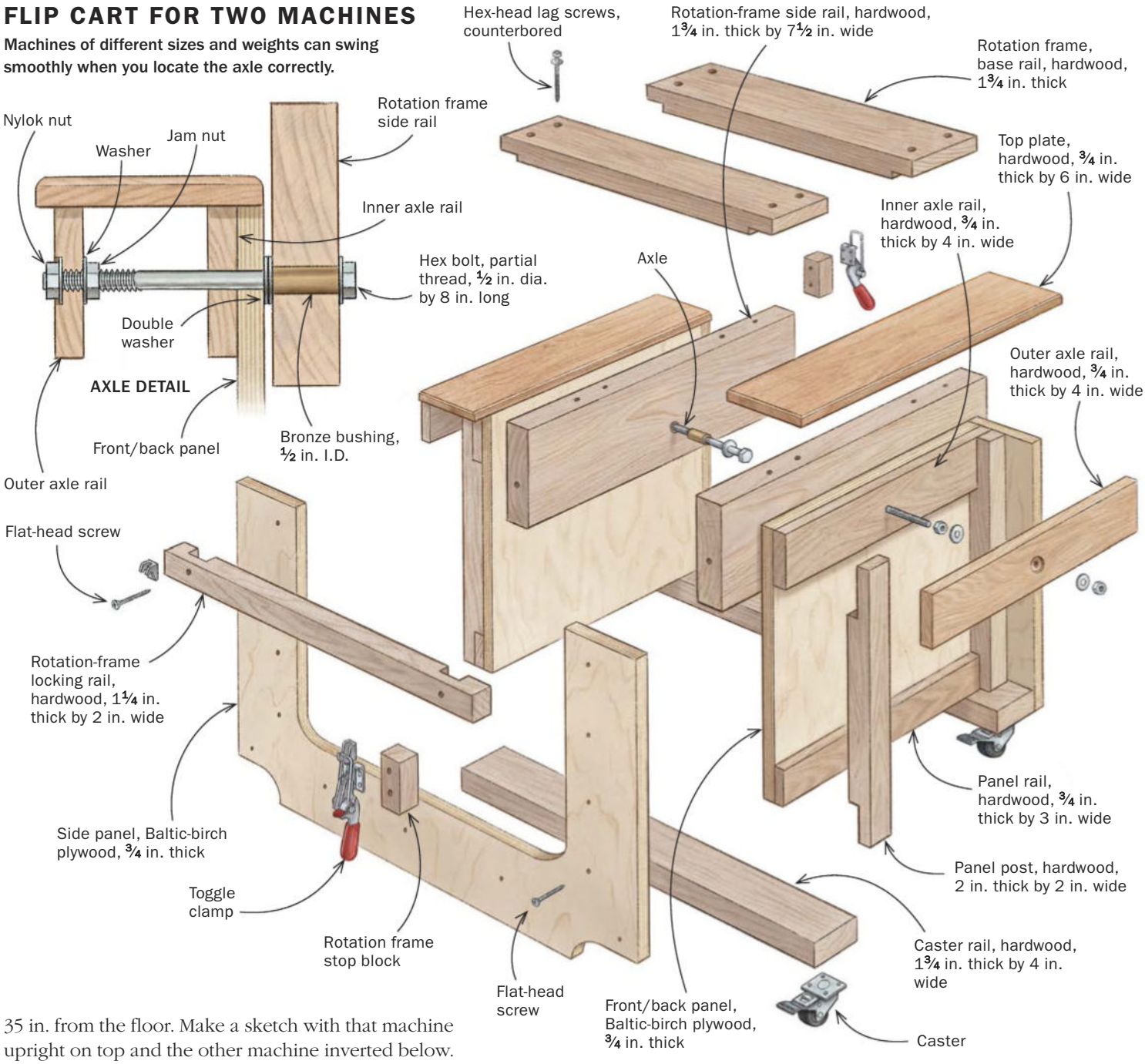
$$\text{D-System} = \frac{(D1 \times M1) + (D2 \times M2)}{(M1 + M2)}$$



Drawings: Derek Lavoie

FLIP CART FOR TWO MACHINES

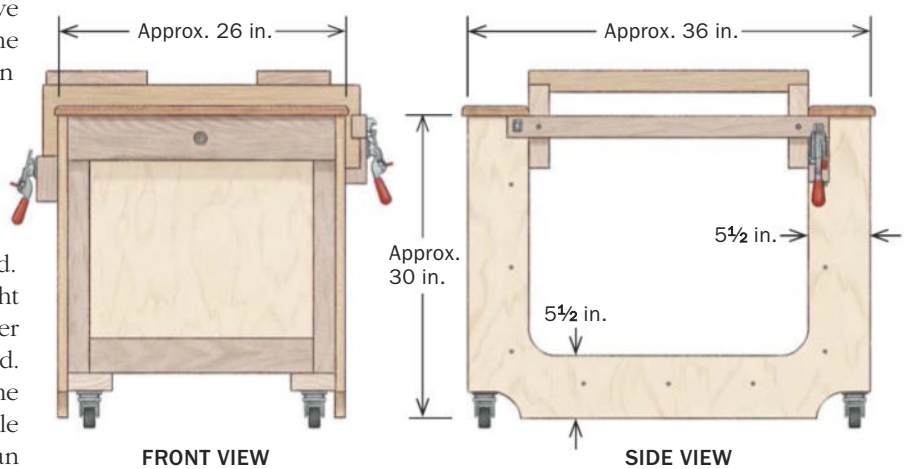
Machines of different sizes and weights can swing smoothly when you locate the axle correctly.



35 in. from the floor. Make a sketch with that machine upright on top and the other machine inverted below. The sketch should include the floor and should have a space between the two machines representing the rotation frame's base rails. For further instructions on finding the system CG, see the drawing at left.

Use your sketch to confirm that all parts of the inverted tool are at least 8 in. off the floor to provide adequate swing clearance to the cart. I also recommend doing a second sketch with the tools reversed, while keeping the system CG unchanged. This allows you to confirm that the working height of the second tool is comfortable and that the other machine also has 8 in. of floor clearance when inverted.

If space is too tight for the 8-in. floor clearance, the options are to make the cart wider or increase the axle height (and thus the work height). In a pinch, you can



Assemble the cart





Attach the frame to the axles. *The cart has two short axles, each connected to one of the rotation frame's heavy side rails.*

Arrest the rotation. *The locking rail spans the rotation frame's side rails. Install a stop block to limit the frame's swing, and screw a toggle clamp to the block to lock the frame in place. Install a second block and clamp on the other side of the cart.*



also lower the cutouts on the cart sides if you're not too aggressive. I had to trim about an inch from one cutout. (Symmetry is not required.)

Structural design

The load-bearing frame of the flip cart is primarily 8/4 solid stock, with some 4/4 and 6/4 where appropriate. Plywood panels add shear strength, while heavy bottom runners are the foundation of the cart and provide the mounting points for the casters. Vertical members run straight up from the casters and take the load from the axle supports. Half-lap joinery keeps the construction simple. The plywood side panels have large cutouts for the tool clearance; keep the radii on these generous (more than 4 in.), and resist the urge to build them out of multiple pieces, since that would significantly reduce the load-carrying capacity versus single-piece construction. I found it simplest to build the side frames individually, using screws to hold the plywood to the frame components, then to join them with the cross-members and cross-cart plywood panels. The four boards that support the axles are cut to size, then clamped together and drilled for the axle clearance simultaneously on the drill press to ensure good alignment. Once those are installed, mark and cut the vertical members to them for a tight fit. Install caps over the axle supports once everything is lined up.



Secure the top rails. *A pair of heavy solid-wood rails provide the mounting surface for both machines.*

I first assembled the cart using screws only. That was strong enough to allow me to mount the tools and do some practice rotations. As it turned out, that adjustment, which one of the plywood frames needed, was made much easier by partially disassembling the cart. Once I was satisfied with the machine mounting and swing clearances, I disassembled the cart and used glue and screws for the final assembly to get the most rigidity possible.

Construction of the rotating frame is very simple, but the details are important to get right. The frame consists of two pieces of 8/4 stock—the base rails—that are wide enough for mounting both machines. For balance, the CG of each machine should be positioned directly above the rotating axis. Once you know the position of the machines on the base rails, trim the length of those rails, allowing for about ⅛-in. clearance to the adjacent cart components. The rotating frame is completed by attaching the side rails with lag bolts. Pay attention here—the frame forms a shallow U-shape, and one of the machines will be nestled in that space. It's important to make sure the design allows adequate clearance between the machine and the side rails.

Since the design requires clearance for a machine inside the "U" of the rotating frame, it isn't possible to use a continuous axle across the width of the flip cart. But in many ways the alternative is easier. The axles consist of ½-in. by 8-in. carriage bolts paired with fender washers and lock nuts. The design uses two support points on the cart for each axle to resist the twisting loads that are encountered when you aren't using a continuous axle. This is an important detail and should not be skipped in favor of a shorter bolt through a single board on the cart side.

Other considerations

The frame rotates 180°. I added a simple handle that spans one side of the rotating frame, with 3-in. overhangs. Stop blocks and toggle clamps are an inexpensive and easy option to keep the tools locked in position. Take a moment to ensure that cords have retention provisions and can't get pinched between the rotating frame and the cart. Double-check dust ports, hinged doors, and tool stops to confirm they won't interfere with the rotation.

For final assembly, once the cart is complete, install the rotating frame and secure the axle bolts. Clamp it in position and install the first tool. Carefully unclamp it and rotate 180°. This is the point where it is most imbalanced, so assistance is recommended; be careful not to let fingers get pinched between the rotating frame and the cart. Mount the second machine and do a trial rotation. If your measurements and build are accurate, they should spin freely. If the balance is off too much, you can add spacers under the tools, move a machine mounting position to one side, or add a counterweight; all of those options will move the system's CG a bit. In extreme cases you can drill new axle holes in the rotating frames. □

Mike Wilkie works wood in Ellington, Conn.





Get ready for the ride. *After bolting the machines to the top rails (above), Wilkie prepares for a test rotation, wrapping up the power cord and using a bungee to hold the planer's outfeed tables upright.*

Make a Pocket-Size Coffin Plane



A perfect project to start your adventure into wooden hand-plane making

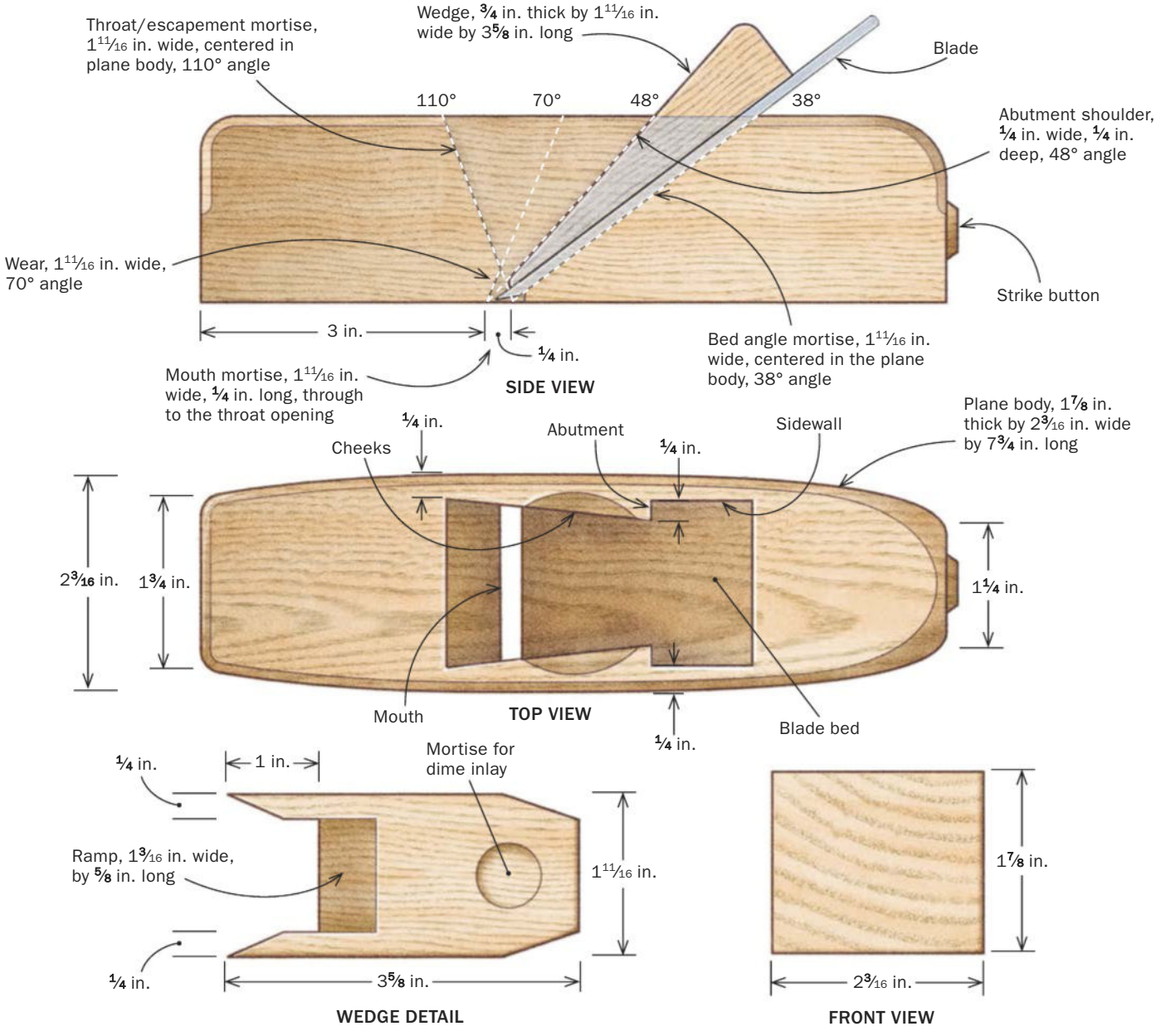
BY BILL HOWES

When I was asked to talk about wooden planes at my woodworking club, I chose to focus on my favorite plane, what I call my pocket coffin plane. I picked it up at an estate sale almost 50 years ago near Lunenburg, an area of Nova Scotia known for boatbuilding. The blade of the plane was taken from an early Stanley block plane and fitted into the wooden body. I estimate that it was made around 1900. The body is craftsman-made from lignum vitae, which was a common wood in the boatyards of that time. Clearly proud of the tool, the maker stamped his initials on the front and top. I set out to re-create the plane to show others how to make it. In the process, I developed a high regard for the history and longevity of a simple tool that's made well.

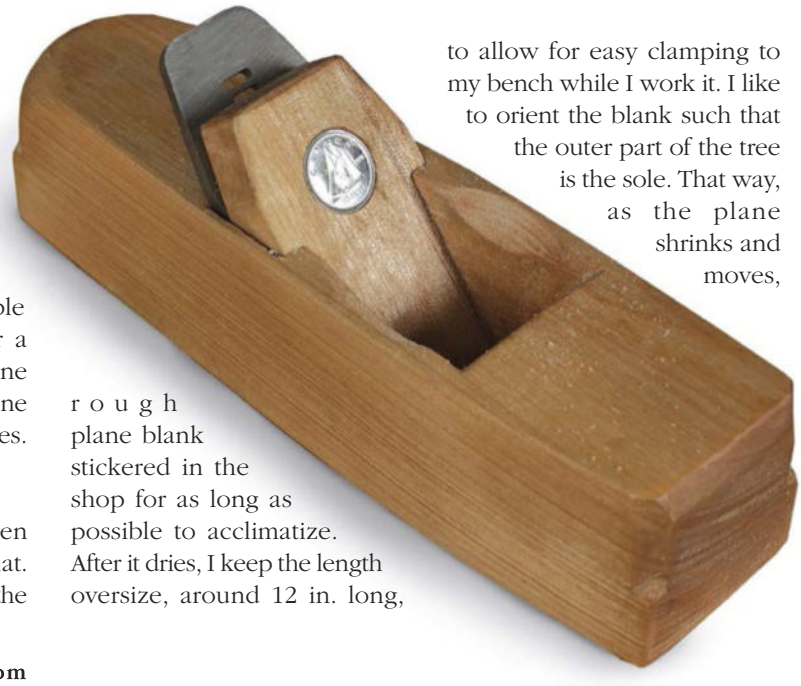
Most woodworkers have the necessary tools for making a plane. A set of sharp chisels is essential; there is lots of chopping and paring involved. Floats, although traditionally used for bedding a blade and well suited for the job, are not required. They can be replaced with shopmade sandpaper sticks or a "dulled" chisel, which makes a great scraper for fine-tuning. A small, tapered flush-cut saw is needed. These are not expensive (I found mine online for $15), and you can easily make your own; in the past I have fashioned a handle for a reciprocating-saw blade, though it requires grinding away the set to produce a good-quality cut.

As for the material, I have no access to the lignum vitae of the original plane, so I went with yellow birch for the body instead. Readily available and stable with straight grain, the yellow birch is surprisingly dense, which works well to take the abuse of an everyday-

Photos: Owen Madden.
Drawings: John Hartman.



use plane. The pitch of the blade is set at a low angle (38°), so the plane can be made from 8/4 stock. I fitted the new one with a 1⅝-in.-wide blade from Lee Valley; this Stanley block-plane replacement blade is the thickest available at ⅛ in., which makes for a nice, smooth cut. Taking a fine shaving with a self-made plane is one of life's great pleasures.



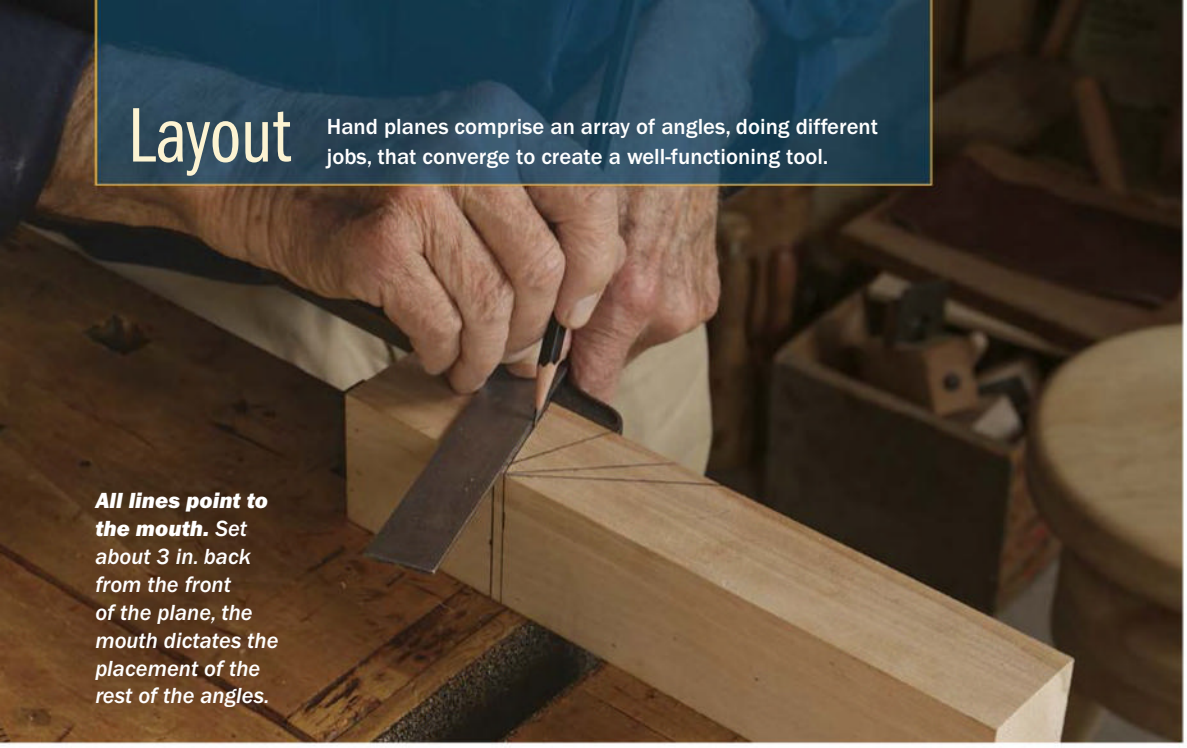
Begin with the layout

The key to a good wooden plane is its ability to stay flat. To stave off warping, I keep the rough plane blank stickered in the shop for as long as possible to acclimatize. After it dries, I keep the length oversize, around 12 in. long, to allow for easy clamping to my bench while I work it. I like to orient the blank such that the outer part of the tree is the sole. That way, as the plane shrinks and moves, the edges of the bottom will be the high spots and will be easy to flatten down to the sole, as opposed to having to flatten the middle and working outward. Once I have marked the top and bottom of the plane, I determine the front and back as well. The grain should slope downward from the front toward the rear, so when I push the plane, it runs with the grain.

The plane's total width ends up being 2 3/16 in. That's 1⅝ in. for the blade, ¼ in. for each sidewall, and 1/16 in. for wood movement. I add that allow-

Layout

Hand planes comprise an array of angles, doing different jobs, that converge to create a well-functioning tool.



All lines point to the mouth. *Set about 3 in. back from the front of the plane, the mouth dictates the placement of the rest of the angles.*

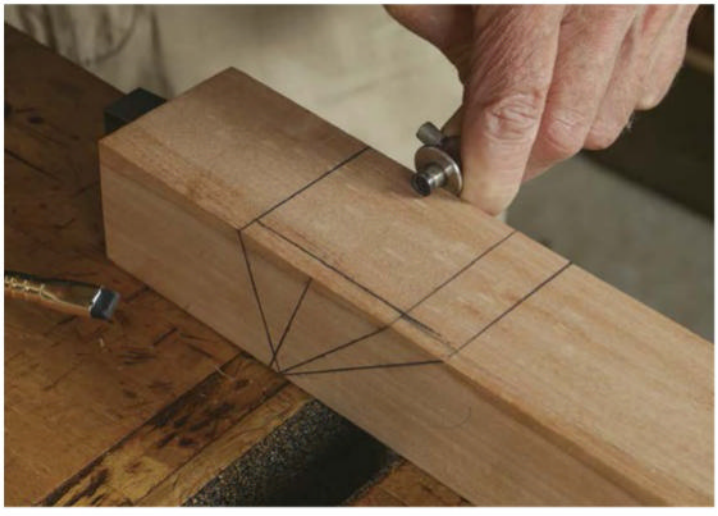


Transfer across. *Marking the angles on all sides keeps things consistent and square, and makes it easy to determine the plane's orientation from any side.*

ance because I've found many older wood planes with seized blades or cracks in the sidewall due to wood movement.

I mark the start of the mouth opening 3 in. from the front, and its end another ¼ in. past that. This is a very important area of the plane. If the opening is too tight, shavings will get clogged and the plane won't cut; if it's too large, the wood fibers being cut will be unsupported, causing tearout. The final opening will be about 5⁄16 in., but I start with ¼ in. and don't open it further until the blade is set in place to make sure I don't go too far.

On the side of the plane body, I draw all my different angles: 38° for the bed, 48° for the abutment, 70° for the wear, and 110° for the escapement. The wear and abutment angles start at the front of the mouth, and the others from the back of the mouth. With those lines drawn, transfer them square across the top and back down the other side to the mouth for a visual reference from any side of the plane. On the top, mark the sidewalls and the cheeks. The cheeks each taper ¼ in. from the shoulder of the abutment to the escapement,



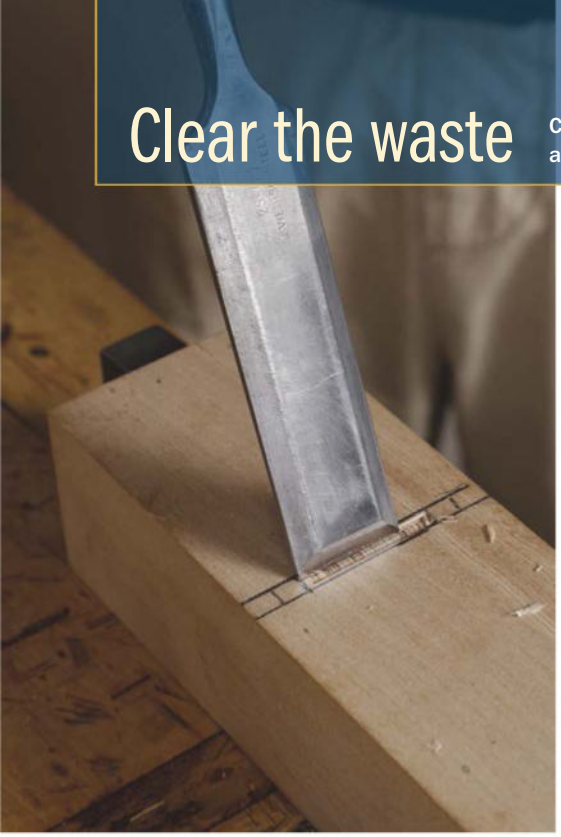
Mark the sidewalls. *To ensure a good fit of the blade side to side, Howes marks a crisp line for the sidewalls, leaving the width of the blade and a little extra for adjustment and seasonal wood movement.*



Angle the cheeks. *The angle of the cheeks allows the shavings to eject from the plane smoothly. The enlarged opening is also helpful for clearing any clogs if they occur.*

Clear the waste

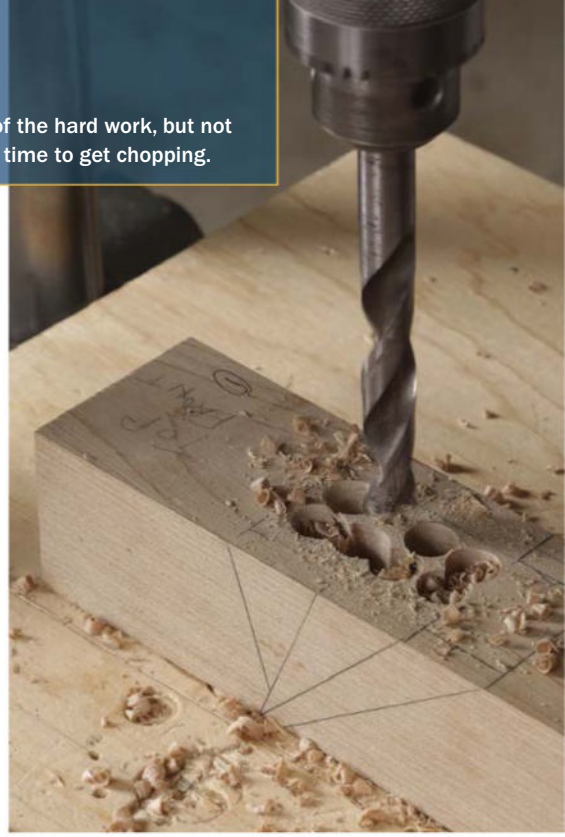
Clearing out the openings with a drill press does some of the hard work, but not all. So sharpen the chisels and roll up your sleeves—it's time to get chopping.



Start at the mouth. *Starting on the inside of his lines, Howes chops a shallow mortise around the mouth to prevent any tearout from the drilling that follows.*



Drill press for consistent angle. *With the table angled at 20°, drill a series of ⅛-in. holes into the mouth. A drill press works great, but a hand drill and guide block work as well.*



More material, bigger bit. *With the drill press table set back to 90°, work from the top of the plane, drilling a series of larger holes to remove the waste.*



Chop the cheeks. *For the time being, the cheeks should be chopped square to the plane body. These will eventually be angled but need to be a square reference for future work.*



Rough the bed angle. *Chopping with a wide chisel at an approximate angle, remove most of the waste before fine-tuning with a fresh-edged blade.*

Pare to the line

Hone the angles to your layout marks using guide blocks to ensure a consistent cut at the desired angle.



Fine-tune with a guide. *With the block set along the waste side of your layout line, chop away the material to establish the angle. Then move the block to your line and take a light paring cut, leaving a clean surface.*



Escapement. *Howes uses a long flat-backed chisel to gain the most reference on his large guide blocks. If you're working with smaller chisels, smaller guide blocks may be in order to finish the deep cuts.*



Say ahh. *Open the mouth to your layout lines at the approximate angle. Because the dimensions were planned to be shy, there will be more work to do once the blade is set.*

creating a nice wide opening for the shavings to clear.

Clear out the waste

Excavation starts with the body bottom up. At the mouth of the plane I make a ⅛-in.-deep mortise with my chisel; this will prevent tearout from the drilling that follows. Next, at the drill press, with its table angled 20° and the plane body still bottom-up, I drill a group of ⅛-in.-dia. holes, deepening the mortise I began with a chisel. This angled mortise creates the wear, and it will help keep the mouth narrow as the plane bottom gets worn down.

Still at the drill press, but now with the body turned right side up and the table set to 90°, I use a larger bit to clear out as much of the waste as I can without plunging into my layout lines.

I cut a block to 38° as a guide for my chisel and clamp it to my piece. I take a couple of roughing cuts, working from the drilled-out body toward my layout line, then a final fine cut right to the line, leaving a flat, consistent angle for the blade to bed nicely. To prevent blowout when my chisel exits the mouth, I place a sacrificial piece under the plane. I follow the same steps but with a 20° guide block to clear the rest of the throat and establish the escapement angle.

I clean everything up with a final pass, making sure the mouth is clear and the cheeks are square and even ½ in. from the outside edge before moving on to cutting the shoulders for the abutment.

Shape the abutment and cheeks

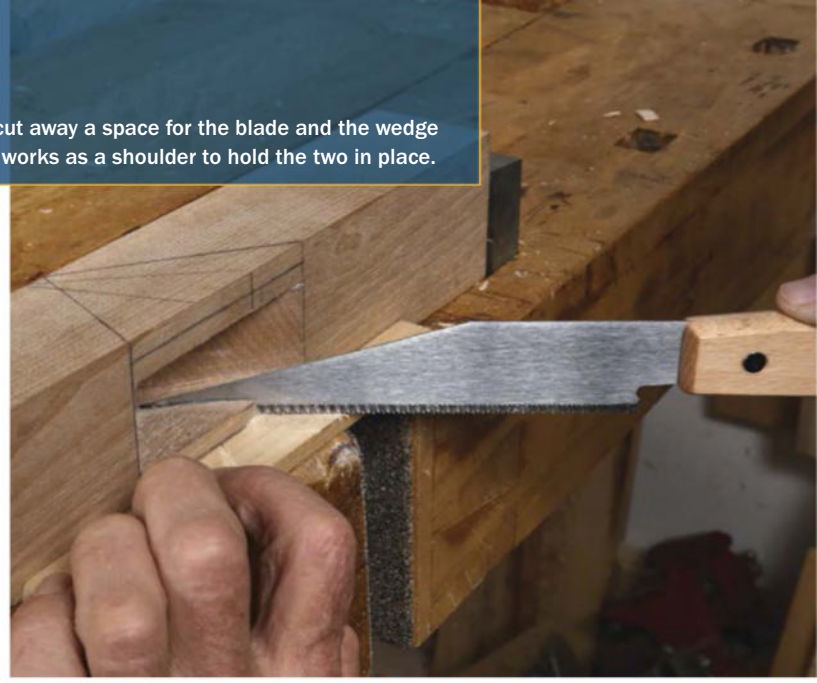
With the walls ½ in. thick, I want to cut away the 48° angle to create the ¼-in. abutments that hold the wedge and blade in place. With the plane on its side, I use a template I made

Turn to the cheeks

Using a tapered saw, cut away a space for the blade and the wedge to fit. What's left over works as a shoulder to hold the two in place.



Mark the angle. *Using a template cut to the 10° wedge angle, mark the line to cut the shoulder. The template helps keep the two sides equal, which will save time in fine-tuning later.*



Saw the shoulders. *Using a tapered saw allows Howes to get all the way down into the mouth of the plane to establish the shoulders and set the depth of the sidewall.*

to represent the blade and the 10° wedge. I hold it against the 38° bed angle and trace a line marking the abutment shoulder. I cut along the line with a precision Japanese pullsaw that is tapered. This allows me to saw all the way to my baseline even in the tightest parts of the mouth to get a clean shoulder throughout. Then I chisel across the plane body, taking incremental passes to pare down to the baseline. I use a variety of chisel widths to work down into the taper, getting smaller and smaller until I'm paring the last bit with my ⅛-in. chisel. It's important for these sidewalls to be an even ¼ in. or the blade won't project properly. I adjust any high spots with shopmade "floats" that consist of sandpaper glued to sticks cut at different angles to reach into tight spots. These inexpensive devices work well and are my go-to tools for flattening odd spaces quickly.



Saw at an angle. *The cheeks of the plane run at an angle from the abutment to the escapement. Saw from the mouth to the baseline at an angle, being sure not to cut into the mouth but to reach the baseline.*



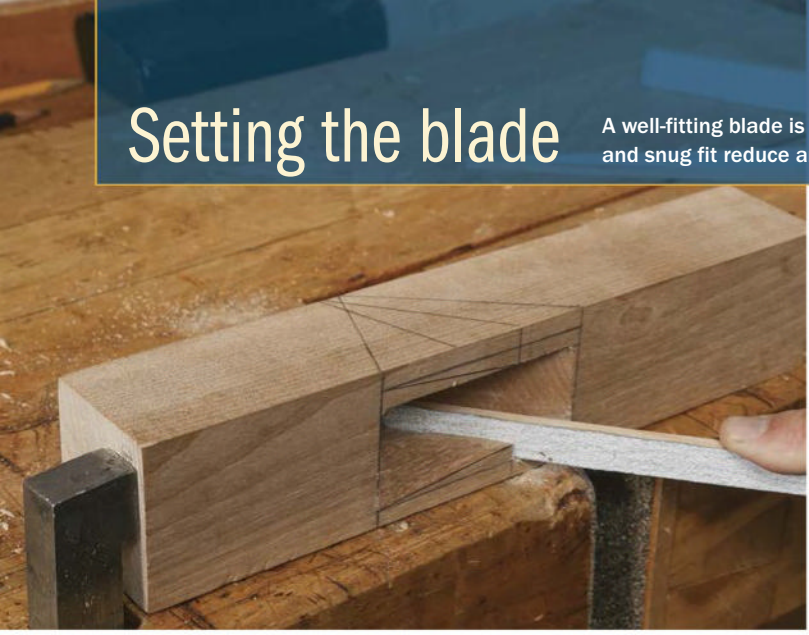
Even the sides. *Chop out and pare down the sidewalls. A smaller chisel will be needed to reach the tight point of the wedge.*



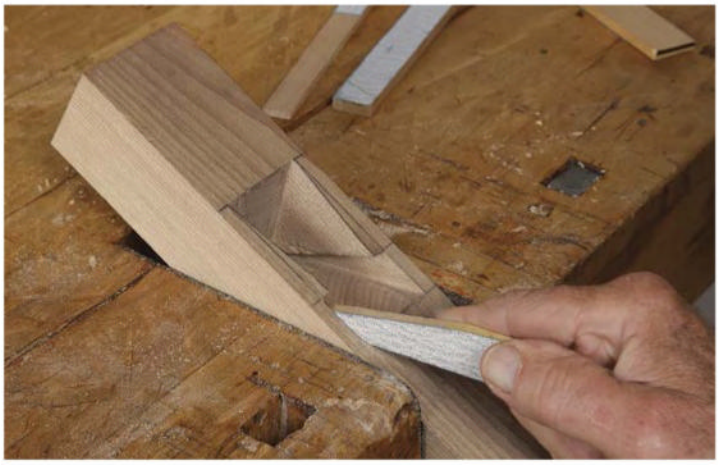
Connect the kerf. *Follow the layout line to chisel away the material from the abutment shoulder to the escapement, then taper that angle down to the point of the mouth.*

Setting the blade

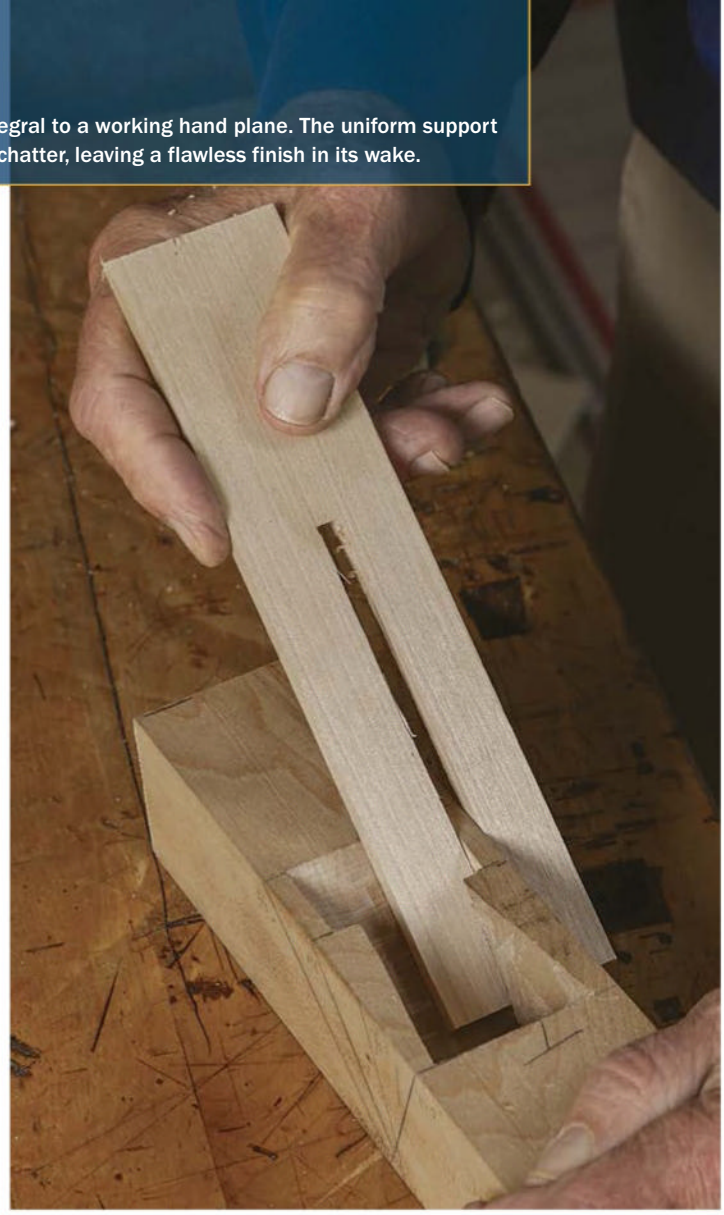
A well-fitting blade is integral to a working hand plane. The uniform support and snug fit reduce any chatter, leaving a flawless finish in its wake.



A simple way to fine-tune. *To remove any tool marks, Howes uses an assortment of sandpaper-clad offcuts to work these odd spaces to final size.*



Float on. *In traditional plane making a float would be used. Although Howes has many floats, he still reaches for the sandpaper sticks because of their ease of use.*



A crucial fit. *Check the thickness of the sidewall all the way to the mouth. A consistent ¼ in. will allow a perfect fit. Howes uses this shopmade gauge to test each side of the plane.*





The graphite trick. *Scribble a pencil along the entire bevel side of the blade. With the bevel facing down, put the blade into the plane and, with downward force, move it front to back. When the blade is removed, the graphite will have transferred to the high spots of the plane bed. Scrape away the graphite and repeat until there is much more graphite than bare wood.*

Fitting the wedge

The wedge holds the blade in place, and while seeming simple, it is easy to misstep. Adjusting a plane with a poorly fit wedge can lead to endless frustration and poor cut quality.



Saw the wedge. *With a bandsaw, cut out the rough blank of the wedge. Cutting this way yields two wedges, so a practice piece is always recommended for your first wedge.*



Smooth equals better hold. *With a smoothing plane, remove any sawmarks left on the wedge. A piece of sandpaper attached to a flat surface can also do the trick.*

To finish the shaping of the throat, I taper the cheeks from the shoulder of the abutment back to the escapement. This is a simple step that makes all the difference when clearing out shavings. I saw an angled reference line from the mouth to my baseline, then shave away the waste. This angle creates room for the shavings to clear and to get my hand in to break away any clogs that may occur.

Fit the wedge and blade

The traditional angle of the wedge in a wooden plane is 10°. If it's any higher, the wedge won't hold the blade still; any lower, and the wedge will jam in so tightly that adjustment will be difficult.

I start by bisecting a piece of ¾-in. stock into two wedges, keeping the offcut as backup. It can later be made into more templates or floats or even used for another plane. I clean up the sawmarks with a plane before I test the fit.

I insert the blade and the wedge blank and trace a line along the abutment's shoulder to the edge of the wear. To



Test fit. *With the blade in place, drop the wedge into the plane. It should seat all the way down, almost to the mouth opening, and hold the blade firmly with just a press fit.*



Fine-tune with feeler gauges. *With the wedge in place, check the projection of the blade. Tap the blade out until it's just past the sole of the plane, and check the mouth opening with a feeler gauge. Adjust the opening if you can't fit a gauge in easily.*

Fitting the wedge continued



Trace the shape. *With the wedge fit snugly in place, trace the edges where the shoulders meet the wedge. This will mark where to cut away to get the cat-ear shape.*



Escape plan. *The specific shape of the wedge allows room for the shavings to easily flow while keeping the blade supported. Start by forming the "cat ears" with a chisel by removing material between the shoulder lines starting approximately 1 in. from the tip.*

make way for shavings, I saw a notch centered in the wedge and starting about 1 in. from the tip, then create a slope cut with a chisel. Next, I add a taper to the ends of the wedge "legs" and taper the bottom of the abutments to match. The wedge must be carefully fit, so I use the finest feelers to seek out high points. I plane those down until there is snug contact all around, which will prevent any chatter in the blade.

Once the wedge is fit well, I make sure there is no unevenness on the blade bed by coating the blade with graphite and rubbing it about to mark high points. I scrape the high areas flat using a "blunt" chisel. I have ground the end of the blade on one of my chisels square, making it similar to a scraper. It is an ideal tool for removing fine shavings, particularly in end grain. With the blade in place, I make sure I can fit a feeler gauge between the blade and the mouth of the plane; if I can't, I use a chisel and open the mouth a little more. I sneak a quick shaving to feel how well the plane





Finalize the fit. *Set the wedge back in the plane, and this time use a mallet to set it snug. Check with a feeler gauge to make sure there are no gaps between the wedge and the shoulder. If there are, work the high spots down until the fit is correct.*

Carve the coffin shape

The term *coffin plane* comes from the tool's resemblance to a traditional coffin—wide in the shoulders but narrow in the head and at the feet.



Subtle curves. *Starting with a block plane, taper the sides from the mouth opening to the front and back. The dimensions aren't too important; find the size that fits your hand.*





Nothing fancy. *No compasses here, just a simple wooden button to mark the radius for the contoured parts of the plane. Howes uses only a chisel to shape the plane, taking large chopping cuts to knock off the edges, and smooth slicing cuts to define the curves.*



Drill for the striking button. *A hammer strike on the back of the plane is the common way to retract or remove a blade from a wooden plane. A striking button absorbs the impact and keeps the plane body from splitting on a weak section of grain.*



Soften the edges. *Make every edge smooth to the touch. This plane will spend lots of time in your hand and so should be comfortable for you to hold.*

works, and adjust the mouth more if necessary.

A shape true to the original

I want an exact replica of the original plane, so I trace and measure the coffin shape. I taper the sides from the mouth, which is the widest part, to the narrower front and back using my block plane. I use some 1¼-in. wooden circles to mark the contour of the plane and pare the back with my chisel to a pleasing rounded shape. I add some chamfers along the top of the sides and the ends to match the original. Finally, I add some curves to the top of the cheeks.

At the back of the plane, I add a strike button, which is used to draw the blade out of the plane by hitting it with a plane hammer. I could skip this step because not all wooden planes have one, but I believe it adds longevity to a plane by absorbing the continued impact of the hammer. I like to use a ⅝-in. dowel of contrasting wood, in this case walnut. I sand and finish all surfaces of the plane with Tried and True, except for the sole. Because I will reapply wax regularly, I only use wax on the bottom.

Lastly, as my makers mark, I insert a Canadian dime of recent vintage on the front of the wedge. The obverse of the coin features the Bluenose, a famous fishing and racing schooner built in Lunenburg, where the original plane is from; the Bluenose was built in 1921, probably about the same time as the plane. □

Bill Howes collects and creates woodworking tools in Halifax, Nova Scotia, Canada.

Online Extra

For more information on the history and design of Howes's favorite tools, go to **FineWoodworking.com/326.**

Build a Sawblade Caddy

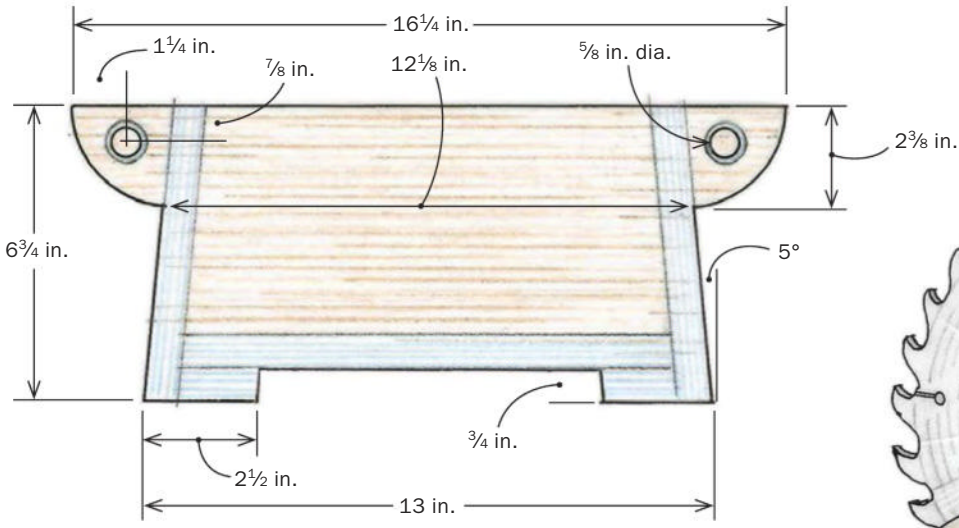
This little box keeps blades protected, organized, accessible, and portable

BY NEAL WALDEN



Table-saw blades are expensive, prone to damage, and dangerously sharp. I've seen lots of storage methods—from hanging them on dowels to sliding them into slots—and while these work, they can require removing three blades to get to the one you want, or some rummaging to distinguish one type of blade from another. I wanted to solve those problems with a storage system

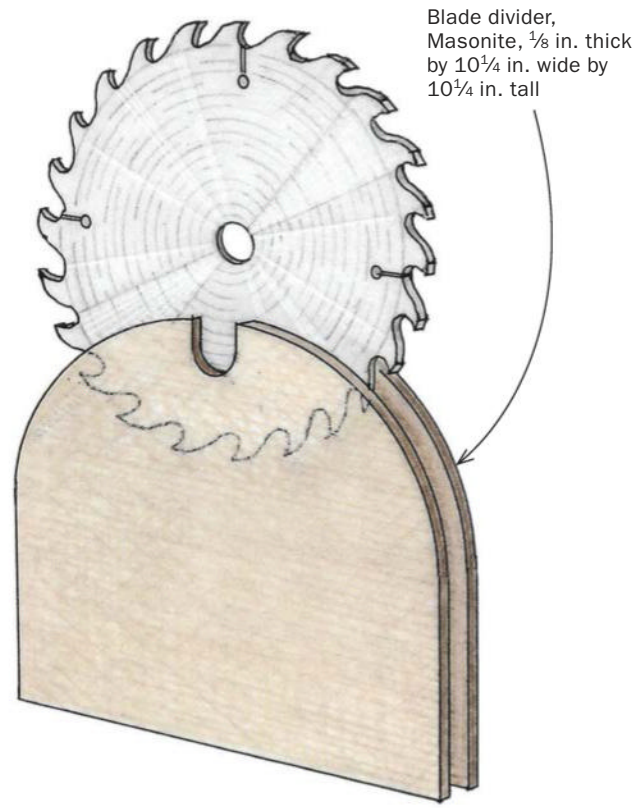
Photo this page: Michael Pekovich. Other photos: Jonathan Binzen. Drawings: Vince Babak.



FRONT DETAIL

CUTE LITTLE BLADE CADDY

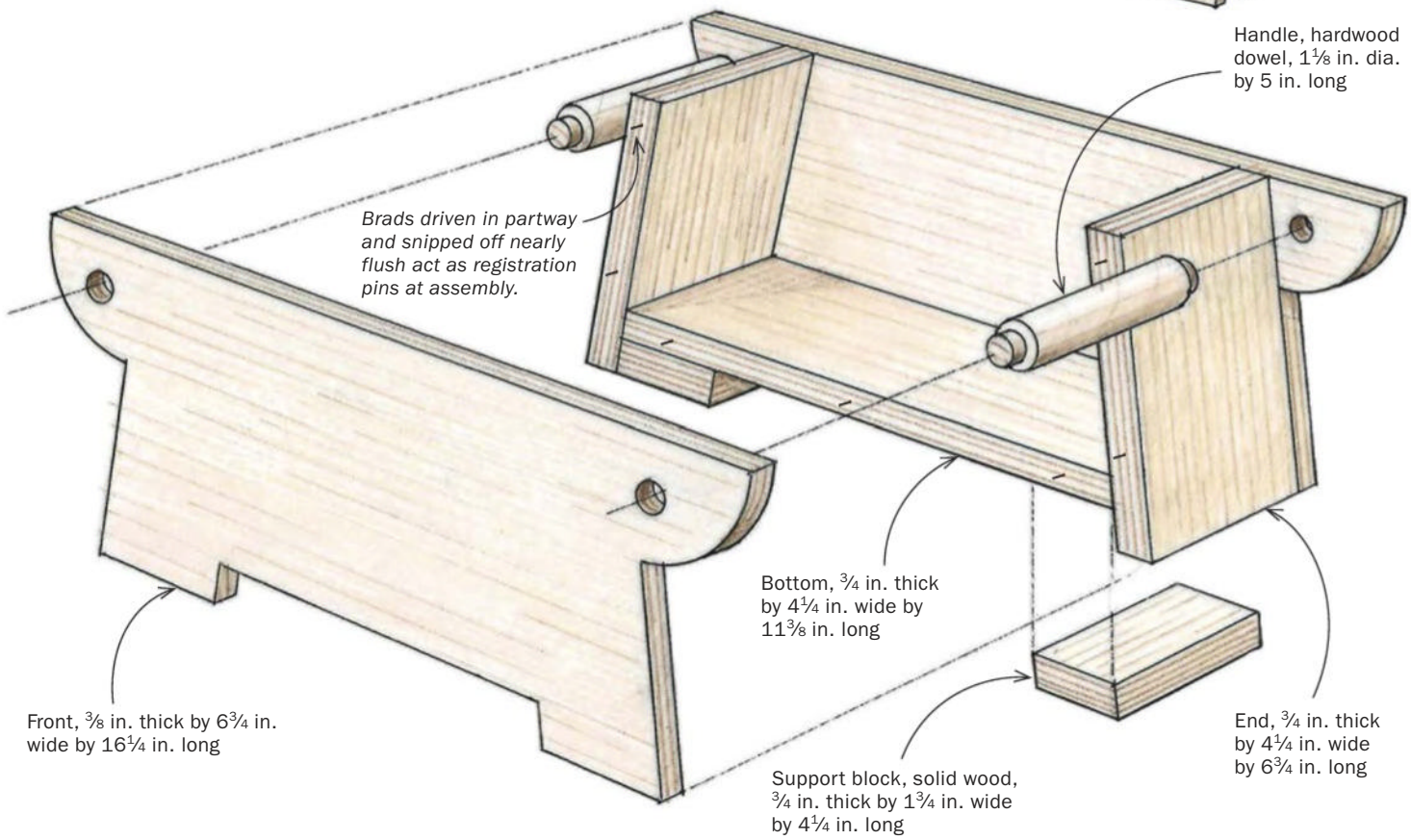
All parts are Baltic-birch plywood except where noted.



that would protect the blades from each other yet permit me to select between them quickly and pull out just the blade I need. And why not also make something to let me carry a kit of blades to the saw?

The genesis for the shape of this little caddy was the profile of an ancient Greek serving bowl I saw at a museum. While my design is absent a spectacular bronze patina, it is at least evocative of the main silhouette. It's funny what goes on in the mind of a woodworker.

I used Baltic-birch plywood for the main parts of the box—¾ in. for the ends and bottom, and ⅜ in. for the front and



Initial assembly

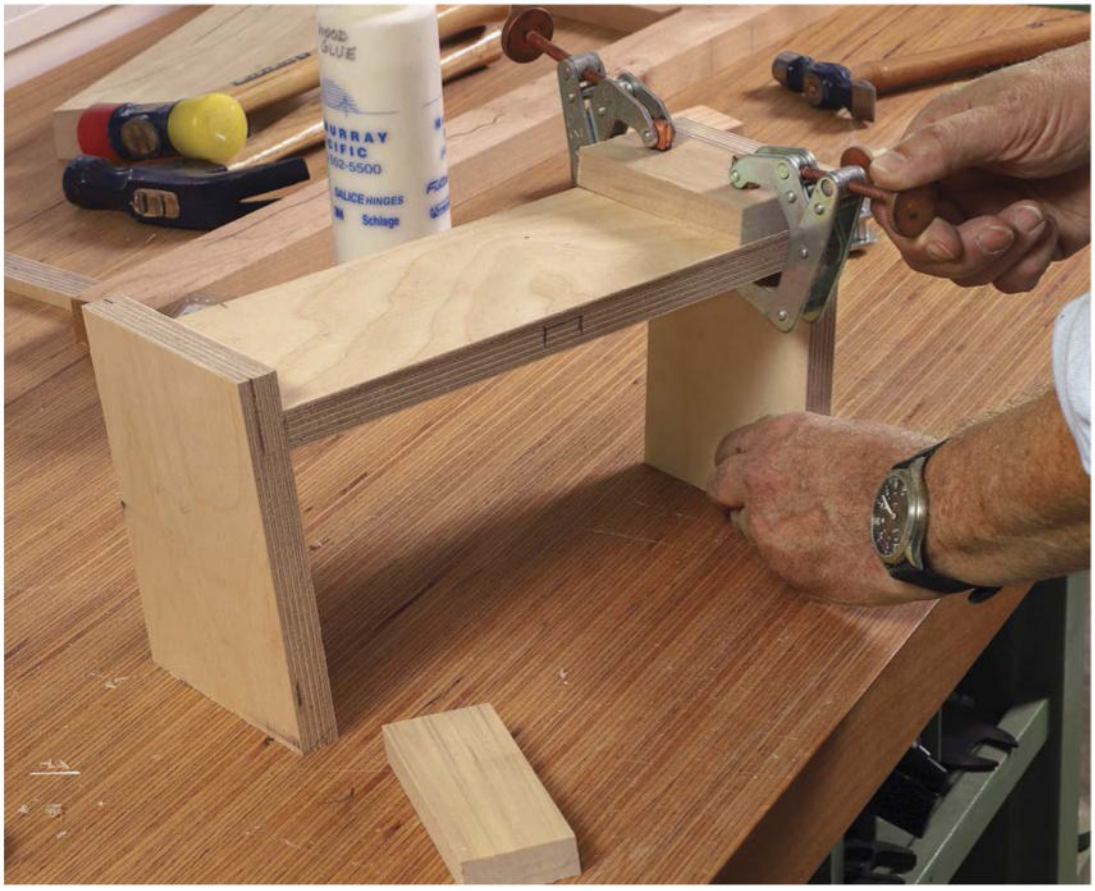
Walden starts assembling the caddy by connecting the ends to the bottom, then widening the feet with solid-wood blocks.



The ends are canted. *Crosscut the bottom to length with the blade tilted to 5°.*



The main squeeze. *Glue the ends onto the bottom using clamping cauls cut to the same 5° angle. You can use snipped brads or a biscuit between the ends and bottom to help register the parts during assembly.*



Solid supports. *After glue from the first assembly dries, glue solid-wood blocks under the bottom at each end to create wider feet for the caddy.*

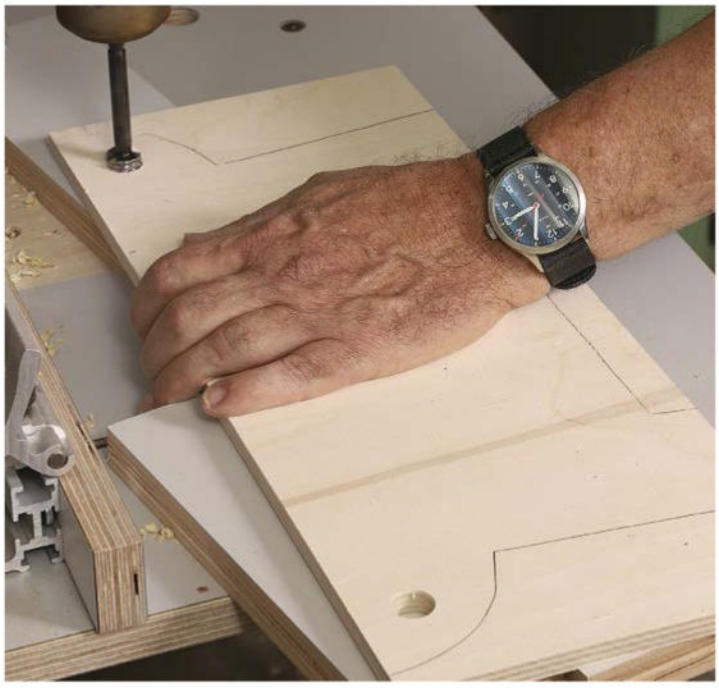
back. In truth, most any material would work here, but the Baltic edges are nice even if they are just sanded smooth. I added solid-wood blocks below the bottom on each end to extend the feet, and hardwood handles.

The dimensions of my caddy may work just fine for you, assuming that you'll be using it for 10-in. blades, but it's important to gauge the total thickness of your sawblade collection and add in ⅛-in. Masonite dividers. If you have lots of blades, you may need to increase the front-to-back space.

The first time I made one of these, I used a biscuit in each end of the bottom board to help with alignment when I glued on the ends, and that worked well. But this time around I skipped the biscuit and instead drove tiny brads partway into the ends of the bottom and snipped off their heads so they stuck out just

Panels and handles

While the center section assembly dries, prepare for final glue-up by sawing out and drilling the front and back panels and tenoning the ends of the handles.



Draw and drill. *Lay out the shape of the front and back panels on ⅜-in. plywood, and drill through-holes to accept the handles.*



To the bandsaw. *As you cut out the front and back panels at the bandsaw, leave a little extra meat to be flush-trimmed after assembly.*

slightly. When I dry-assembled the ends to the bottom, using a mallet to drive them tight, the little points made mating dents in the ends, and when I did the glue-up they acted as registration pins.

The captive dowel handles must first be tenoned on a router table or lathe. I cut mine on the router table, carefully rotating the dowel against the rotation of the bit and gradually feeding it toward my stop block. I made the through-tenons fractionally long so that after assembly I could plane and sand them perfectly flush.

The front and rear panels simply glue on without joinery. Using the snipped brads technique again made for a glue-up wherein the parts didn't slide around under clamping pressure. This led to a fairly stress-free assembly.

After assembling the box, I carefully flushed the parts to each other and sanded every-



Rout a round tenon. *Use a fence and a stop block at the router table to quickly make a round tenon on a section of dowel. As you press the dowel against the fence, gradually rotate it against the rotation of the bit, and advance it incrementally to the stop block.*



Final fitting

With the caddy's U-shaped center section cured, glue on the front and back, fitting the handles in place between them.



Helpful brads. *Drive brads partway into one glue surface, then snip off their heads, leaving 1/16 in. or so protruding. Press the parts together at dry-assembly, when alignment is easy. Then at glue-up the brads automatically register the parts.*

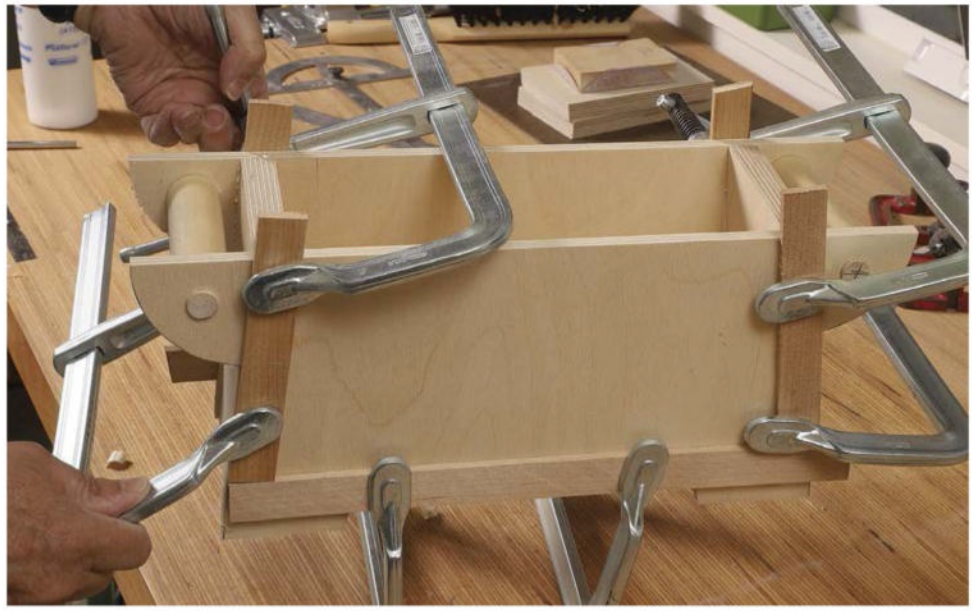
thing. I might leave the box unfinished, or I might apply an easy water-based brushable finish.

The loose 1/8-in. Masonite dividers that separate the sawblades were quick to make with a router pattern. The scooped notch at the top gives me a ready view of the tooth pattern of the sawblades, so I can make a rapid selection while I'm standing at my saw. □

Neal Walden works wood in Santa Rosa, Calif.



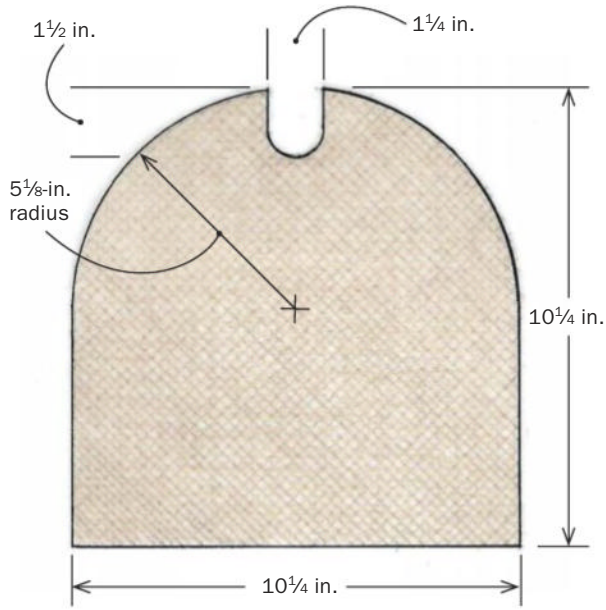
Hammering handles. *The handles get glued in when the front and back panels are assembled. Fit one panel, glue and fit both handles into it, then complete the box with the second panel.*



Clamping your caddy. *Cauls around the perimeter protect the front and back panel surfaces and focus the clamping pressure.*

Divider time. *After bandsawing the Masonite blade dividers, use a router and a plywood template to flush-trim the dividers to shape.*





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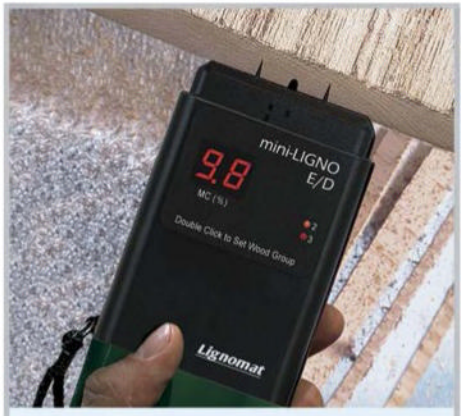

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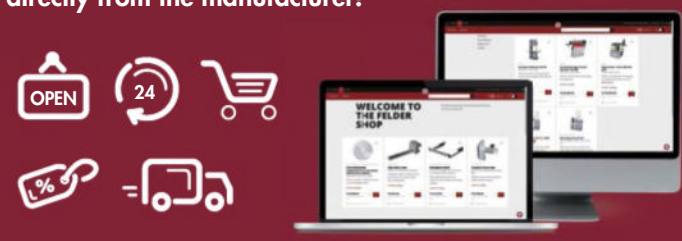

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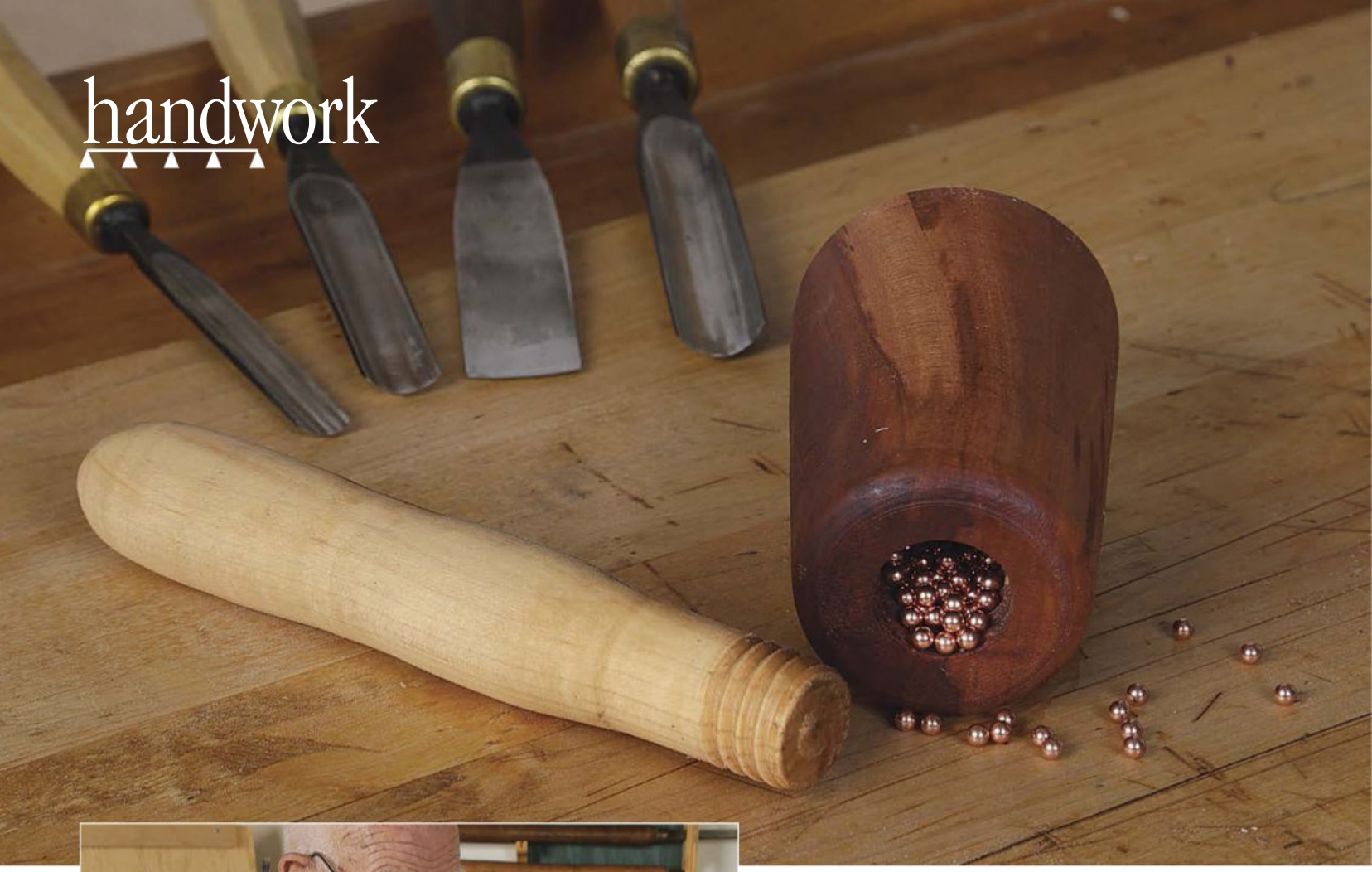




Make a dead-blow wooden mallet

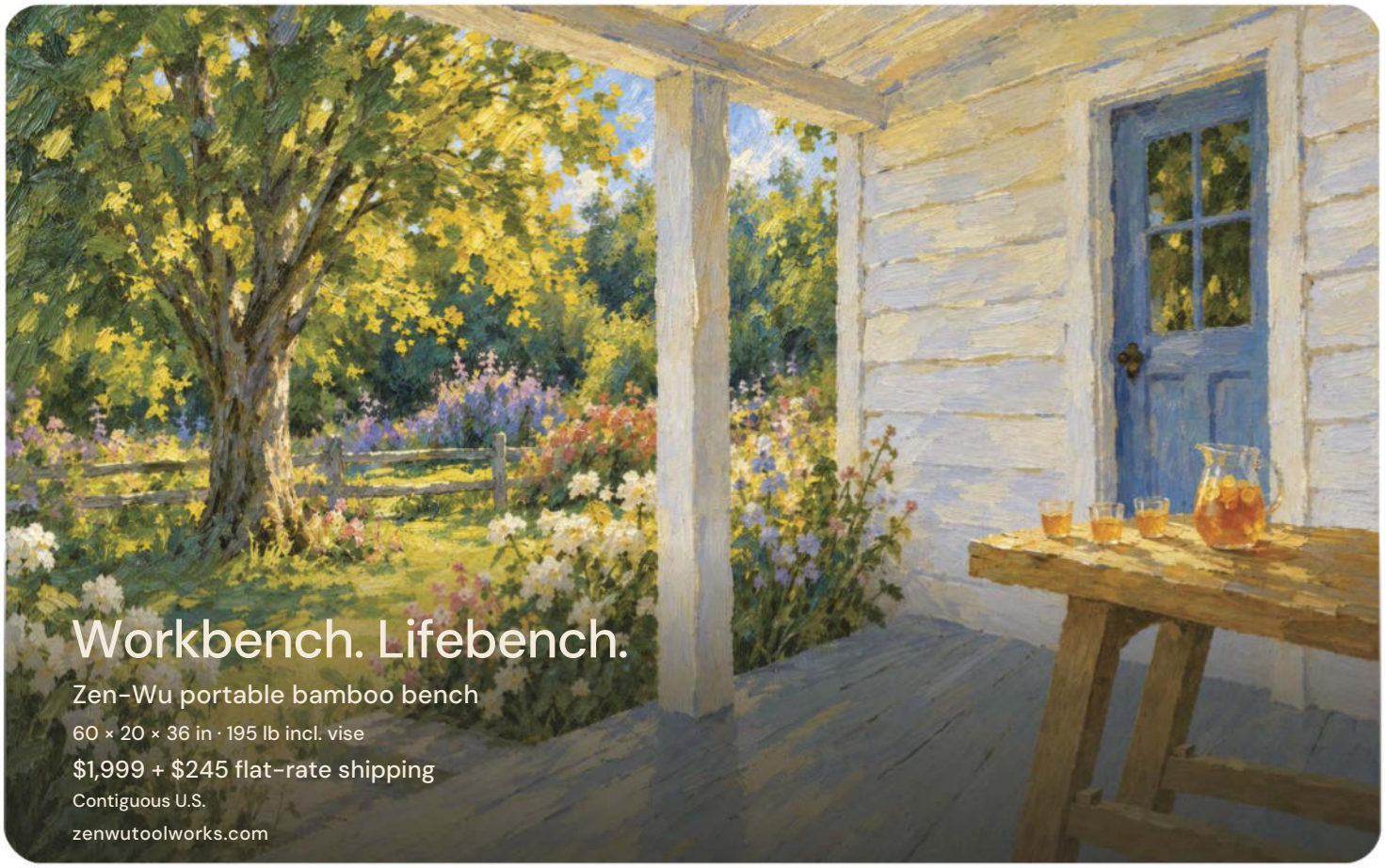
METAL BBs ADD EXTRA OOMPH TO A CLASSIC CARVER'S TOOL

BY BILL HOWES

Two things should never strike the end of a carving gouge or any wooden-handled chisel: the heel of your hand, which could sustain nerve damage, and a hammer, which has ruined many a good chisel handle. Traditional carver's mallets of wood or soft metal such as brass are gentler and safer. The contact of a dead-blow mallet, however, is even better. A dead-blow mallet contains metal BBs or sand within the mallet's head. The inertia of the loose pellets transmits the entire energy of the blow into the chisel. This is contrary to a solid object that has a recoil, which disperses some of the energy in opposing directions upon striking its target.

Dead-blow hammers made of polyurethane or rubber are not suitably shaped for carving. Most of them are

Photos: Owen Madden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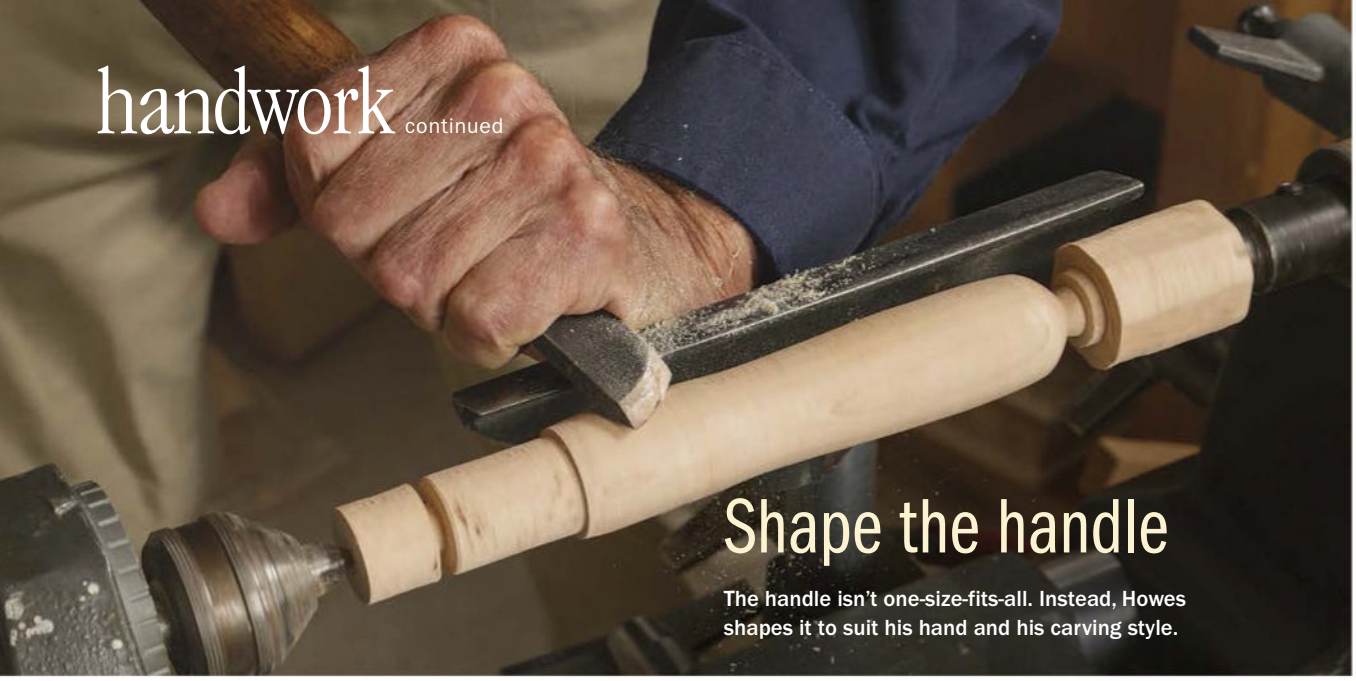

Shape the handle

The handle isn't one-size-fits-all. Instead, Howes shapes it to suit his hand and his carving style.

Mind the tenon. *Turn the handle shape as you please, but the tenon needs to be an exact 1 in. dia. for the best result with the threading tool.*

better suited for hitting broad things, not chisel handles. And their flat plastic face is prone to cracking when it strikes the wooden handle of a gouge. I wanted to incorporate the same dead-blow physics into my favorite wooden mallet, and with some trial and error I found the perfect balance between power and feel. The consistent contact of the round wooden face protects the gouge handle as well as the carver's wrists, but it delivers an added heft that comes in handy, especially when I'm working with stubborn woods.



No turning back. *The threading tool requires one steady pass. Backing out of the cut and restarting could lead to a loose fit to the mallet head.*

Online Extra

Learn how to sharpen and set the threading tool at **FineWoodworking.com/326.**

Shape the handle

While carving, my attention is focused on the cutting edge of the gouge, not on the mallet strike, so I grasp the mallet just where the head meets the handle, for better control. Because of this holding position, I want the handle to be relatively short—6 in.—and shaped to fit my grip, with a flare at the end to keep it from sliding out of my hand.

Starting with a 6/4 square maple billet, I turn the handle on my lathe. I establish the shoulder of the 1-in.-dia. by 1-in.-long tenon where the threads will be and turn the handle from there, creating a shape that feels organic. The tenon needs to be exactly 1 in. dia. to have a tight fit when threaded into the head, so I set my calipers exactly and then slowly work the tenon until I have an even 1-in. round.



Dig these threads. *For Howes, the key to crisp threads is to soak the tenon in mineral oil overnight. Sharpening the odd-shaped threading blade will result in the best cuts.*



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Turn the mallet head

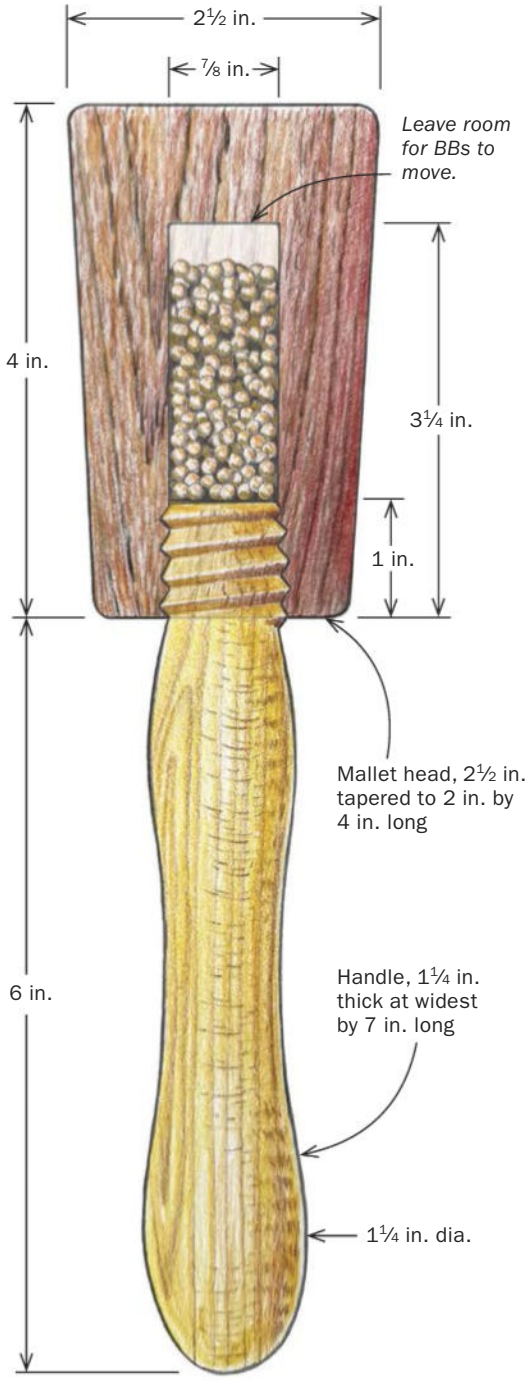
Starting from 12/4 stock, turn the mallet head to a tapered cylinder. Then drill the center, adding room for the BBs and the threads to mate with the handle.

The turned mallet. *Carving mallets are conical in shape for many reasons: increased surface area for longevity, uniform orientation for consistent strikes, and balance and symmetry to feel like an extension of the worker's hand.*

Drill the void. *Howes drills the head on his ShopSmith lathe, which ensures a perfectly centered hole, although a drill press would work equally well.*







To thread the end, an overnight soak in mineral oil eases the otherwise difficult cut. I use an old wooden-bodied Conover wood threading tool (also known as a die). These are getting harder to find, but plastic replicas are easily obtainable through woodworking stores like Highland Woodworking or Garrett Wade and work just as well. Work the die slowly, cutting threads down the tenon until the tool bottoms out on the taper at the shoulder. Cut the threads in one steady pass without reversing the cutter until the end. Backing out and trying again

Drawing: John Tetreault



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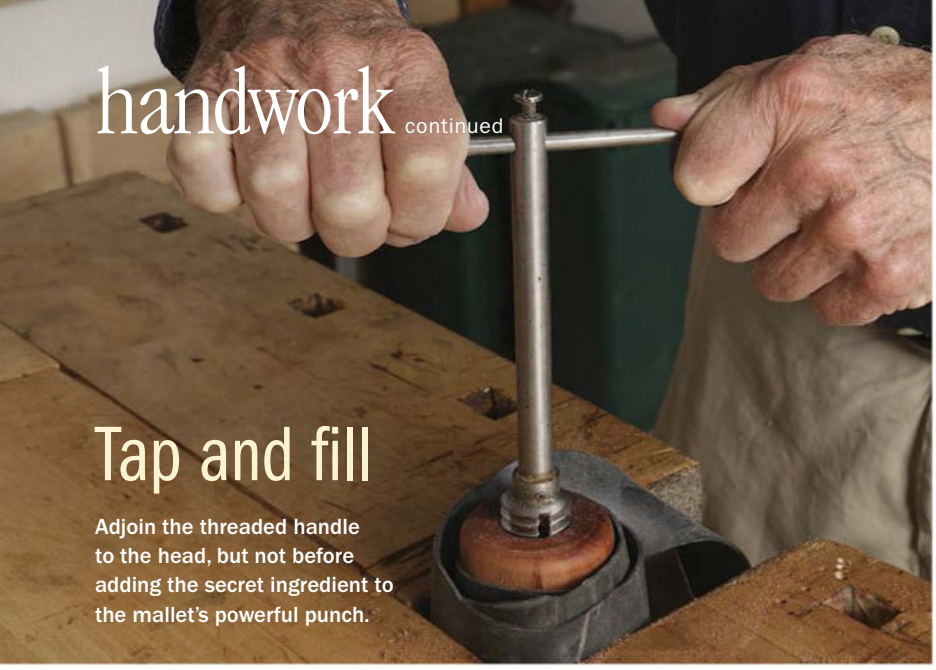

Tap and fill

Adjoin the threaded handle to the head, but not before adding the secret ingredient to the mallet's powerful punch.

TIP

STURDY WORK HOLDING



A rubber bicycle tube adds grip to the round mallet head in the vise, keeping it from spinning and preventing any damage to the mallet's face.



Tap the threads. *Tap the mallet head steadily and carefully to stay perpendicular to the mallet bottom. Having the handle straight when it's attached isn't just for aesthetics; it creates a consistent feel no matter where you grip the mallet.*



Fill the void, almost. *Carefully pour the BBs into the mallet head, leaving room for the handle plus a little extra. A steady hand prevents a lifetime of finding BBs around your shop floor.*



Adjust accordingly. *Screw the handle into the head and give it a shake. If it feels right, use it to give your favorite gouge a couple of chops. Try varying the amount of BBs until you hit the sweet spot.*

can lead to damaging the thread and creating a loose fit to the joint. I suggest practicing on a 1-in. dowel to get the feel for the tool and how to adjust it before moving on to your handle.

What's in your head

A lot of factors make up a good carving mallet, and I have tried a few iterations to find my preferred one. I found that this 4-in.-long tapered cylinder from 12/4 stock is the all-around best size, satisfying the ratio between weight, strength, and comfort. After turning the mallet head to size, I drill a ⅞-in.-dia. hole down the center to within ¾ in. of the end. Not only will this hold the BBs, but it will also house the handle once the hole is tapped. The tap and die set are made to cut 1⁄16-in. threads, so starting with a 1-in. tenon and a ⅞-in. hole creates the perfect fit. I wrap the head in a piece of bicycle inner tube and place it in my vise; the rubber compensates for the taper and adds grip so the handle doesn't spin from the torque of the tap cutting the threads. I turn the cutter until I've tapped just over 1 in. so the handle will seat snugly to its tapered shoulder.

I used to fill the cavity of the head with #7 lead shot. However, I should have known better; due to lead's toxicity, I had problems sourcing the shot. Copper-covered steel BBs are as good as lead shot, if not better, and their smaller diameter allows me to fill the space more evenly, which makes up for the slight loss in weight. I fill the head almost full, leaving only enough space so when the handle is inserted and I shake the mallet, it rattles just a bit. The feel of carving with this mallet is unmatched compared to my other solid wood or brass mallets, and it finds its way into my hand on most projects.

Bill Howes is a woodworker in Halifax, Nova Scotia, Canada.

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The myth of mistakes

BY BRIAN BOGGS



After four decades in the shop, I've learned about the fine art of screwing up. An expert on mistakes, I have made some doozies.

As a furniture maker, I have always loved exploring new ideas, pushing limits, and walking closer to the edge of what seemed possible. That is fertile ground for mistakes. When I have added employees, deadlines, overhead, and demanding clients, the soil has gotten richer still. And the mistake farm has been productive!

By the time I began teaching, I learned that students rarely found a way to mess something up that I had not already found myself. That was mostly true for employees as well, although some of them were impressively creative in the endeavor.

The myth of mistakes is the belief that when something goes wrong, the story is complete. A mistake happened. Someone is to blame. The chisel was dull. The guide slipped. Someone was careless. Attention wandered. End of discussion.

I've found there's often more to the story.

One project in particular brought that truth into focus. It was a 12-ft. dining table for a penthouse in New York City. Because of elevator constraints, it had to be made in two sections and assembled on-site. Its setting was to be spectacular. Three walls of the room were floor-to-ceiling glass. That kind of light is merciless for a finish. Every defect is magnified. Knowing this, when we sprayed and buffed the finish in our Asheville shop, we lit it every way we could to make sure it was ready to go.

It looked great, and we had it delivered.

Then I got a call. Something was wrong with the finish. I flew to New York to see it for myself. What the new environment revealed was an uneven sheen from the buffing process. Worse still, there were several pits in the finish that had been completely invisible in the shop under any lighting we had tried.

I honestly did not know what to do. Neither did my finisher. Nor did the other professionals I called for advice. What I needed most in that moment was a private place where I could scream some very special words at full volume.

Bringing the table back to the shop was not an option. I needed a perfect on-site repair, and quickly. This was far outside my wheelhouse.

The pits had to be filled, then blended into the surrounding finish—gloss conversion varnish. I had to level the repair but not disturb the finish around it. Respraying was impossible.

Getting the fill to stick was not the real challenge. The challenge was leveling and blending it without burning through the original surface and without leaving a trace of the repair in impossible lighting. The only tool that might be capable of this was a finely tuned scraper.

There was just one problem. I had never successfully scraped a finish without causing more damage than I was trying to fix.

So it was time to learn. Over the next week I did exactly that—practice, practice, practice. It took two more trips to New York to get the finish right. But I did not burn through the existing conversion varnish, I got no varnish on the fine silk rug, and the table looked great when I was done.

This was, hands down, the most expensive screwup I was ever part of. I'm not sure I gathered all the wisdom that was placed on the bench that day. But I know this: The experience forced me to elevate my scraper game in a profound way. And that skill has paid dividends ever since.

It also strengthened something less visible. My ability to stay calm long enough to find a way through trouble rose to a new level. A small finish problem now feels like a walk in the park.

For much of my adult life, I have believed that the universe is always offering us lessons we need to learn. Those lessons often arrive in painful packages—an accident, a careless comment, a missed flight, a failed relationship. It took me years to recognize that shop mistakes belong in the same category. The mistake is the wrapping paper. The gift is the wisdom inside.

So the next time something goes wrong at the bench, fix what needs fixing. Replace the part. Sweep up the mess. But before you move on too quickly, ask what else has been placed in front of you. There may be more on your bench than a ruined piece of wood.

Brian Boggs makes furniture (and the occasional mistake) in Asheville, N.C. This is from an essay originally published on BrianBoggs.Substack.com.

Photos: courtesy of Brian Boggs

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