

Fine
WoodWorking

Essential bench jigs
for handwork, p. 46



Tools & Shops

A small, sturdy workbench

Dust collection
for small shops

What drill bits
do you really need?

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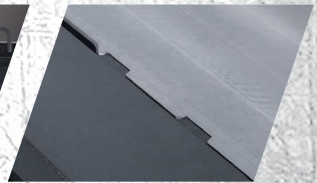


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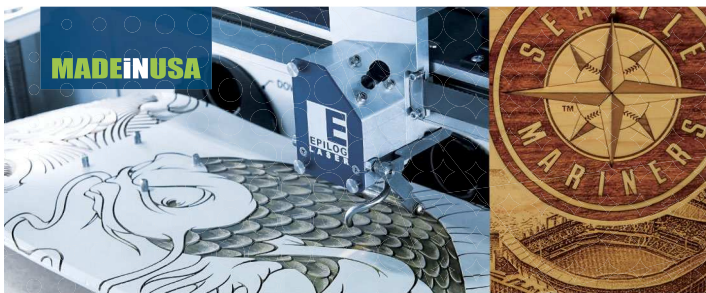
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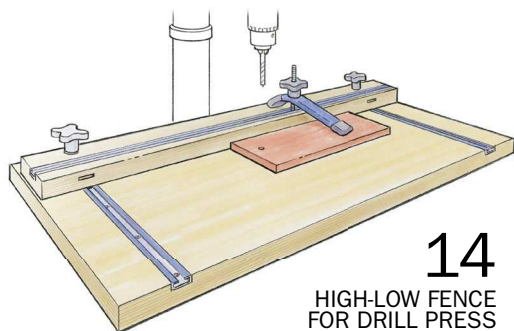
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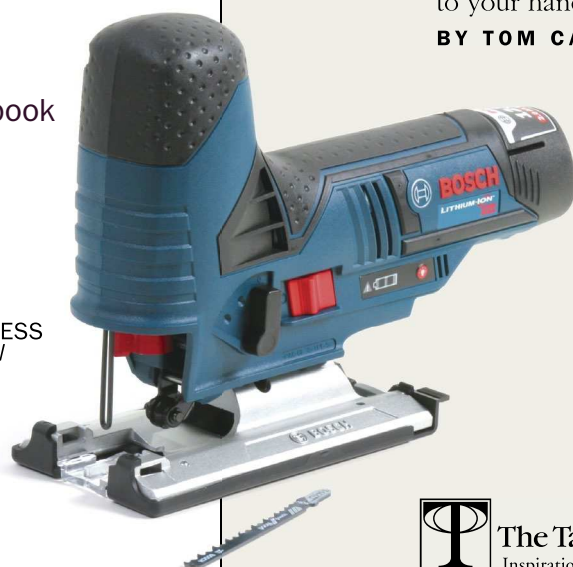
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Cover photo: Matt Kenney



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on the web

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Visit FineWoodworking.com/258 for free online extras, available Nov. 2. And don't miss the collection of free content on our new website, including tool reviews, an extensive project gallery, and must-read blogs.



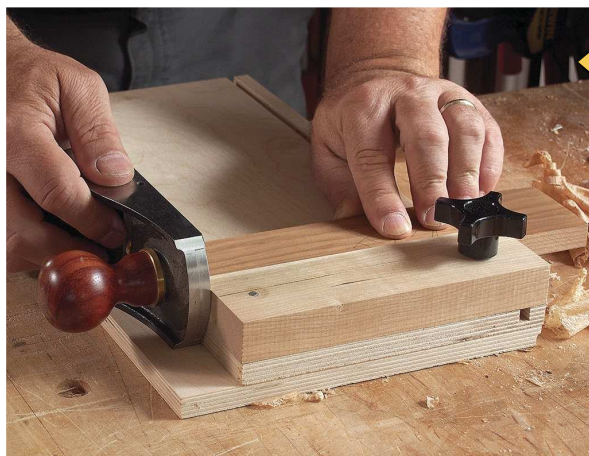
VIDEO Secrets Revealed

Take a look inside Dan Smith's beautiful Maine shop and see how the compartments of his tool cabinet (p. 28) artfully reveal their contents.



VIDEO Knockdown Workbench

Matt Kenney demonstrates how the clever interlocking joinery in Eric Tan's rock-solid workbench (p. 32) allows it to break down for transport.



VIDEO Saw Slotting

One of the most intimidating parts of building a handsaw (p. 68) is making sure you have the saw slot perfectly straight. Assistant editor Dillon Ryan shows a simple technique that eliminates any chance of error.

VIDEO Bench-Jig Breakdown

See Mike Pekovich's six essential bench jigs (p. 46) in use, and hear why he considers them an integral part of his workflow.

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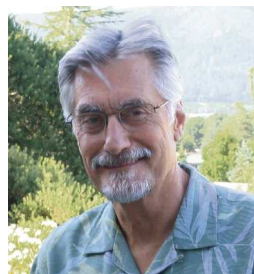
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contributors

After 20 years working for private companies, **Eric Tan** (designer of “A Small, Sturdy Workbench”) left his 9-to-5 job to begin a career in woodworking. For the past 18 years, Tan has been writing, designing furniture, and teaching woodworking full time. In recent years, his focus has been on using traditional Ming-style joints to create contemporary wood art. Tan and his wife live in Taipei, Taiwan, where he owns Harimau Gallery & Workhouse. Tan is an avid reader, so when he is not working, he can usually be found reading something either for an upcoming project or just for fun.

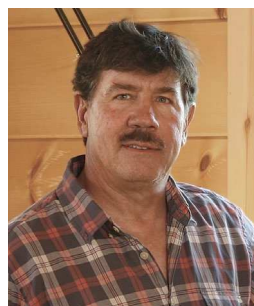


An avid woodworker and metalworker, **Anatole Burkin** (“Dust Collection for the Small Shop”) joined *FWW*’s editorial staff in 1998. Before he retired in 2014, Burkin had risen through the ranks to become a vice president. To Burkin, “the most rewarding part of woodworking is solving design and engineering problems, then seeing them to fruition. If there’s one moment, however, that always gives me pause, it is when finish goes on a really beautiful piece of wood and the figure and grain come alive. Wow! I never get tired of that. Like watching the sun rise.”



Tom Calisto (“Build Your Own Handsaw”) became serious about building furniture during his freshman year in college while working toward a degree in engineering. But he spent 20 years as a mechanical engineer before he decided to chase his dream. Today he creates custom furniture at his shop in North Carolina and teaches woodworking and saw making at the Woodwright’s School. “I have always been passionate about designing and building. I was the kid on the block to visit if you wanted a tree house or a bike fixed.” For more, go to windwardwoodworks.com.

Dan Smith (Designer’s Notebook) is an orthopedic surgeon in St. Joseph, Mo., who specializes in reconstructive surgery, including knee, shoulder, and hip replacements. But woodworking has always competed fiercely with medicine for his attention: His subscription to *FWW* dates to issue #19, when he was a third-year medical student, and he admits he would read it before reading his medical journals. Over the years, in addition to making clocks, built-ins, and many pieces of furniture for his family’s house in Missouri and for a summer place in Maine, Smith has also built four boats.



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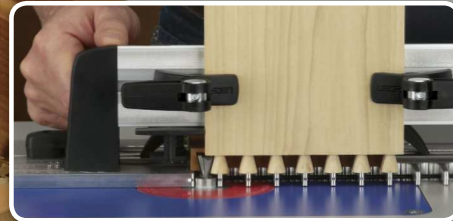
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From the Editor

FINE WOODWORKING LIVE RETURNS

Join us for the premier event in woodworking

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Ever since we had our last live event, back in 2013, a lot of folks have been asking when we would do it again. Well, I'm excited to announce that Fine Woodworking LIVE will return this April.

Like our previous events, Fine Woodworking LIVE 2017 will be a can't-miss weekend for anyone looking to share the passion, be inspired, and take a deep dive into the craft of woodworking. This is your chance to meet the experts behind the magazine and website you love, to learn from the best and brightest instructors in the field, and to network with a community of fellow woodworkers.

The event will feature renowned furniture maker and designer Hank Gilpin as keynote presenter. There will also be plenty of classroom instruction, technique demonstrations, and design inspiration from familiar faces, including Christian Becksvoort, Garrett Hack, and the rest of our contributing editors, plus distinguished woodworking masters such as Allan Breed, Peter Follansbee, and Michael Cullen.

Fine Woodworking LIVE 2017 will be held at the Southbridge Hotel & Conference Center, conveniently located minutes from Sturbridge, Mass., and an hour's drive from Boston and Springfield, Mass., Hartford, Conn., and Providence, R.I. The hotel and conference center includes the finest amenities for meeting spaces and guest accommodations. It's a perfect environment for woodworking classes, demonstrations, and get-togethers.



For information, you can go to finewoodworkinglive.com, where we will be posting updates and announcements. It's also where you will go to register, once we are ready for signups. Though there's lots of work ahead, my team and I are looking forward to meeting and greeting you all. And don't be surprised if you find any of us taking in a class or two. See you there!

—Tom McKenna, editor

Pros weigh in on antiques article

Being in the business of restoring 17th- and 18th-century American furniture, I enjoyed reading Steve Latta's article "Learn from Antiques" (*FWW* #255, pp. 42–48). The cabinetmakers of the past certainly understood wood movement, but many times just chose to ignore the consequences for whatever reasons. A lot can be learned from their mistakes and applied to new construction with very little additional effort.

—KEITH LACKMAN, New Tripoli, Pa.

I was pleased to see this article and feel that I might be qualified to add a few cents' worth of frosting to this cake. Many years ago I earned a degree in Wood Furniture Design from Boston University's Program in Artisanry, and for the past 22 years I have made my living in the furniture repair and refinishing business. I can tell you with no exaggeration that, of all the furniture that has come through my shop, no more than 5% is constructed properly, regardless of age.

What the article didn't include was a discussion of manmade sheet goods as an alternative to solid wood in cabinet or table construction where cross-grain issues come into play. The molding applied to the side of a carcass under the top or at the base is an example of this. In my opinion, the author's solution (partial glue only) is a compromise that only mitigates the problem but doesn't solve it. In the case of tables: I have never seen an antique solid-wood kitchen or dining-room table that did not have some signs of warping, cupping, twisting, or splitting (even when quarter-sawn.) Therefore, any table that I make larger than a sofa table or coffee table would have to be veneer over an MDF core. Purists would have a problem with this but I am a pragmatist and am able to guarantee flatness over time that a solid-wood top can never achieve.

—DAVID L. SMITH, Leominster, Mass.

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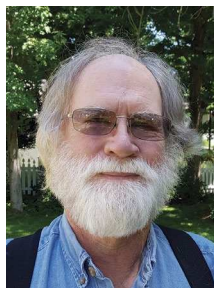
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Best Tip



Before retiring, Steve Alling was a design sculptor for General Motors. His love affair with woodworking began when he was 12 and read *The Boy Mechanic*, a book of projects by *Popular Mechanics*, and made a working wagon that looked like a World War II jeep. Now 76, Alling is building a new kitchen for his 100-year-old house.

Sanding block is quick to make and easy to use

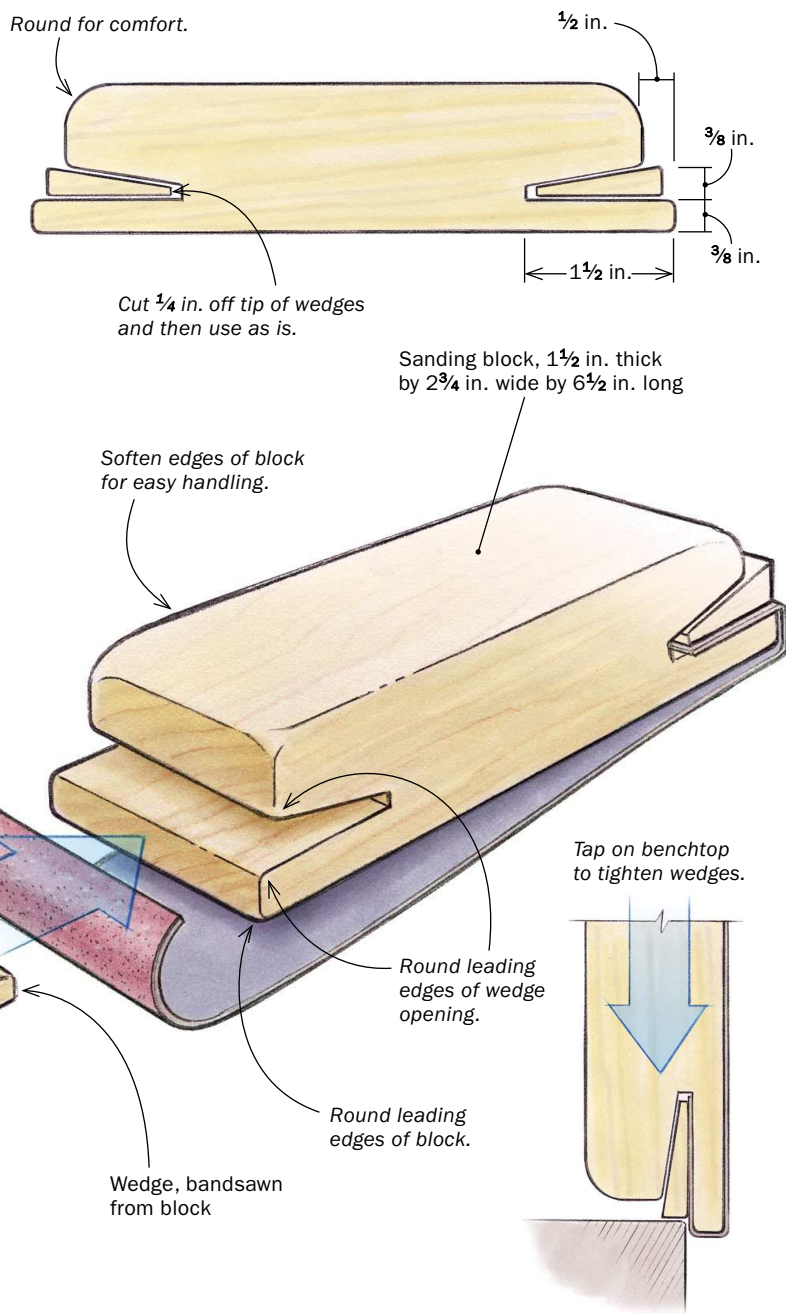
A sanding block is an essential piece of woodworking equipment, with designs ranging from basic to high-tech. I've had good luck with this bandsawn block for many years. It can be made quickly and sized to fit a strip of sandpaper cut from a conventional sheet. The key is the wedges, which go in easily and pull the paper taut.

I usually make the block by gluing up two pieces of maple, which stands up well to the wedging action. The wedges are bandsawn from the ends and fit right back into their notches after the paper is inserted. A few taps on the edge of the bench and the wedges are tight.

I make a few other cuts and contours on the block for comfort, but that's about it. You can make more than one block and keep your key sandpaper grits locked and loaded.

Be sure to tear the sandpaper sheet crosswise into four equal strips, each about $2\frac{3}{4}$ in. wide by 9 in. long.

—STEVE ALLING, Romeo, Mich.



A Reward for the Best Tip

Send your original tips to fwtips@taunton.com or to Workshop Tips, Fine Woodworking, P. O. Box 5506, Newtown, CT 06470. We pay \$100 for a published tip with illustration; \$50 for one without. The prize for this issue's best tip was a Stanley Sweetheart 750 series 8-piece socket chisel set.



Quick Tip

Flip the can for a smooth pour

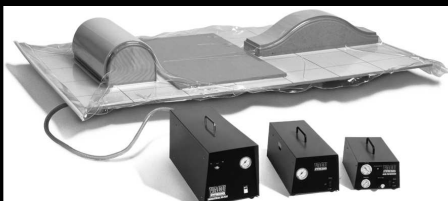
When pouring finish and thinners from those cans with the spout near one edge, flip the container so that the spout is near the top, not the bottom. You'll get a smooth pour instead of sloshing and splatter. It works even better on big 5-gal. buckets of paint and finish, as every good contractor knows.

—MARTHA COLLINS, Petaluma, Calif.

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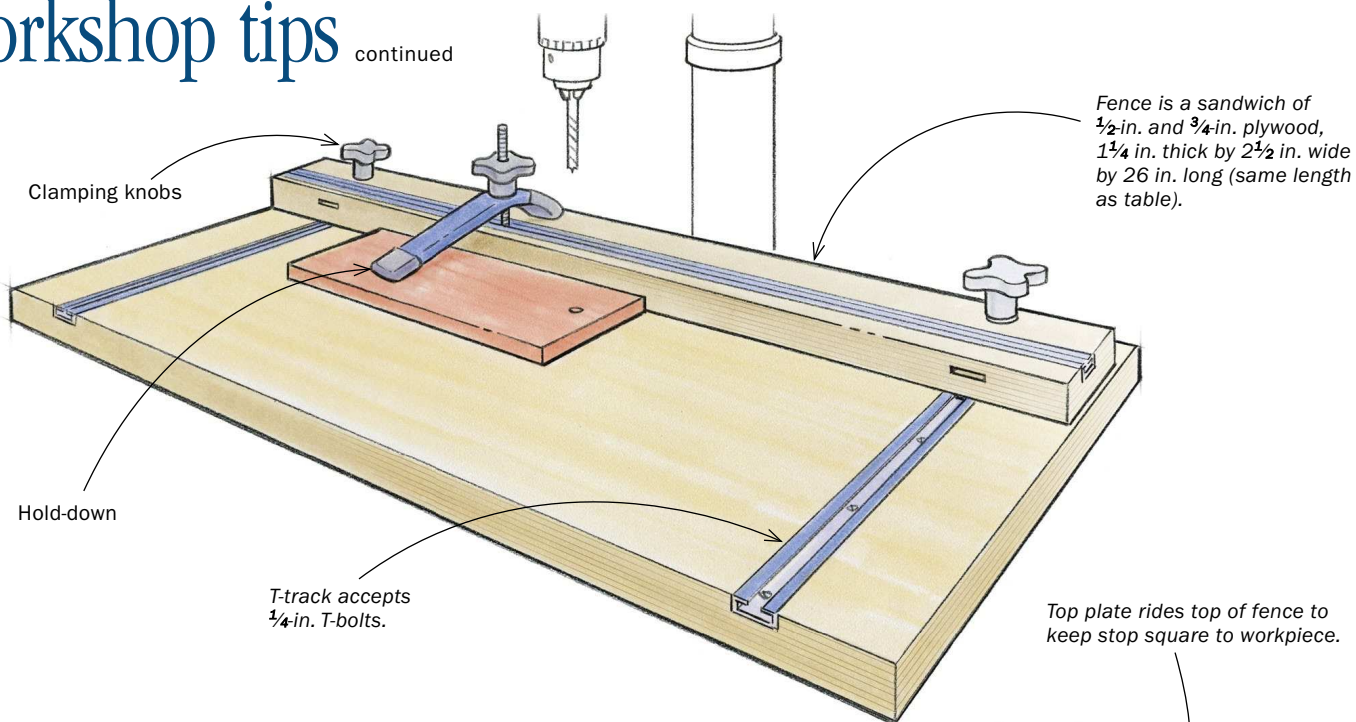


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workshop tips continued



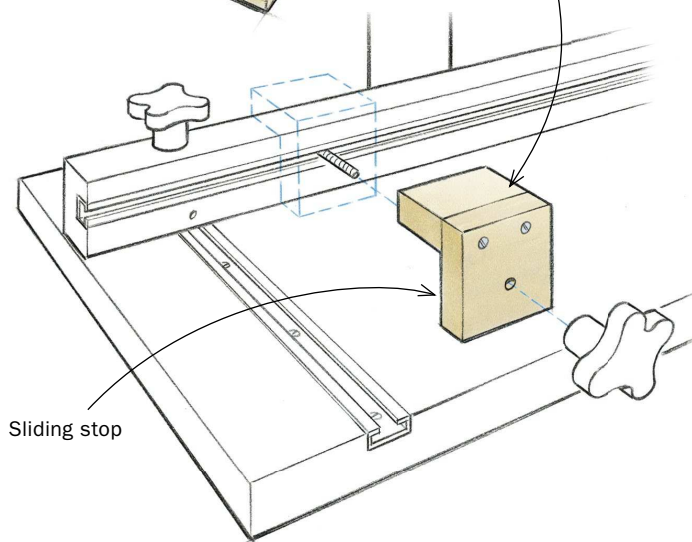
High-low drill-press fence does it all

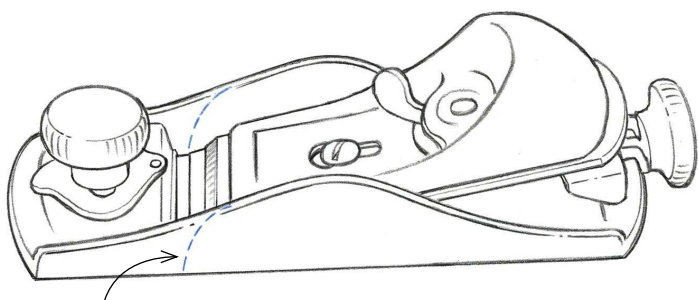
When using my drill press, I find that some workpieces need to be held down firmly, while others benefit from a stop block for repeat positioning. This two-position drill-press fence does both jobs perfectly. I can use it upright with a stop block or down low with a hold-down—either one positioned anywhere along the fence's length. The fence attaches and adjusts quickly in both positions by means of T-tracks in the table.

The fence is a plywood sandwich that I dadoed for the T-track and bolts. For the T-bolts that secure the fence to the table, I just drilled holes.

The hardware is from Rockler.com.

—DEAN M. VANDE GRIEND, Story City, Iowa

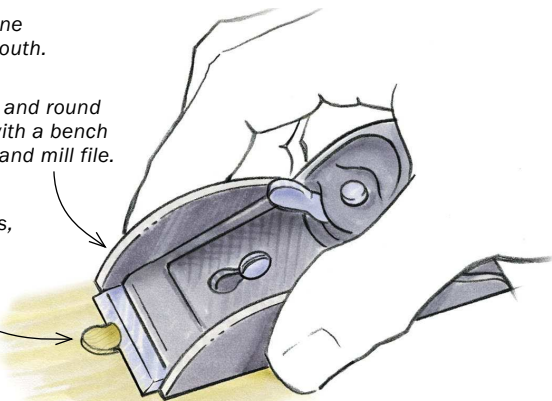




Cut off toe in line with back of mouth.

Smooth and round edges with a bench grinder and mill file.

Trim wood plugs, dried glue, and much more.

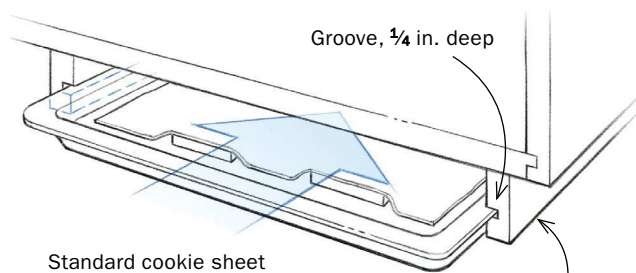


Turn a block plane into a chisel plane

For tasks like trimming wood plugs or removing dried glue in corners, I've wanted a chisel plane for a long while. I know they are available commercially, but I had a brainstorm when looking at a broken-down block plane in my parts pile: "Why not just cut the toe off of this?"

I took a hacksaw and made a curving cut, ending at the back of the mouth. Then I used a bench grinder to round the edges, and a smooth-cut mill file to refine the shape further and remove burrs. I lapped the sole flat on sandpaper and stones and honed the iron, and my shopmade chisel plane works wonderfully. By the way, my original beat-up block plane was a Stanley-Bailey 12-960 low-angle model, which is also available new for under \$40, so that's the most you'll have to spend.

—BRYAN KOPPERT, Loudonville, Ohio



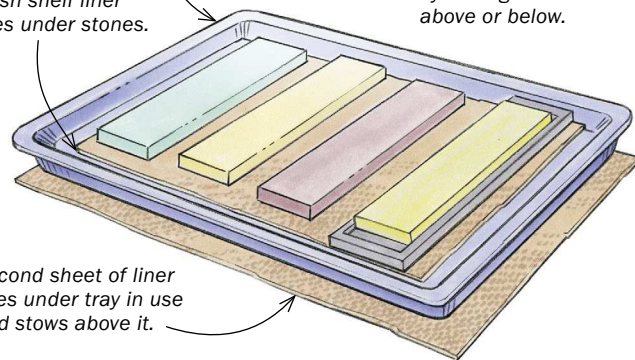
Standard cookie sheet

Groove, 1/4 in. deep

Mesh shelf liner goes under stones.

Blocks can be attached by driving screws from above or below.

Second sheet of liner goes under tray in use and stows above it.



Stowaway storage for sharpening stones

Not having room in my small shop for a dedicated sharpening station, I turned a cookie sheet into a stowaway station that tucks under a wall cabinet or on the underside of a shelf. The key is two grooved blocks. I attached them by driving screws up through them and into the cabinet. You also could hang the blocks by screwing down into them from above.

I put one rubber shelf liner on the sheet to keep the stones from sliding around in use, plus my three grades of waterstones, my stone holder, and a diamond plate. I stow a second piece of shelf liner above the stones. It goes under the tray when I put it down on the countertop. When I'm done sharpening and honing, I throw the extra piece of shelf liner on top of the stones, slide the tray into the grooved supports, and the counter is clear.

—JON BATES, Portland, Ore.



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Computer-assisted drilling. After you've told the drill press a few things about what you're drilling and the bit you're using, its onboard computer determines how fast to spin the bit.



Zero out the bit. Once you lower the bit to the surface of the workpiece and press a button, the drill knows where to begin measuring when determining the drilling depth.



Digital depth stop. There is an old-fashioned stop, but you don't need it. Just tell the drill how deep to bore, and it stops the bit when it reaches that depth.

■ MACHINES

Nova rolls out a smart drill press

NOVA WOODWORKING, BEST KNOWN for its lathes and turning accessories, has introduced an advanced drill press loaded with handy digital features that make it stand out from other drill presses commonly used by woodworkers. Nova's Voyager drill press has no belts or pulleys. Instead, the speed of the direct-drive motor is controlled electronically, which allows for infinite variability in speed between 50 rpm and 5,500 rpm. Because there are no belts and pulleys, the drill press is very smooth and quiet.

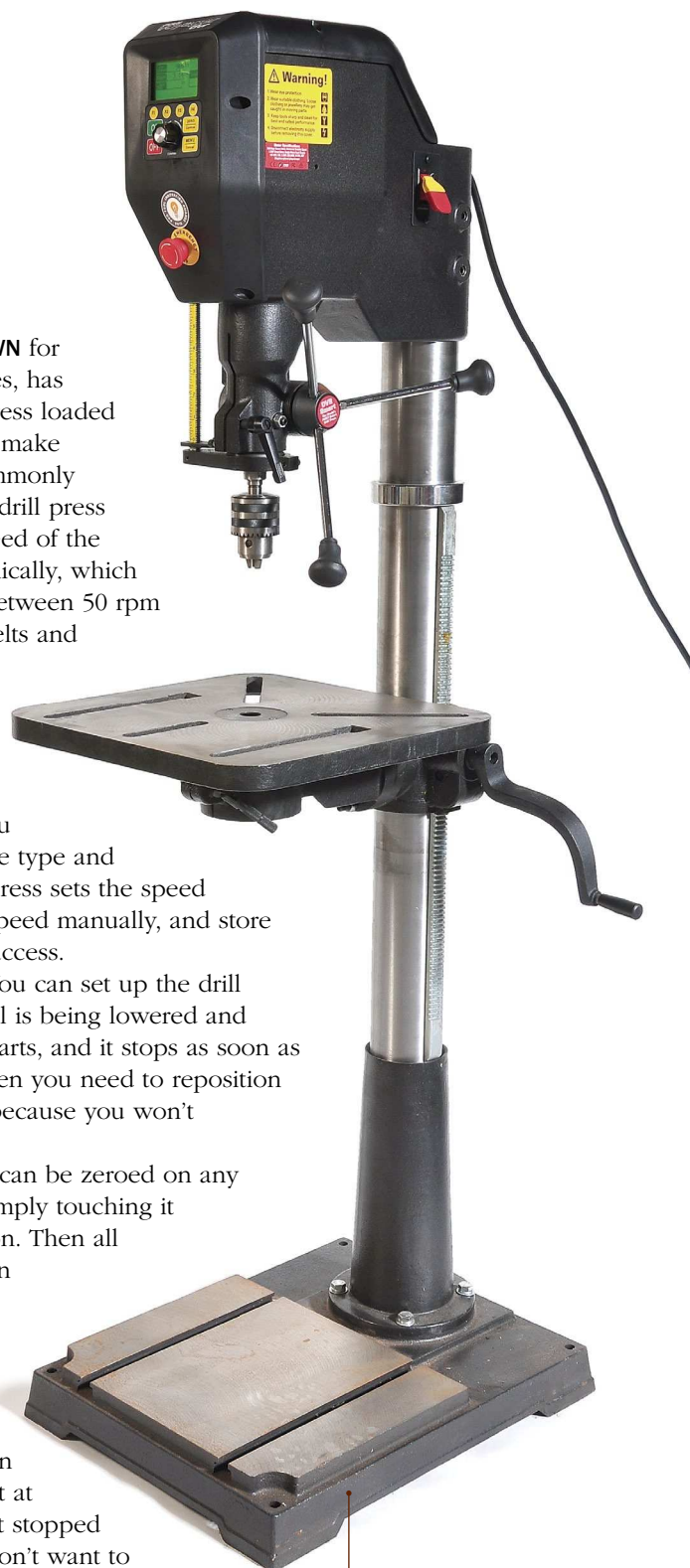
The Voyager features a small control screen on the front of the machine that lights up when you turn it on. Enter the type of material you are drilling (hardwood or softwood), the type and size of bit you are using, and the drill press sets the speed automatically. You also can adjust the speed manually, and store this setting as a favorite that is easy to access.

There are a few more cool features. You can set up the drill press to spin the bit only when the quill is being lowered and raised. As you pull the handle the bit starts, and it stops as soon as the quill returns to rest. This is nice when you need to reposition the workpiece between drilling holes, because you won't accidentally hit a spinning bit.

Another helpful feature is that the bit can be zeroed on any surface, even ones that aren't flat, by simply touching it to the surface and then pushing a button. Then all you have to do is enter the cut depth on the digital screen, and the bit stops spinning and cutting as soon as it reaches that depth. The digital readout also shows the depth of the hole as it's being bored. I used the press to bore some 1 $\frac{3}{8}$ -in. holes $\frac{3}{4}$ in. deep in an irregular surface. I simply zeroed the bit at each location, drilled a hole, and the bit stopped spinning at exactly $\frac{3}{4}$ in. deep. If you don't want to program the depth, you can zero the bit and watch the digital readout. Pretty nifty. The depth can also be set the old-fashioned way with locking nuts on an indexed, threaded rod.

There is also a quill lock for holding the quill at a set height. Quill travel is 6 in. and it takes only two revolutions of the handle to travel the full distance. The keyed chuck has a $\frac{5}{8}$ -in. capacity. Overall, this is a great drill press, one I'd be happy to have in my shop.

—Roland Johnson is a contributing editor.

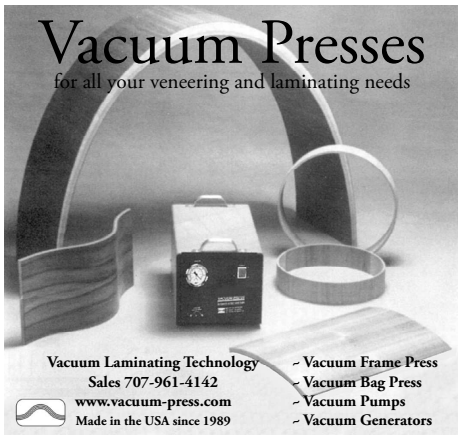


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■ MACHINES

Bandsaw has plenty of power and great guides

I'VE HAD RIKON'S NEWEST 14-IN. BANDSAW in my shop for the past few months. Powered by a 1¾-hp motor, it has easily handled everything I've thrown at it, from ripping a bench's worth of ash—some of it 10/4 thick—to resawing 10- and 12-in.-wide boards.

The large table, nearly 16 in. deep by 22 in. wide, is a great platform for working with such large boards. The table sits atop a rack-and-pinion trunnion that is easy to adjust with one hand. The locking lever can be operated with one hand, too.

Setting the blade guides was especially easy because it requires no tools. The guides are spring-loaded, with the spring pushing the guide away from the blade when it's not locked in place. It was no problem to push in the guide with one hand and rotate the locking knob with the other.

All adjustments to the fence can be made without tools as well. The adjustments include switching the fence between its ½-in.- and 6-in.-tall orientations, and adjusting the fence for drift.

The saw has a single 4-in. dust port, and the dust collection is good. I also liked the power switch. The shut-off button is larger than the on switch and sticks a bit farther out, making it easy to push to turn off the saw.

I do have a small complaint. There's an adjustment bolt on the bottom of the fence head (see photo, below right) that falls into the left-side miter slot every time the fence crosses over it. It makes moving the fence a two-handed affair. Still, this is a minor complaint about an otherwise great bandsaw.

—Kelly Dunton is a furniture maker in Terryville, Conn.



14-in. bandsaw by Rikon

Model: 10-326
\$1,000

Big power. The 1¾-hp motor spinning the wheels on Rikon's new bandsaw is more than enough for demanding jobs like resawing wide hardwood boards.



Snappy guides. Pinch the spring-loaded button to move the guide against the blade, and turn the knob to lock it in place.



Big target. The large off button makes it easy to turn off the saw, a big plus when you are preoccupied with a workpiece and spinning blade.



Adjust for drift. An eccentric cam in the fence's head rotates to angle the fence, allowing you to match it to the blade's drift.

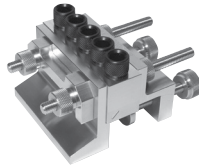
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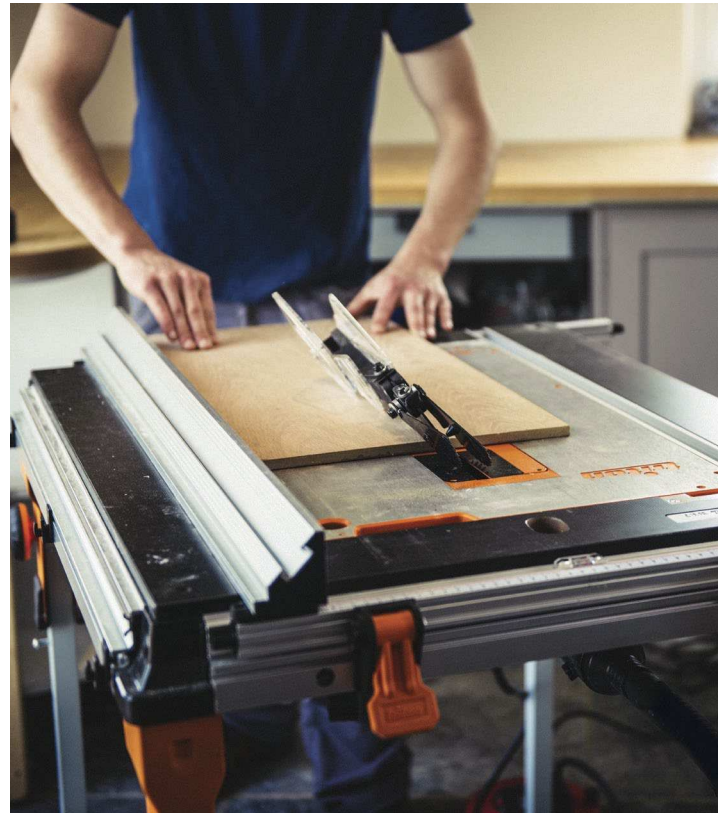
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■ POWER TOOLS

Cordless jigsaw never gets snagged

I'VE OWNED SEVERAL JIGSAWS during my career, and one irritation they all shared was the cord. It always seemed to hang up on something on the bench or on the edge of the workpiece just as I was coming to a critical spot in a cut. Bosch has come to the rescue with a cordless version, and it's exactly what I've always wanted in a jigsaw.

It's diminutive, lightweight, has a good blade guide, a great quick-change collet, variable speed, three different blade strokes (straight, low oscillation, high oscillation), and a nifty LED light. The base accepts an almost transparent zero-clearance insert and a snap-on plastic shoe that protects the workpiece from marring. The barrel grip is narrow and fairly easy to grasp, but I wasn't able to wrap my hand completely around it.

Although the saw is sold without batteries, it uses the same 12-volt lithium-ion battery that other Bosch 12-volt tools use. If you don't have some already, you can buy two with a charger for \$69.

Of course, my favorite feature was the lack of a cord. I've used this jigsaw quite a bit now, and I've not had to stop once to free the cord. It's been wonderful.

—R.J.



**Cordless jigsaw
by Bosch**

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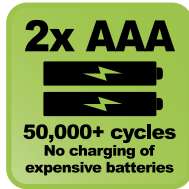
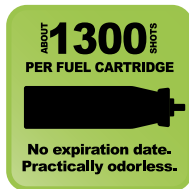
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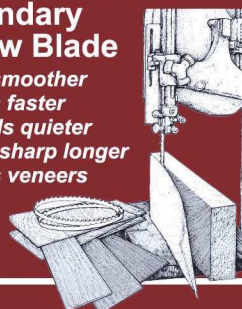
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A man with grey hair and glasses, wearing a red button-down shirt, is operating a drill press. He is holding a piece of light-colored wood steady with his left hand while the drill bit is positioned above it. The background is dark and out of focus, showing workshop equipment.

fundamentals

What drill bits do you really need?

HOW TO PICK THE RIGHT BIT FOR EVERY TASK

BY ROLAND JOHNSON

No matter what kind of woodworking you are doing, eventually you'll have to drill a hole in something. Tasks can range from drilling pilot and clearance holes for screws to mortising for chair legs. There are a few basic requirements for drilling accurate, concentric holes: The bit must create a clean entry, run concentrically so that it produces an accurate bore, and have appropriate cutters and geometry for the material being cut. Finally, it should clear away waste during the cut.

There are many types of drill bits out there, and it can be tough to make the right choices, especially if you're just starting out as a woodworker. But don't worry. I've been woodworking for decades, and I've drilled holes in all sorts of materials and in every situation imaginable. So here I'll give you some time-

tested guidance on which bits you need and why. Before I get to the recommendations, though, here's some money-saving advice.

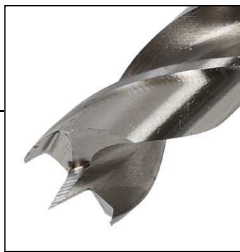
I purchase bits in sets because it's a good value. Buying a single bit gets expensive, especially if shipping costs are involved, and invariably the one bit you don't have will be the one you urgently need in the middle of a project when time is of the essence. Yes, I have bits that have never been captured by a drill chuck and may never be, but having full sets of bits in my shop, ready for use, gives me peace of mind. Another big advantage to buying sets is that most come with a case that will keep your bits organized and protected. By the way, all of the drill-bit sets I'll talk about here are readily available at most woodworking-supply stores.

Roland Johnson is a contributing editor.

Brad-point bits

Brad-point bits look like slightly modified twist bits. The bit has spurs machined on the tips of the flutes (some designs simply have the tips sharpened at an angle, resulting in a point at the outside edge) and a centering spur that is slightly longer. The spurs cleanly shear the fibers and the helical flutes efficiently transport waste from the bore. Brad-point bits create clean bores both on entry and during the cut.

Brad-point bits have a downside. They aren't very good at drilling end grain cleanly. They will cut most angled holes cleanly and efficiently, but if the angle is too shallow (5° to 10° off center), you won't get good results.



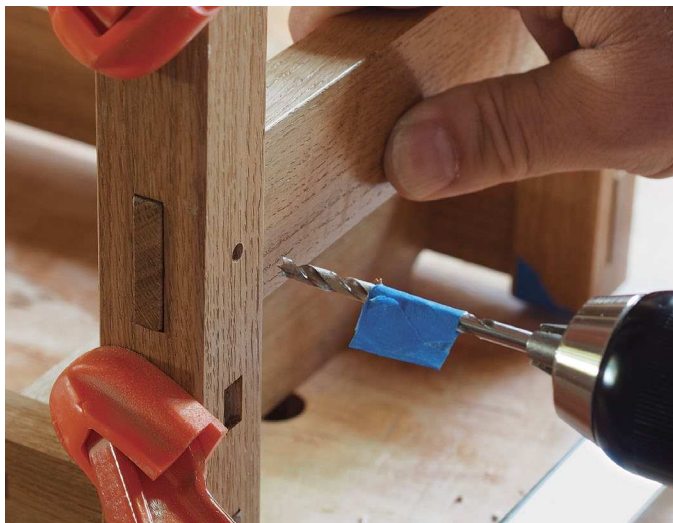
BRAD POINTS

7-bit set: 1/8 in. to 1/2 in.

This kit covers the gamut of sizes for furniture making.



Clean and easy. Brad-point bits make a very clean entry, leave clean hole walls, and don't wander at the start or during a cut. They are perfect for shelf-pin holes that will be visible and must be precise.



Superior chip ejection. Ideal for peg holes, the brad-point bit removes chips as you go. Use a tape flag stop (left) when you don't need to be ultraprecise. But use a wooden stop (above) when you need to prevent the bit from breaking through the other side.

Twist bits

A jack of all bits, the common twist bit does a good job at cutting a variety of materials—wood, plastics, and sheet goods. However, these bits excel at drilling shallow, small-diameter holes in wood (for hinges and hardware) and for drilling clean holes in end grain.



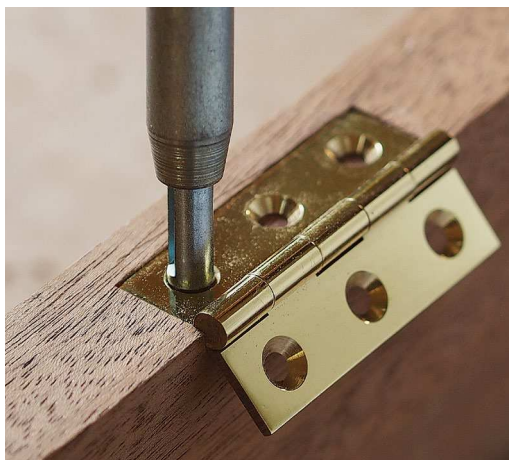
There are limitations, too. First, unless you're cutting into end grain, these bits leave some tearout. Twist bits also can meander at the start of the cut if there isn't a starter hole or center point for the bit to register in. Plus, they're not great at evacuating chips because of their rather small flutes and they tend to scorch the wood, on occasion creating enough heat to damage the bit. That means they're not great for deep holes—use brad points for those. Twist bits also are not good for cutting flat-bottomed holes or drilling at angles over 45°.



Follow the leader. Because of its web, or V-angle point of the bit, a twist bit is the bit of choice for drilling multiple steps because it follows the center of a pre-drilled hole or the centerpoint a Forstner bit leaves.

Center perfect.

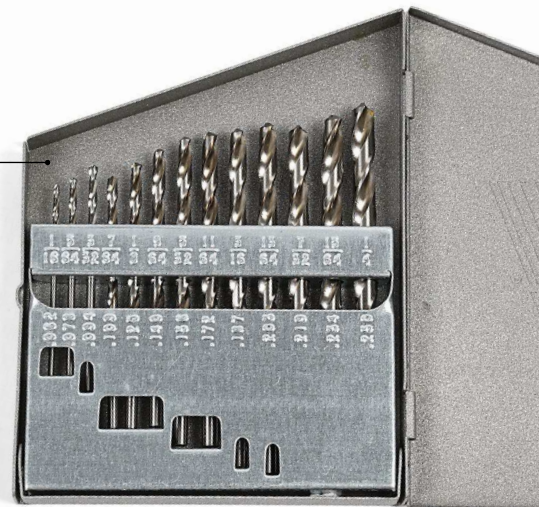
A Vix bit has a spring-loaded sleeve that surrounds a twist bit. The beveled end of the sleeve automatically aligns the bit to the center of the mounting hole in the hardware.



TWIST BITS

13-piece set, 1/16 in. to 1/4 in.

Twist bits are superb for use in all hardwoods and metals, except hardened steel. High-speed steel bits are the best general-purpose bits.



VIX BITS

3-piece set for screw sizes 5 through 10

Twist bits with a spring-loaded sleeve are used for drilling centered holes for hardware.



COUNTERBORES

5-piece set for screw sizes 5 through 10

These three-in-one bits drill clearance holes, pilot holes, and counterbores all at once for installing flat-head screws.



Another variation on the twist bit.

The counterbore bit is an all-in-one bit for screws. Combined with a countersink and depth stop, the tapered twist bit does an exemplary job of drilling holes that allow the screw head to be flush with the surrounding wood.



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Forstner bits

The ideal wood-cutting bits, Forstner-style bits circumscribe the rim with a slicing cutter and follow the scribe with low-angle shearing wings that leave a flat, clean bottom and a smooth wall. They can be used effectively for overlapping holes and can produce clean, accurate angled holes even when the bit enters the board at a steep angle.

A drawback with Forstner-style bits is the lack of chip extraction in deep bores. As the bore deepens, the chips tend to clog around the bit shank. If the bit isn't retracted from the bore at regular intervals, the detritus packs tight, sealing the bit in the bore.

Toothed Forstner-style bits are excellent for boring large holes. Sawteeth cut into the rim do an effective job of shearing the end grain, and gullets between the teeth help control the debris. Toothed bits cut much faster than a continuous-rim Forstner but don't leave as crisp a shoulder.

Big holes are no problem. Forstner bits make a clean entry and don't wander during the cut, so wider holes are easy. Make sure to back the bit out of the hole frequently to clear the waste, or the bit will jam in the hole and burn the wood.



Steep angle overachiever. Forstner bits excel at cutting severe angles accurately and cleanly. Just be sure you give the workpiece solid support.



FORSTNERS

7-bit HSS Forstner set (1/4 in., 3/8 in., 1/2 in., 5/8 in., 3/4 in., 7/8 in., 1 in.)

When buying a set, stick with smooth-sided bits.



Partial holes are easy. An MDF scrap offers additional protection against tearout and helps register the bit.

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designer's notebook

FOUR LAYERS OF TOOLS

Smith stores large and heavy tools in the deep outer doors. The shallow inner doors hold frequently used smaller tools. The carcase is solid ash with mahogany plywood panels. Interior fittings are solid mahogany with oak plywood panels.

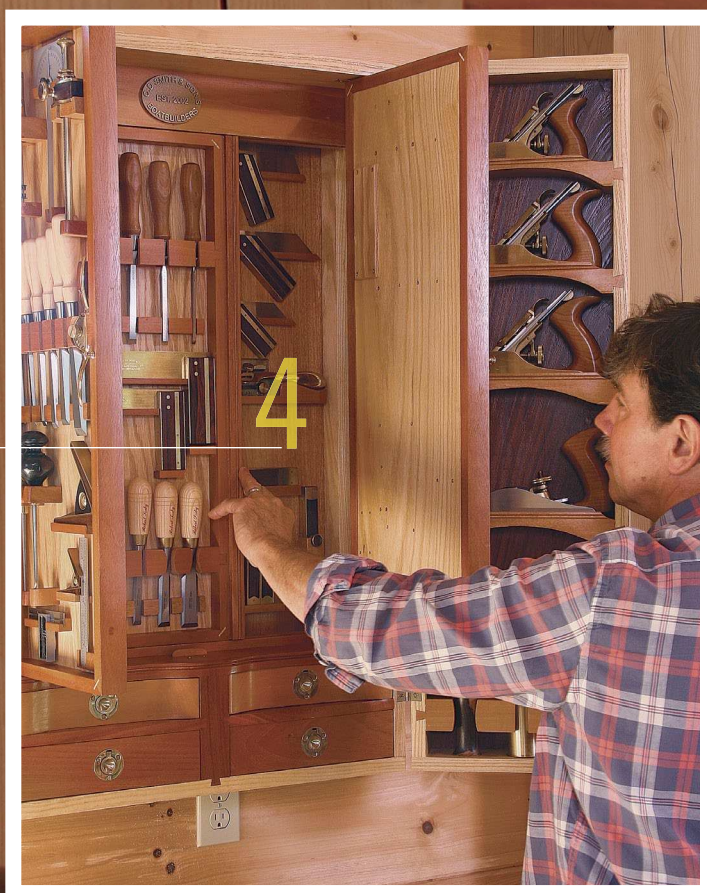


Tool chest with surprise storage

BY C. DANIEL SMITH

Fifteen years ago I built a wall-hung tool chest much like this one. But in the meantime my collection of hand tools had outgrown that chest, and I decided to build a larger one.

My original chest had storage in three layers: in the deep main doors, on a pair of shallow inner doors, and on the back board of the cabinet. But for this version, I increased its capacity with a fourth layer of storage, a shallow tray that sits behind the inner doors and in front of the back board. To keep access quick and straightforward, I made the tray so that it slides side-to-side in dovetailed tracks. When you open the chest's inner doors, you can access any of the tools on the sliding tray. Or, using the wooden handle at the middle of the tray, you can slide the tray aside to reach the tools on the back board.



SLIDING STORAGE

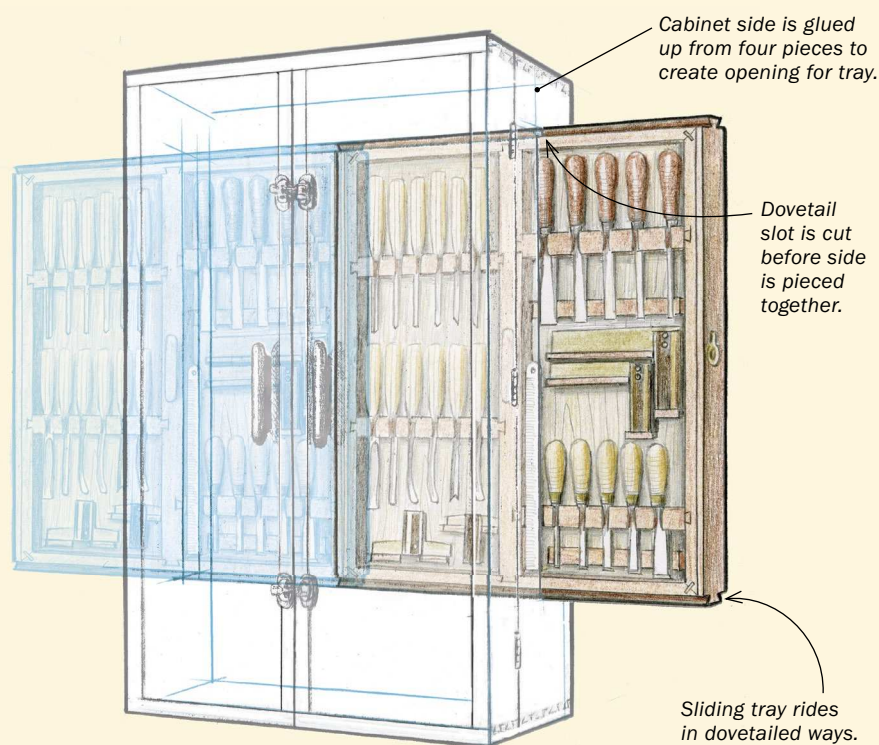
The third layer of storage in Smith's tool chest is a tray that slides sideways. It can be accessed from outside the chest even when the doors are closed, or from the front when both sets of doors are open. Behind the sliding tray is a fourth layer of storage, reserved for larger tools that are used less frequently.

Online Extra

For a video visit to Dan Smith's shop and a look inside his tool chest, go to FineWoodworking.com/258.

When you do slide the tray aside, it travels right out the side of the chest. This means you can also access the tools in the tray without ever opening the doors: Just pull the brass ring on either side of the chest, and the tray slides out. The wooden handle on the front of the tray acts as a stop, so the tray slides just halfway out either side of the chest.

To determine the placement of tools, I cut scraps of plywood to the size of the various components and laid out the tools until I had arrangements I liked. I placed the heaviest and deepest tools in the front doors. I put some of my most frequently needed tools on the shallow inner doors. The sliding tray, with no extra depth to spare, became home to carving and



bench chisels and some layout tools. I reserved the back board for tools that I use less frequently.

Knowing how my tool kit continues to grow and change, I built the chest so its main components can be disassembled, and I made all the tool mounts removable—screwing them in from behind—so I can alter their arrangement when I need to.

I made the handle on the front of the sliding tray removable too, (above left) so the tray can be slid right out of the chest if I need be. I used French cleats top and bottom in the back of the carcase to secure the chest to the wall. □

Orthopedic surgeon C. Daniel Smith works wood in Missouri and Maine.



A Small, Sturdy Workbench

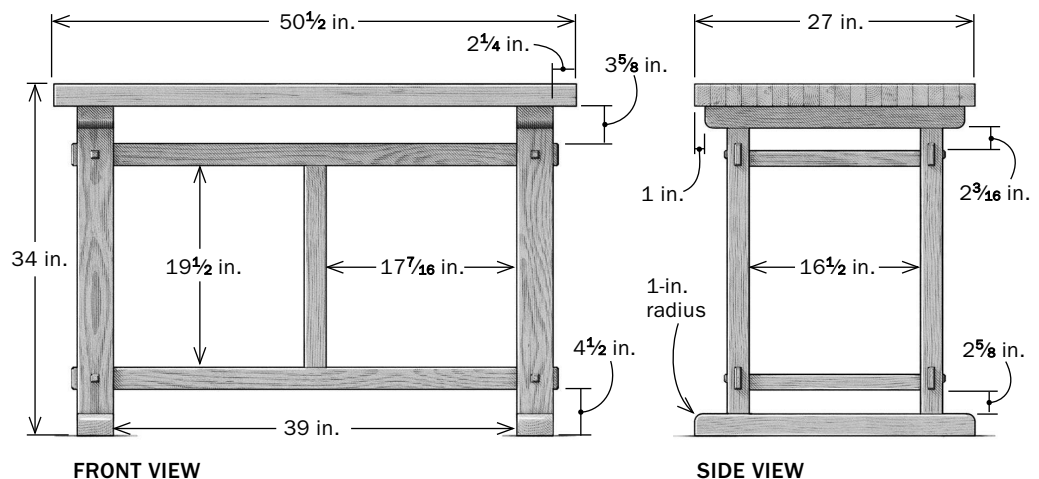
Compact design gets its strength and rigidity from clever interlocking joinery

BY MATT KENNEY

When we received this workbench proposal from Eric Tan, it was quickly accepted by the staff. Tan, who specializes in Ming dynasty furniture, incorporated interlocking joinery—a signature detail of that era—into the bench, creating a strong, rigid construction without the need for glue or hardware. The unique design is brilliant, a no-brainer for a shop project.

But there was a problem: For the vast majority of articles, one of our editors travels to the author's shop to take photographs. Tan lives in Taiwan, and I did my best—on several occasions—to convince my editor to send me there to photograph him making the bench. Alas, due to expense and time constraints, my arguments did not prevail. So, instead of flying to Taiwan, I drove a few miles down the road to the shop of Kelly Dunton, who agreed to help us show readers how to make the bench.

Aside from working in imperial rather than metric units of measurement, Dunton made the bench exactly as Tan designed it. There is more to this bench than its ingenious self-locking joinery. When assembled, it's rigid and heavy, making it well-suited for handwork like planing, sawing, and chopping mortises. It's also compact, making it perfect for anyone with limited shop space.



JOINERY, NOT GLUE, HOLDS THIS BENCH TOGETHER

Interlocking joints borrowed from Ming dynasty furniture eliminate the need for glue. We chose ash—heavy and strong—for this bench.

Top, 2⅞ in. thick by 27 in. wide by 50½ in. long

Side rail, 1½ in. thick by 2⅞ in. wide by 21¼ in. long

Trestle top, 2⅞ in. thick by 3½ in. wide by 25 in. long

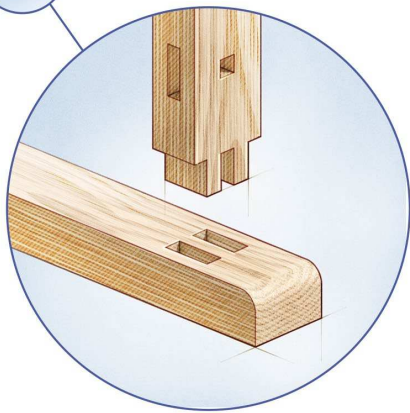
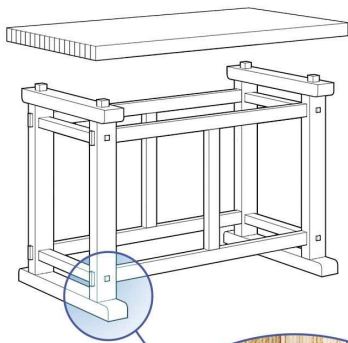
Tenon, ½ in. thick by 2⅞ in. wide by 1 in. long

Middle post, 1⅞ in. thick by 2⅞ in. wide by 21½ in. long

Post, 2⅞ in. thick by 3½ in. wide by 32¼ in. long

Front rail, 1⅞ in. thick by 2⅞ in. wide by 47 in. long

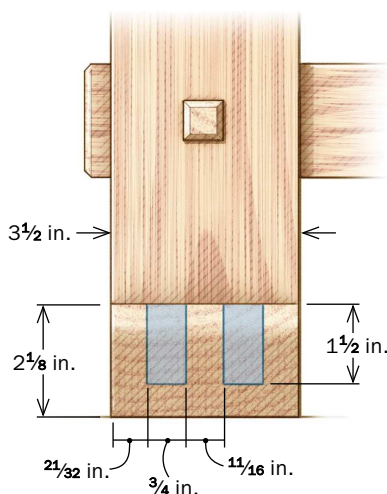
Trestle foot, 2⅞ in. thick by 3½ in. wide by 27 in. long



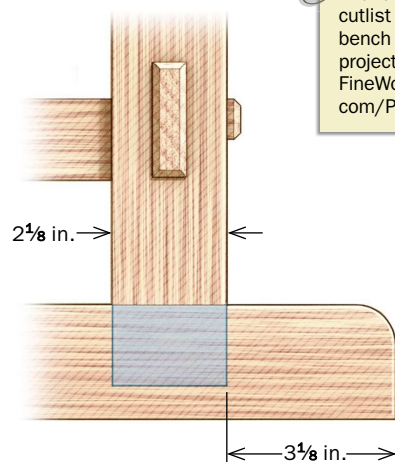
Post and foot are double-jointed

Two tenons are stronger and resist racking better than a single tenon. Fortunately, cutting a double mortise-and-tenon isn't much harder than cutting a single one.

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



FRONT VIEW



SIDE VIEW



Double setup. For the foot's double mortise, set the fence to cut the outside wall. Spin the foot, and do the same for the second mortise. Repeat the process for the inside wall (above).

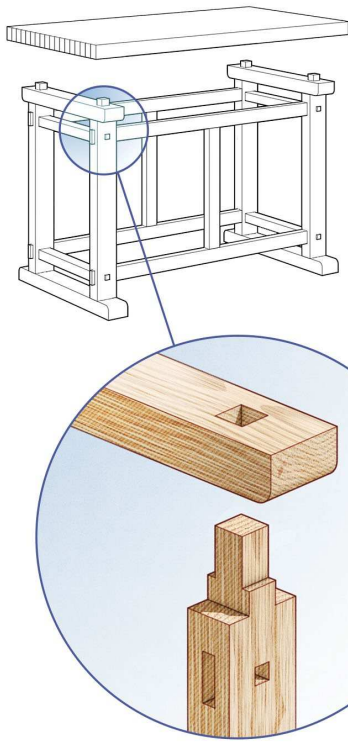
A dizzying bunch of mortises

All the joinery was done with a hollow-chisel mortiser and tablesaw. This bench has 28 mortises, ranging from dead-simple to fairly complex, combining a stopped mortise with a smaller through-mortise. Fortunately, none of them are difficult to cut.

After milling the parts to their final dimensions, go to work on the mortises, starting with the most straightforward: those that connect the middle post to the front and back rails. Dunton cut them in two passes with a 1/4-in. bit. Set the mortiser's fence to cut the inside wall first, then flip the stretcher around and cut the second wall without moving the fence.

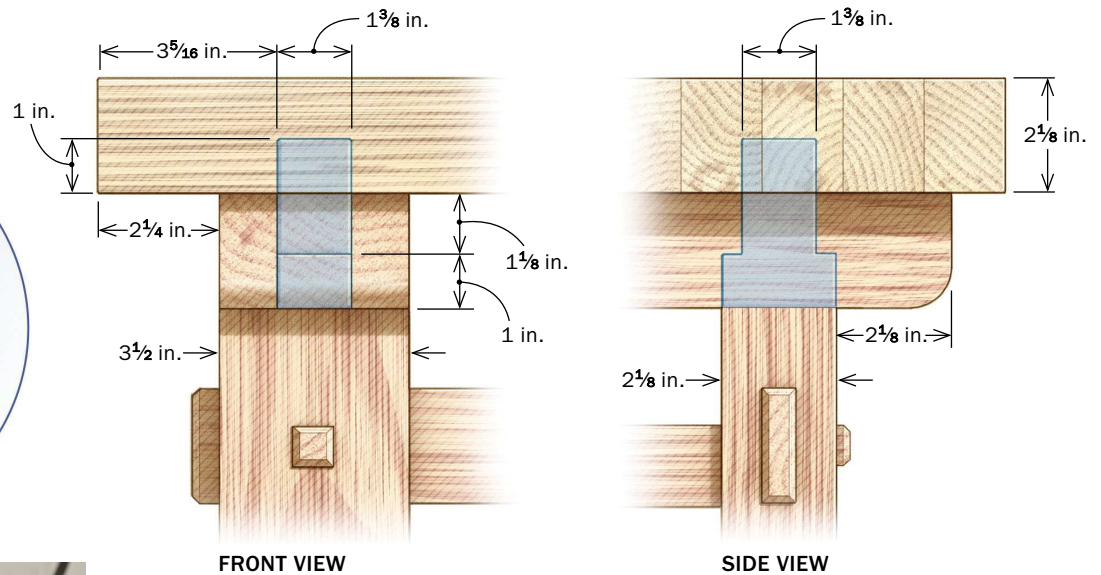


One blade for the cheeks and shoulders. Use a blade that cuts a flat-bottom kerf. For perfectly centered tenons, cut one outside cheek, rotate the post, and cut the other. Adjust the fence and cut both inside cheeks (left). Then shift the fence to nibble away the waste between them. Replace the tenoning jig with a miter gauge and cut the shoulders. A stop block ensures they are aligned (below).



Stepped tenon does twice the work

The tenon on the top of the post extends through the trestle top and into the benchtop. The lower part acts as a shoulder for the upper tenon, creating a stronger joint.



Two mortises in one. First cut the smaller through-mortise from the other side. Then cut the larger, stepped one on the underside.

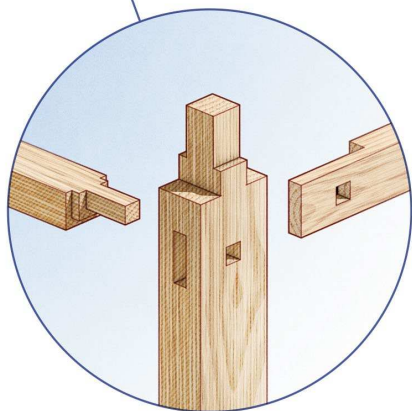
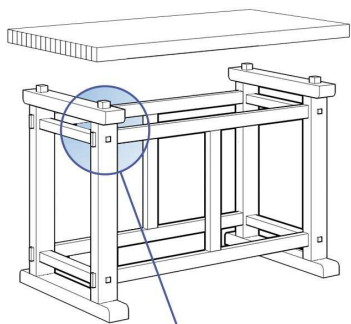
The posts are attached to the trestle feet with double tenons. Dunton used a $\frac{3}{8}$ -in. bit for these (and all of the remaining mortises). Set the fence for the outside walls of the mortises. Cut the first pair, then flip the foot around to cut the outside wall for the second pair of mortises. Adjust the fence for the inside wall and repeat the process.

The joint that connects the posts to the trestle tops is a bit more complex. The mortise in the trestle top has a large, rectangular stopped section and a smaller, square through section. Begin with the through-mortise, cutting in from the top to just over $1\frac{1}{8}$ in. deep. Flip the trestle top over to cut the rectangular section and



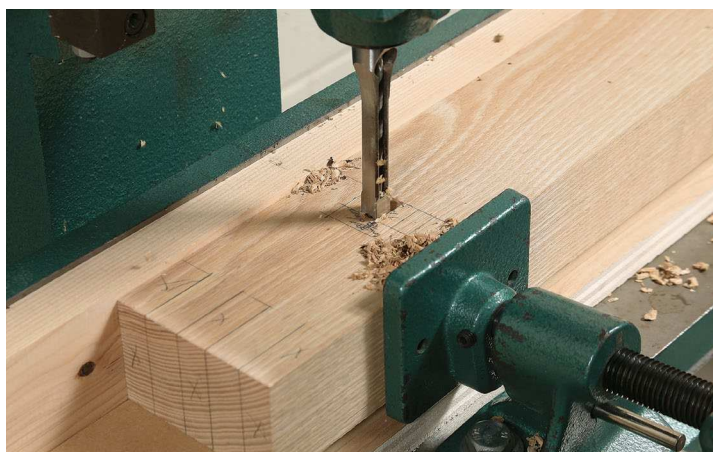
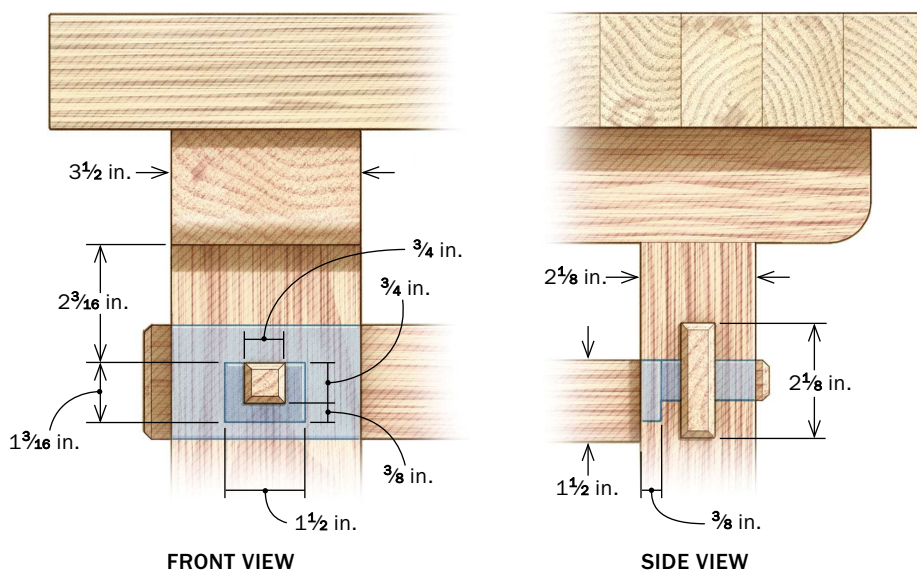
Cut the mating tenon with a dado set. With the blades set to cut the tenon's small shoulders, remove waste from the front and back of the post (left). Then raise the dado set and cut the long, thin tenon (below).





Rails lock together

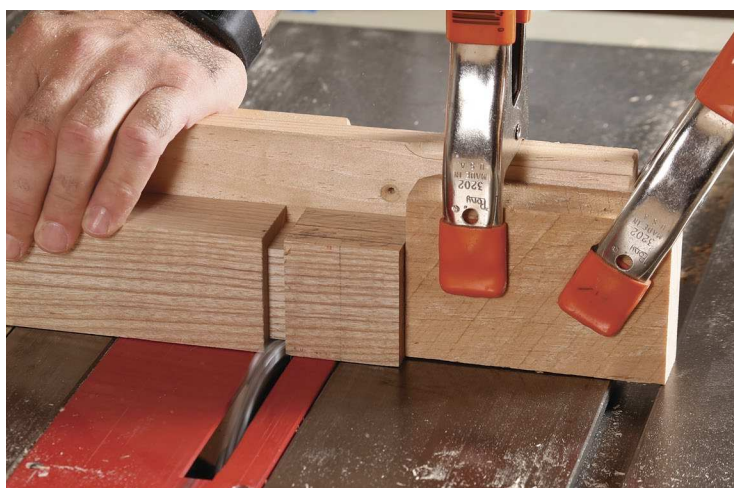
The tenons on the side rails pass through the tenon on the front rails, tying the posts to the rails.



Start with the side rail mortise. Cut the through-mortise from the outside face first, then cut the larger, stopped mortise on the inside.



Then cut one for the front rail. Turn the post on edge and cut halfway through. Flip the post and complete the mortise from the other edge.



Side rail tenon is less complicated than it looks. Start with the large, lower section, cutting the sides and bottom of the rail to create the three shoulders (left). Raise the blade and cut the thin top half (right).



connect it to the square portion. Each post has two pairs of intersecting mortises that connect the front and side rails. Cut the stepped mortise for the side rail first. It consists of a larger stopped mortise and a small through-mortise. Again, start with the through-mortise, cutting in from the outside face. Then flip the post and cut the stopped mortise from the inside face. Next cut the through-mortises for the front and back rails. Because of the post's thickness, you'll need to come in from one face and then flip the post and complete the mortise from the other side.

The last four mortises are in the underside of the top, but you can't cut them until you've cut the post tenons and assembled the base. All of the tenons are cut at the tablesaw. Start with the simple tenons in the posts and front and back rails, using a dado set and miter gauge. Cut the tenons in the side rails and the top of the posts. Cut the biggest part of the tenon first, then raise the dado blade and cut the smaller part.

To cut the double tenon at the bottom of the post, use a blade that cuts a flat-bottom kerf, like a rip blade. Using a tenoning jig, cut the two outside cheeks: Cut one of them, flip the post in the jig, and then cut the second. A second setup gets you both inside cheeks, using the same cut, flip, cut process. Nibble out the waste between the inside cheeks by adjusting the jig between cuts so that you work across the waste.

After all of the tenons have been cut, it's time to mortise the tenons in the front and back rails to accommodate the tenon on the side rail. This creates an interlocking joint. Fit one front or back rail tenon at a time. When it's snug in its mortise, lay the post and rail down, so that the mortise for the side rail is facing up. Use a Forstner bit to drill through the tenon where it intersects the mortise. Square up the corners with a chisel. Pull out the rail and move on to the next tenon. After all of the tenons have been mortised, clean up all of the parts, getting them ready for a finish. After this, you can assemble the base.

A glue-up with no glue

As you put the base together, each new joint assembly locks the previous joint together, so there is only one way to assemble it. Begin by assembling the middle post and the top and bottom front rails. Next, connect the posts to the front rails. The middle post is now locked in place.

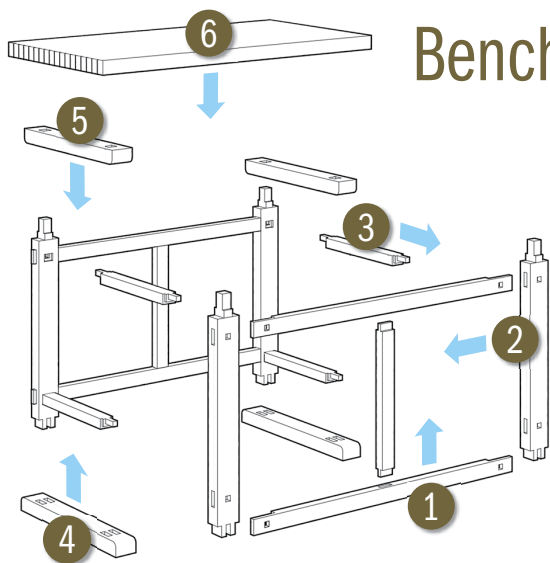
DRY-FIT FOR THE FINAL MORTISE

Fit the side rail.

Because the tenon is shaped like a half-lap, make adjustments by planing the side of the tenon with no shoulder.



Drill a mortise through the tenon. Use a Forstner bit to remove the waste (left), and then square up the corners with a chisel (right).



Bench assemblies without glue and clamps

ORDER OF ASSEMBLY IS IMPORTANT

The interlocking joinery requires a specific order of assembly. Once you settle the top onto the base, all of the joints will lock tight.



Start with the middle post. It fits between the front rails and adds rigidity to the base. Once you put the posts in place, the front rails are locked to the middle post.



Slide in the side rails. The tenon runs through the front rail and the post, which prevents the post from coming loose from the front rail.



Lower the back onto the side rails. Rest the back assembly on the ends of the tenons and then adjust each tenon until all four are in their mortises. Then the back should slide down (left). The trestle top and foot are next (above). They lock the posts in place, and now the base is a rigid, single unit.

Online Extra

To see how the interlocking joinery allows this bench to break down for transport, go to FineWoodworking.com/258.

Repeat this process to assemble the back of the base.

Next, lay down the front assembly and install the four side rails. The tenons on the side rails pass through the tenons on the front rails, locking the posts to the front rails. Lower the back assembly onto the side rails. Now, turn the base upright and lower it onto the feet. Drop the trestle tops into place to complete the base.

Next up is the top. Start with wide boards, ripping them into narrow strips. Flip the

strips on edge and glue them together to create the top. This creates a strong top from rift- and quartersawn boards.

Now it's time to mortise the top for the legs. You'll use a template, router, and straight bits for this. Turn the top upside down and put the base on it. The template is made up of three pieces of MDF that are set around the tenon and then clamped in place. Remove the base and you have a perfectly sized template for the mortise. With a spiral bit in your router, remove

most of the waste from the mortise, taking care not to rout into the template. Now use a flush-trimming bit to clean up the mortise, following the template. Finally, square up the corners, using the template as a chisel guide. Repeat this process for the other three tenons.

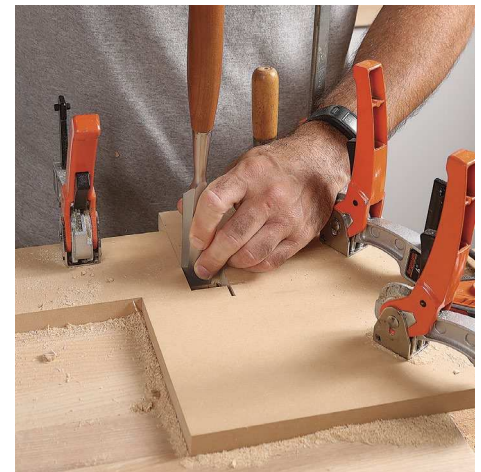
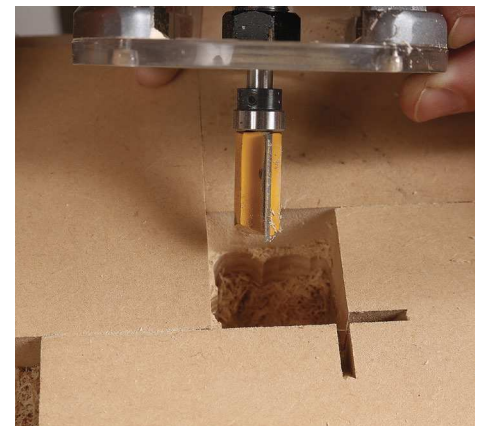
After the mortises are done, turn the base upright and put the top on it. You now have a rigid bench ready for work. □

Matt Kenney is the special projects editor.



Make a mortising template around the tenons. Working one mortise at a time, Dunton used three pieces of MDF, one of them with a notched corner, to build the router template in place, guaranteeing that the mortise would be located accurately.

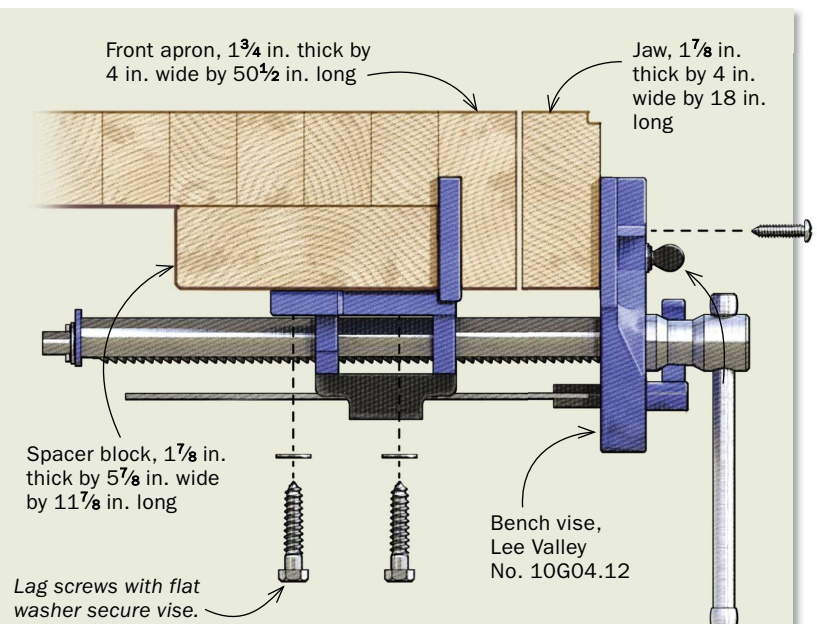
MORTISE THE TOP



Rout the waste. Dunton first used a plunging spiral bit freehand to remove most of the waste, then came back with a pattern bit to flush the sides to the template (top). When squaring the corners (above), the template serves as a guide for the chisel.

A vise is optional

A cast-iron vise is a good, proven choice. You'll need to add an apron to the front edge of the top and a spacer block.



Dust Collection for



DUST COLLECTORS

The wider diameter hose and large air volume created by a dust collector make it the right choice for big machines that create a lot of large, heavier sawdust particles and chips.

Three-pronged approach

When it comes to managing dust, treat the various machines and tools in your shop differently based on how much dust they create. For stationary machines like the jointer, planer, tablesaw, and bandsaw, use a dust-collection system. But for smaller, handheld tools like the circular saw or orbital sanders, a shop vacuum will do the trick. Round up whatever's left circulating with an overhead air filter.

the Small Shop

An effective and budget-conscious trio of solutions

BY ANATOLE BURKIN

The importance of dust collection cannot be overstressed in woodworking. But honestly, it's tough to get excited about spending money on tools that, well, collect dust. No matter how fancy, these machines just don't have the cachet of sleek hand tools or powerful machines that cut and shape wood.

The good news is that a basic kit of dust-collection products won't cost a fortune. And whether you're doing woodworking in a basement or garage, building projects large or small, the essentials are the same. In my case, I'm remodeling a house—trim-

work, cabinets, and built-ins—and working out of a two-car garage. The materials I'm using range from rough lumber to sheet goods.

To make things more difficult, I live in a community with strict homeowners' association rules that prohibit turning a garage into a permanent workshop. So at the end of the day (or a few days running), I need to be able to park the motor vehicles back in the shop ... er, garage. And to keep from tracking lots of dust into the house, I've gotten into the habit of keeping the garage pretty clean with minimal effort.

In the end, no matter what size shop you're in, a three-pronged approach is the best way to attack dust before it settles on you and everything around you. Use a dust collector for bigger, stationary machines, a shop vacuum for handheld tools, and round things out with an overhead air filtration system combined with a dust mask.

Go big for bigger machines

It's tempting to think that a good shop vacuum can solve all dust-collection issues. That might be true when working with only small benchtop tools that don't



SHOP VACS

The smaller volume of fine dust created by chopsaws, routers, and sanders can be handled by a shop vacuum.

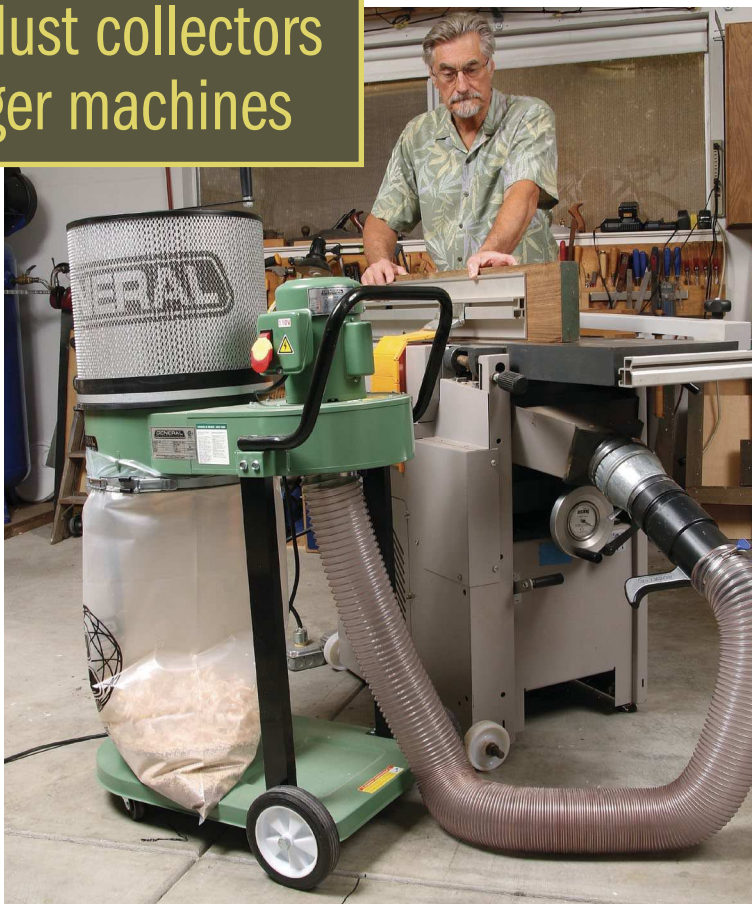


OVERHEAD FILTRATION

A ceiling-mounted air filter can grab the finest particles that end up suspended in the air. A dust mask is a good idea, too.

Small dust collectors for bigger machines

Keep your collector close to the dust. When using a small dust collector, typically a machine with about 1 hp, use a fairly short hose, about 10 ft. long. Too long a run of hose reduces the airflow, and the result is ineffective dust collection as well as possible jams.



include a jointer and planer. But if your woodworking involves milling rough lumber, a jointer and planer (or a combo machine) are absolutely essential, and so is a dust collector. Jointing and planing wood produces large, heavy sawdust particles, and to move them, a fairly large amount of air volume (about 350 cfm) as well as a 4-in.-dia. hose are required. Shop vacuums aren't suitable for a job that big.

A dust collector is also more capable of grabbing sawdust from a tablesaw and bandsaw, again because of the large volume of airflow. That said, I've had pretty good luck using a shop vacuum hooked up to a 14-in. bandsaw and a benchtop tablesaw that has a built-in dust housing under the blade. For larger machines, and especially if you plan to do a lot of resawing or dadoing, the dust collector would do a better job than a shop vacuum, whose hose can sometimes clog when taking big cuts.

For this article, I tried two 1-hp dust collectors that would fit my small space: a mobile tool (General International model No. 10-030CF M1) and a wall-mounted



When floor space is tight. Though it can weigh about 65 lb., a wall-mounted dust collector can be moved quickly (it just hangs on a bracket) and stored elsewhere if needed. Get an extra wall bracket or two and move it around the shop where it's needed.





TIP

DON'T LET THE BAG GET TOO FULL

Empty the bag before it's completely full (shoot for about $\frac{2}{3}$ from the top of the bag) to prevent clogging and to keep the dust from spilling out during the change-out.

machine (Grizzly Industrial model No. G0785), each with pleated filters. Both were up to the task and handled every situation presented in my shop.

To keep the costs down and get the most cfm at the tool, forget about ductwork and blast gates. Just hook up the dust collector to one machine at a time.

Downsize for smaller power tools

Power sanders create very fine dust and are good candidates for a hookup to a shop vacuum.

Chopsaws, routers, and biscuit joiners also can be handled by a shop vacuum, which can generate close to 100 cfm. Finer and fewer dust particles don't require as much air volume. That said, chopsaws are pretty messy no matter what's hooked up to them because most have not been designed with highly effective dust capturing capability.

When using hand tools such as chisels and handplanes, the chips and shavings produced are relatively large and won't get airborne. A broom and dust pan can

Easy hose attachments

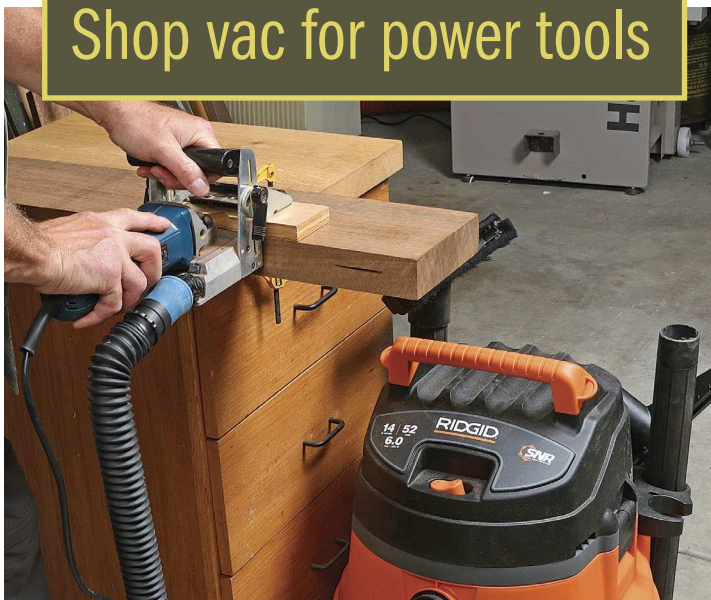


Toolless clamps and fittings. Whether they're spring loaded or the thumbscrew type, they're immediately accessible using only your fingers. The thumbscrew type hold a bit tighter than the spring clamps, but the latter are the fastest to get on and off when switching between tools.



Quick and easy change. Rockler's Dust Right handle and tool ports speed up swapping a 4-in. hose from machine to machine. Once the ports are installed on each machine, the handle slips snugly over the open end, requiring no tools or clamps.

Shop vac for power tools



From a workhorse basic to bells and whistles. While a sturdy, no-frills model is great to have, a handy feature on higher-priced vacs is the auto-start function. When a power tool plugged into the vacuum is turned on, the vacuum starts automatically.

Narrow hose works better. The 2½-in.-dia. hose that comes with a typical shop vacuum is too large in diameter for easy hookup, plus they are stiff and bulky. Invest in a smaller-diameter hose, which allows for easier hookup and more freedom of movement.



handle the job just fine, although I've become fond of a floor sweeper that attaches to a dust collector. It captures both the large chips and fine sawdust left behind from other tools.

Powered air filters finish the job

In spite of one's best attempts to control the mess, some dust always escapes and the finest particles can end up suspended

ADAPT AND CONNECT

Most shop vacuum manufacturers have dedicated adapters that make changing from one tool to another easy. Get a brand that fits your vac.



in the air. For that, I recommend a ceiling-mounted air filter. Now, some experts say that these machines circulate dust particles while they are running, a time during which your lungs may be exposed to more dust (vs. quiet air, when dust tends to settle). So to be really safe, it makes sense to wear a respirator or dust mask when dust is in the air. Or, run the air cleaner during a break when you're not in the shop.

A note about dust collectors and filters

There's a lot to learn about the types of dust collectors and filters, and for more on the topic, check out "A Revolution in Dust Collection," *FWW* #223 (*Tools & Shops* 2012).

But to cut to the chase, here are the key points:

For respirators, use one rated for fine particles (N95 rating) as the last stand against sawdust.

Use high-efficiency filters on all dust-collection devices (dust collectors and shop vacuums) that capture particles down to 1 micron or less. These small particles can enter deep into the respiratory tract past the body's natural defenses.

The cartridge-style filters you see pictured on the single-stage dust collectors in this article are a big improvement over the bags typically supplied with budget dust collectors. Cartridge filters have a large surface area, which allows the machine to breathe better (improving airflow) and include internal flapper arms, which allow the user to brush off dust inside the cartridge, keeping them operating more efficiently. □

Anatole Burkin is an author and woodworker who lives in Santa Rosa, Calif. He is the former editor and publisher of Fine Woodworking.

BASIC DUST COLLECTION KIT

1-hp dust collector
\$300-\$400

14-gal. shop vacuum
\$100

Air cleaner
\$190

Accessories
\$100

Ceiling-hung air filter



For the dust that remains. Use an air-filtration system. These machines circulate dust particles while they work, so to be really safe, wear a respirator or dust mask when dust is in the air.



6 Essential Bench Jigs

Planing stops and saw hooks add speed and accuracy to your handwork

BY MICHAEL PEKOVICH

STOP FOR WIDE BOARDS

This simple stop is the one you'll use most often.



STOP FOR SMALL PARTS

A planing stop with a low fence is perfect for face- and edge-planing smaller parts.



STOP FOR NARROW PARTS

A jig with a side fence as well as an end stop holds long, narrow stock like table legs.

When starting out with hand tools, it doesn't take long to realize that the cutting force of the tool tends to move the workpiece in the direction of the cut. One of the secrets to hand-tool success is stopping that movement.

While clamping a piece in a vise or to the benchtop can work, often it's overkill. Not only that, but clamping and unclamping adds a lot of time to the process. A better method is to use a planing stop or saw hook, which take advantage of the cutting force of the tool to keep the workpiece in place.

When handplaning, the tool drives the workpiece forward. If you add a stop at the front edge of the board, you can plane all day without the piece moving. In addition, it's fast and easy to flip the stock to surface the other faces without messing around with clamps or vises.

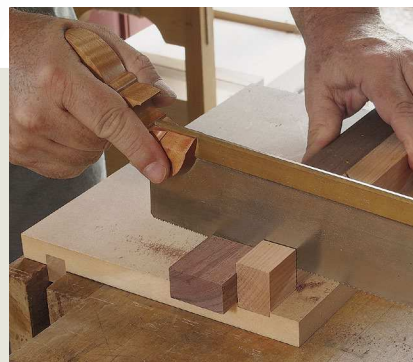
A saw hook works the same way. Hold the workpiece against the saw hook's fence, and you'll get faster, more accurate cuts every time.

Planing stops and saw hooks can take many forms. Some have a cleat that rests against the edge of the



SHOOTING BOARD FOR END GRAIN

This is an indispensable jig for squaring crosscuts and truing miters.



SAW HOOK FOR CROSSCUTS AND MITERS

With a tall, kerfed fence, this saw hook makes quick work of crosscuts and miters.

bench to keep the jig in place, while others are clamped in place.

I use one of these bench jigs just about any time I pick up a handplane or saw. Here I'll cover the ones I use most often. Some take just minutes to make while others are a little more involved. Even so, you can knock all of them out in an afternoon, and then get back to serious work.

Michael Pekovich is a furniture maker, instructor, and Fine Woodworking's executive art director.



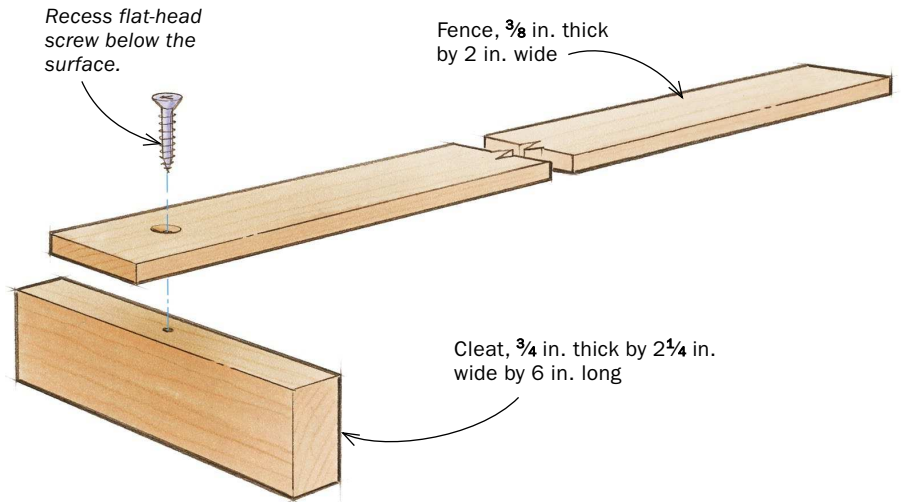
SAW BLOCK FOR THIN STOCK

To cut small, thin stock to length, a saw block clamped in a vise is a better choice than the full-size saw hook.

T-STOP HANDLES MOST OF YOUR PLANING TASKS

The T-stop is the easiest to make and the one I use most often. In its simplest form, it consists of a thin fence screwed to a cleat that gets clamped in a vise. The fence can be as long as your bench is wide. The cleat should be thick enough to accept the screw. Anything $\frac{3}{4}$ in. or more is fine. When attaching the fence, make sure that the screw head is recessed below the surface to avoid contact with the plane blade.

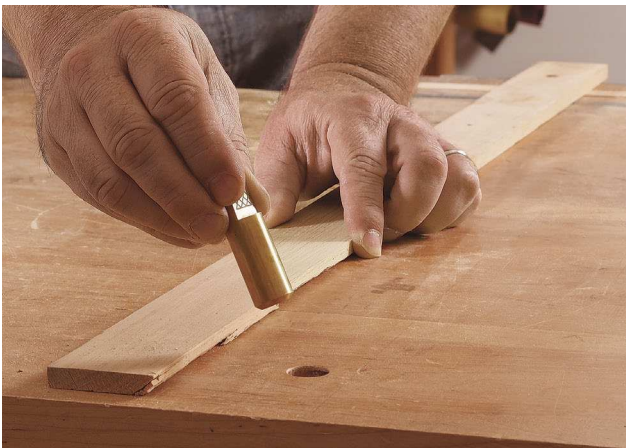
To use the stop, clamp the cleat in a vise and then secure the opposite end—you can clamp it to the far side of the benchtop, or drill a dog hole opposite the vise and drop in a benchdog. The single screw allows the fence to pivot until it hits the benchdog, so the cleat placement in the vise doesn't have to be right on. With the stop in place, you can tackle boards and panels as wide as your benchtop. You can also edge-plane stock up to 6 in. wide by standing it on edge against the stop.



Two scraps and a screw are all you need. The T-square jig consists of a long fence attached to a cleat with a recessed screw. To use it, clamp the cleat in your vise and secure the opposite end with a clamp or benchdog (below).

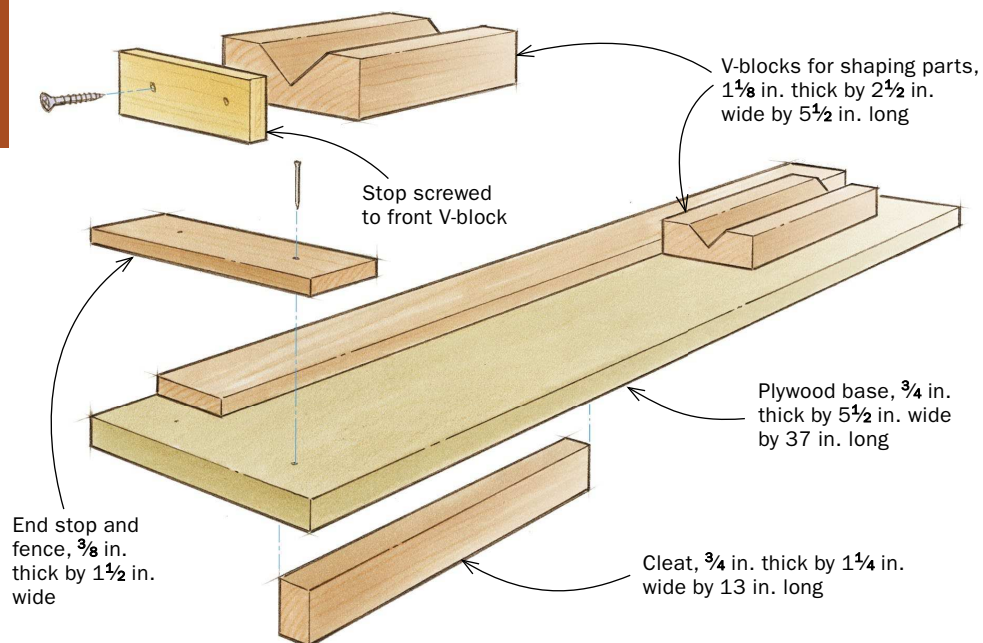


Plane away. The long, low fence offers support all the way across the benchtop without the need to clamp parts in place. Use it to face-plane larger parts and panels (above). In addition, you can edge-plane parts up to 6 in. wide (right).



GET A GRIP ON LEGS AND OTHER THIN PARTS

To plane long, narrow parts, which have a tendency to pivot, I use a stop that provides lateral support as well. Attach two thin strips to a plywood base at right angles and add a cleat on the bottom so it can be clamped in the vise. The stop keeps the work from pivoting, even when you skew the plane for a smoother cut. When chamfering or shaping legs, add V-blocks to the stop to support the stock at 45°.



Easy to build, easy to use. Pekovich glues and pins the thin end stop and fence to the plywood base (left). He also glues a cleat to the bottom of the jig, which allows it to be clamped in place (center). The fence prevents long parts like table legs from pivoting during planing (right).



V-blocks support stock at an angle. For shaping or chamfering long, narrow parts, screw a pair of beveled blocks to each end of the jig (above). The front block has an end stop screwed to the face to hold the stock in place while shaping (right).



SHOOTING BOARD FOR SQUARING END CUTS

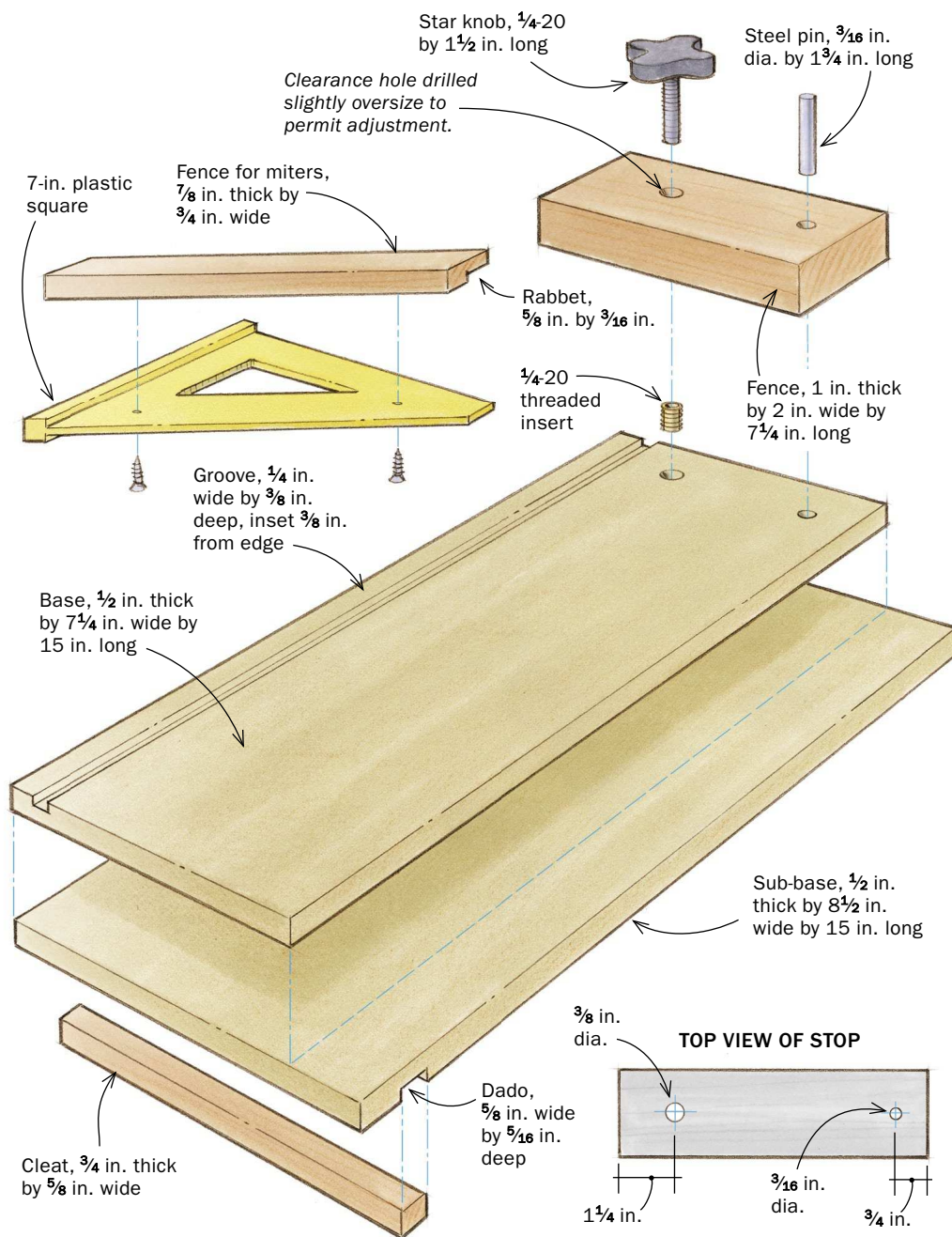
I depend on this shooting board to square up the ends of parts perfectly. In the past, I've tried to attach a fixed fence at exactly 90°, but I've always needed to shim it square later. On this version, though, I made the fence adjustable so that I can square it up as needed.

The heart of the jig is the plywood base, which has two layers glued together to create a bed for the plane. The subbase is dadoed to receive a cleat that registers against the edge of my bench. The top layer has a groove along the top edge to guide a speed square that I use while shooting miters. The hardwood fence pivots on a steel pin, and it has a knob on the opposite end to lock in the setting. Drill the clearance hole for the knob's threaded shaft slightly oversize to allow some adjustment.

Because there's just a small range of adjustment, the fence holes need to be drilled so that the fence is roughly square to begin with. To do this, pre-drill the fence and clamp it in place as square as you can with its end just overhanging the step in the base. Then use the fence as a guide as you drill into the base. Drive the steel pin into the smaller hole in the base, and thread an insert into the larger hole. Once the fence is in place, plane its end flush with the step in the base to create a zero-clearance backstop for planing.

When working end grain I use a low-angle smoothing plane on its side. It rides on the bed and registers against the edge of the base. Place the plane on the bed and snug it up to the edge. Then place the workpiece against the fence and slide it until it contacts the plane sole ahead of the blade. Set the plane for a light cut so that it doesn't get bogged down in the end grain.

For shooting miters I use a speed square with a wood fence attached to it. You need to trim a corner of the square, so buy a plastic one. The base of the square rides in the groove, and you can dial in the miter angle by adjusting the shooting-board fence.



ASSEMBLY TIP



Drilling for the fence. Because the oversize hole only allows for slight adjustment, the fence holes in the base should be drilled as accurately as possible. To make this easier, pre-drill the fence, clamp it square to the jig with its end extending slightly from the edge of the jig, and use it as a guide for drilling. Tap the pin into the small hole and thread an insert into the larger hole.



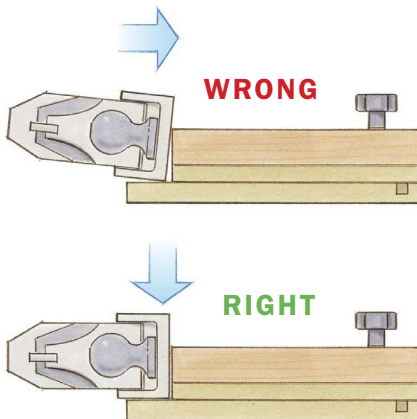
Squaring up is easy. To set up for shooting, loosen the adjustment knob and square the fence to the edge of the jig with a combination square. The first few passes with the plane will flush the fence to the edge of the jig, creating a zero-clearance back stop for planing parts.



DOS AND DON'TS OF USING A SHOOTING BOARD

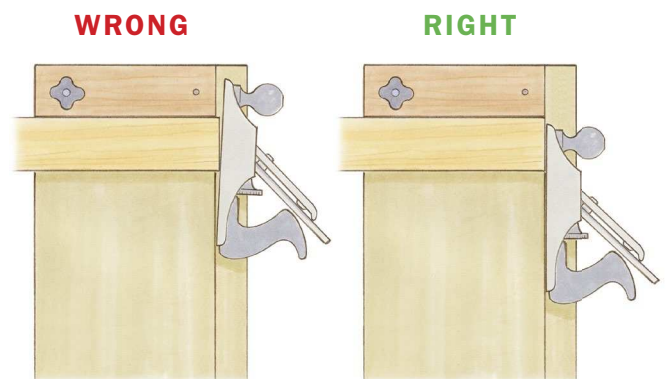
PUSH DOWN AGAINST THE BASE, NOT INTO THE FENCE

The reference face for the plane is its side, so to maintain a square cut and avoid paring into the fence, exert pressure downward.



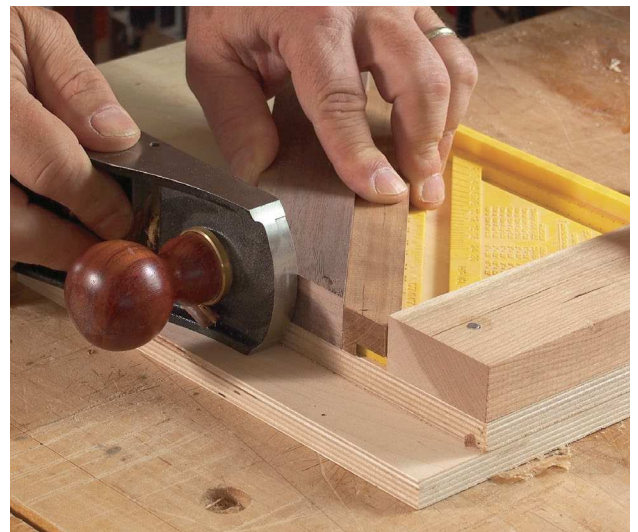
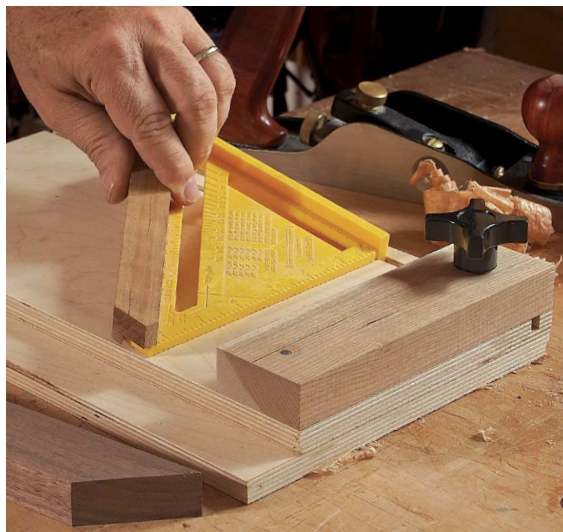
KEEP THE WORKPIECE FLUSH TO THE EDGE

Overhanging the workpiece will result in an angled cut and tearout along the back edge. Instead, set the plane in place and slide the workpiece against the sole ahead of the blade, and then make the cut.



Speed square makes for accurate miters.

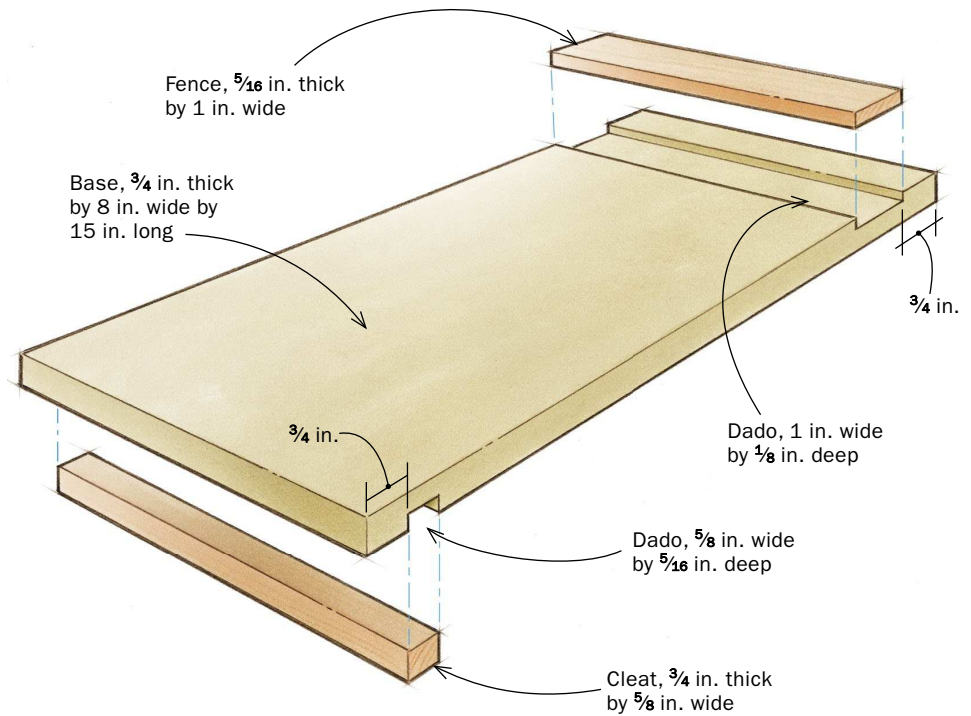
Adapting a Methods of Work tip from Sean Montague, Pekovich uses a plastic square with a hardwood fence to shoot mitered ends of parts. The base of the square slides in a groove in the base and registers against the fence.



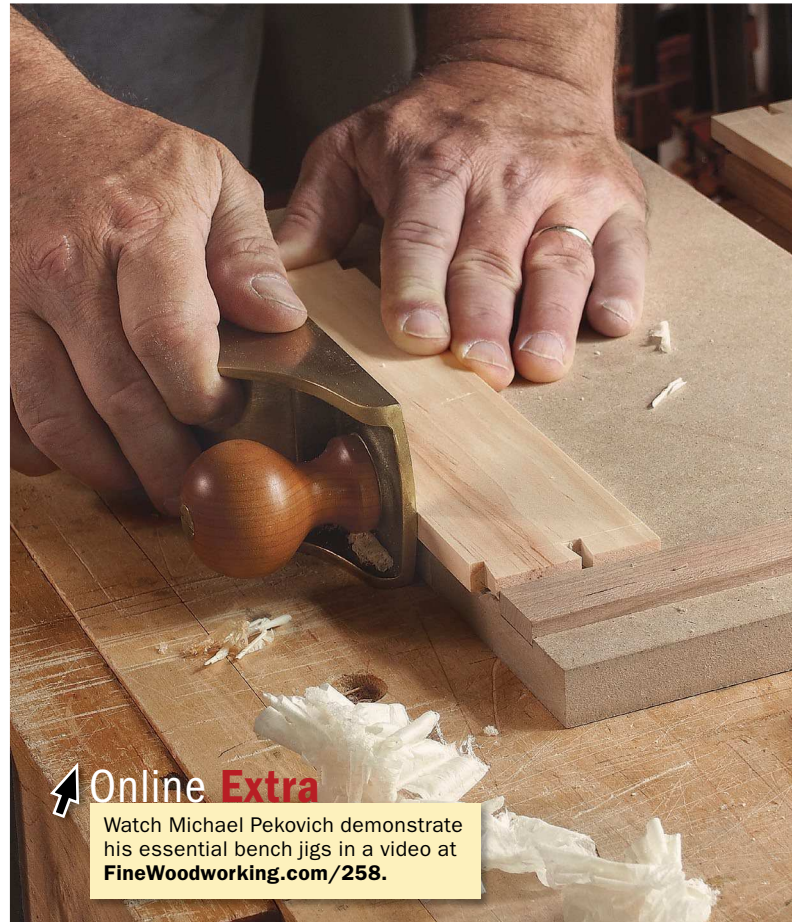
STOP FOR PLANING SMALL PARTS

This stop gets quite a bit of use in my shop. It consists of an MDF base with dadoes for a fence and cleat. The dadoes might seem like overkill, but they ensure that the cleat and stop are square to the edge. More important, this design makes it easy to glue the fence in place, so there aren't any screws to nick my plane iron. Also, I typically make more than one stop at a time, so setting up the dado blade is worth the effort. The fence is only $\frac{3}{16}$ in. high, which allows me to easily plane stock down to $\frac{1}{4}$ in. thick.

The other advantage of the jig is the ability to edge-plane small parts. Just lay the workpiece flat and slide it over until its edge extends beyond the jig. Then place your plane on its side against the bench to plane the edge. This is a great way to ensure a square edge on thin parts.



Dadoes simplify assembly. The fence and cleat on this jig, as well as those on the saw hook (opposite page), are glued into shallow dadoes in the bases. This ensures a sturdy, square glue-up of the jig parts.



Online Extra

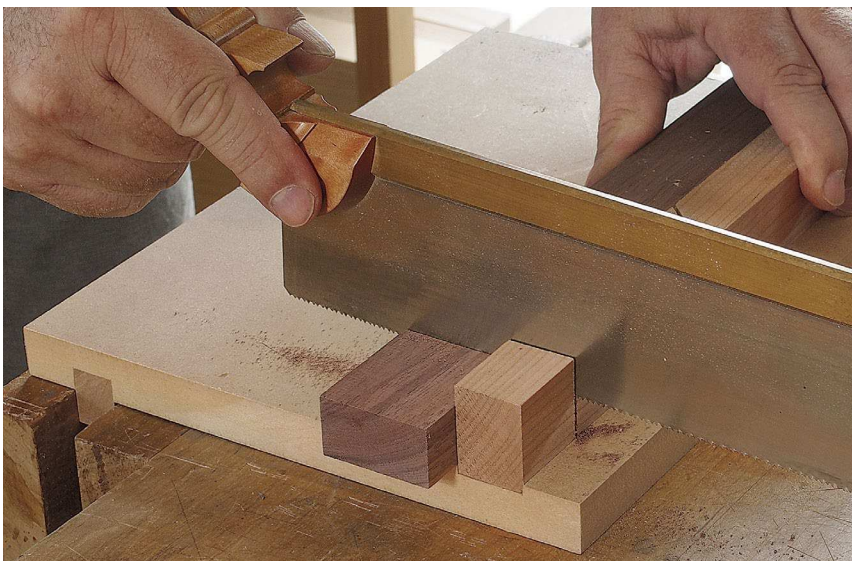
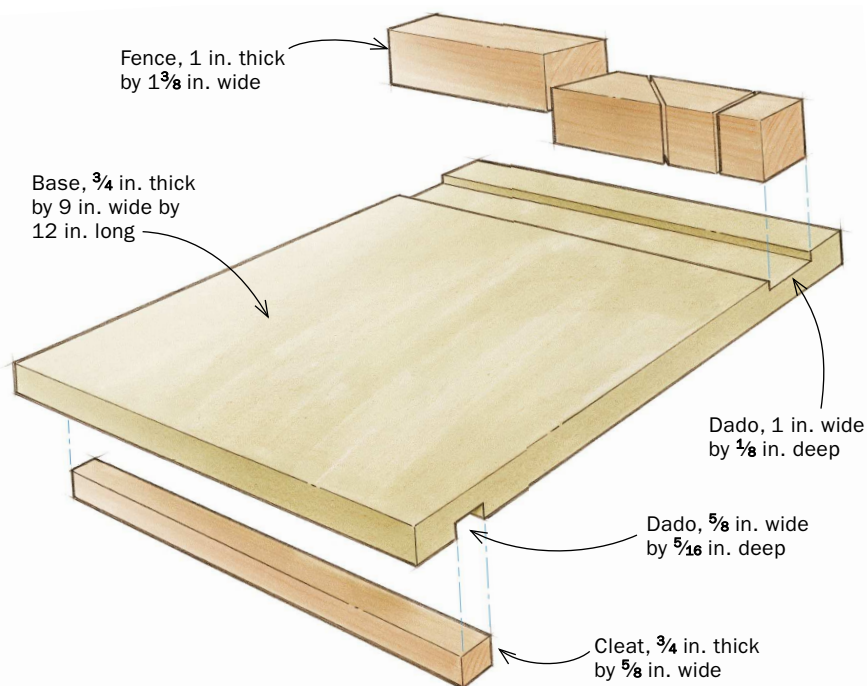
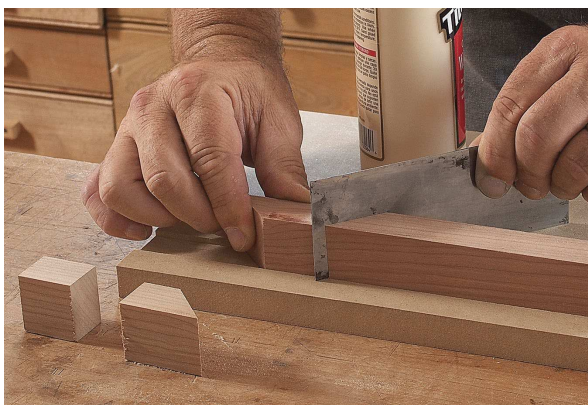
Watch Michael Pekovich demonstrate his essential bench jigs in a video at FineWoodworking.com/258.

A low fence for thin parts. Because small parts also tend to be thin, the fence only protrudes $\frac{3}{16}$ in. above the deck (left). It can be difficult to maintain a square edge while planing thin stock, so Pekovich lays the part and plane on their sides to make edge-planing easier (above).

SAW HOOK FOR CROSSCUTS AND MITERS

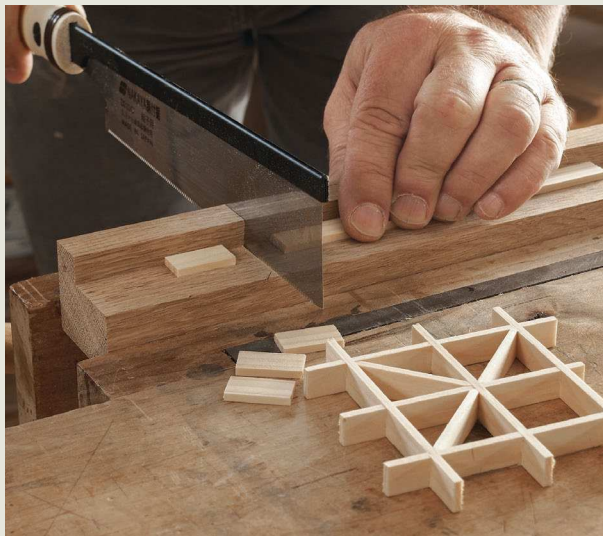
I use a saw hook to tackle sawing at the benchtop. It has a cleat and a fence with slots for the saw at 45° and 90° angles. In the past I've simply sawn through the fence to create the slots, but it's difficult to make a plumb cut at the exact angle. To make it easier, start by running a shallow dado for the fence. Then precut the fence into blocks at the chopsaw and reassemble them as you glue them into the dado. Use a card scraper to space the blocks. The resulting slot is slightly wider than the sawkerf, which prevents the saw from binding during a cut.

Chop and assemble the fence parts. Cut the fence apart at the chopsaw and glue the parts into the dado in the base. Pekovich uses a card scraper to space the parts and create a slot for the saw.



SAW BLOCK FOR SMALL PARTS

For small, thin stock, I replace the bigger saw hook with a simple rabbeted block that gets clamped in my vise. I use a Japanese pull saw for trim work, so I orient the block with the fence toward me (reverse that for a Western saw). To make the kerfs, I use the saw itself in combination with a square for alignment.



Under-Bench Tool Cabinet

Practical storage cabinet utilizes the wasted space beneath your benchtop

BY CHRISTIAN
BECKSVOORT

The shelf below my workbench was always heaped with stray stuff—clamps, power cords, glue, scraps, jigs—things I often needed at the bench but never quite found a home for. It was constantly a mess, and the space above the mound of stuff was wasted, too. Sound familiar? Wouldn't a storage cabinet under there be just the ticket?

All it takes is proper planning and a little effort to create a custom cabinet to fit your bench, your tools, and your work style. Just as I did when building my wall-hung tool cabinet (see "Tool-Cabinet Design," *FWW* #153), I measured and grouped similar items to fit specific drawers beforehand to achieve an efficient and well-planned layout. Your cabinet will differ in size and layout, of course, depending on your bench and your tools.





Layout tips for tools

Not every bench is the same, so you'll have to custom-fit this design to suit your situation. To determine the exterior dimensions of your cabinet, measure the distance between the legs of your workbench. My cabinet slides in from the end of the bench, just fitting between the front and rear legs, and leaving a 3-in.-wide clamping ledge along both the front and back of the bench. This also keeps the cabinet from interfering with the benchdogs. If your bench doesn't have stretchers positioned to support the cabinet, you may have to add ledger strips as I did.

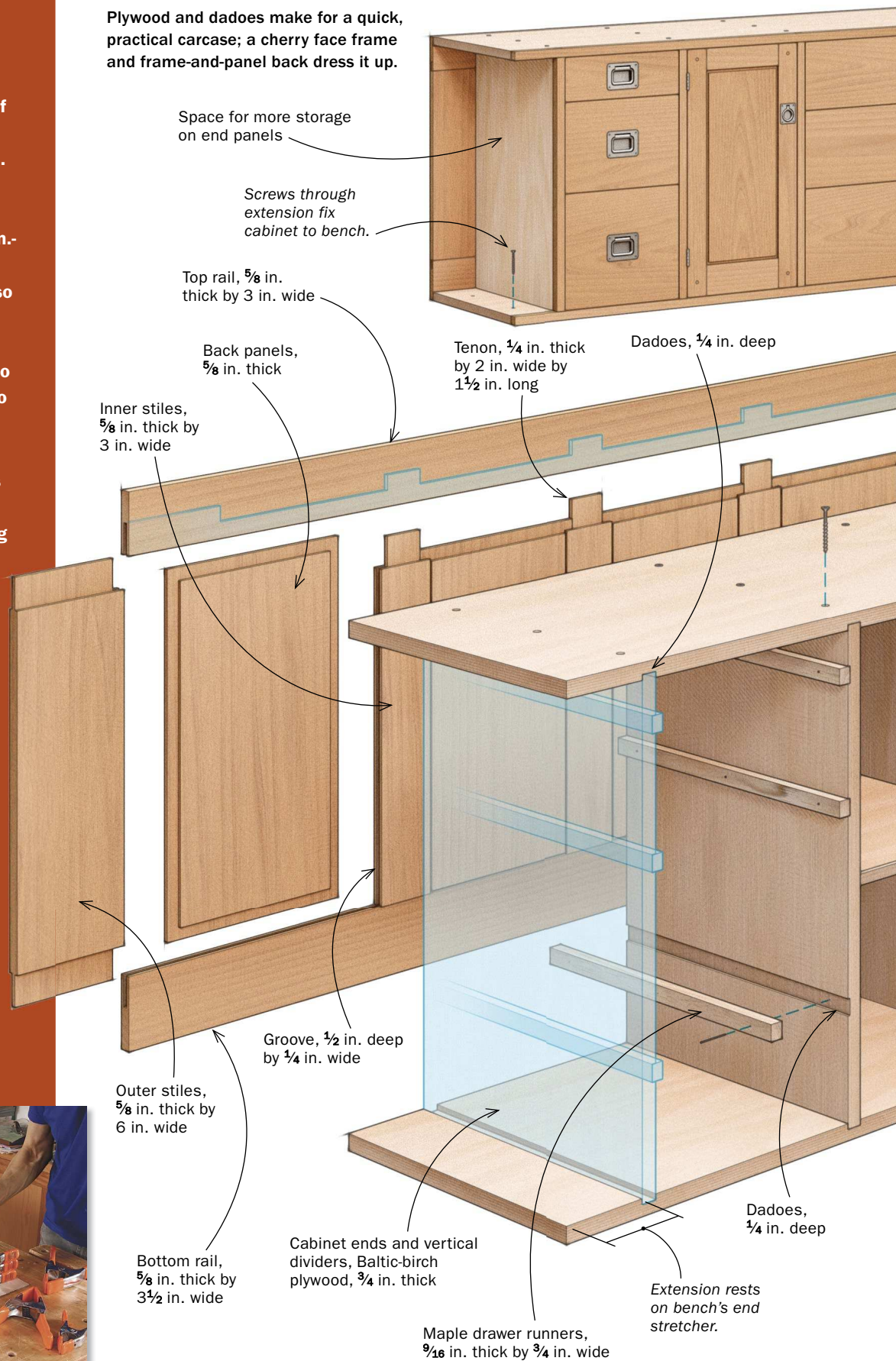
Some time spent planning the arrangement of items in the drawers and cabinet will result in the most efficient layout. I started by grouping similar items that might go into the same drawer. I put all the stuff that accumulates in the tool well—sanding blocks, glue bottles, pencils, tape, spacers, and partially used sandpaper—together in the top shallow drawer. Larger items like clamps, hold-downs, and bench hooks fit in the larger drawers.

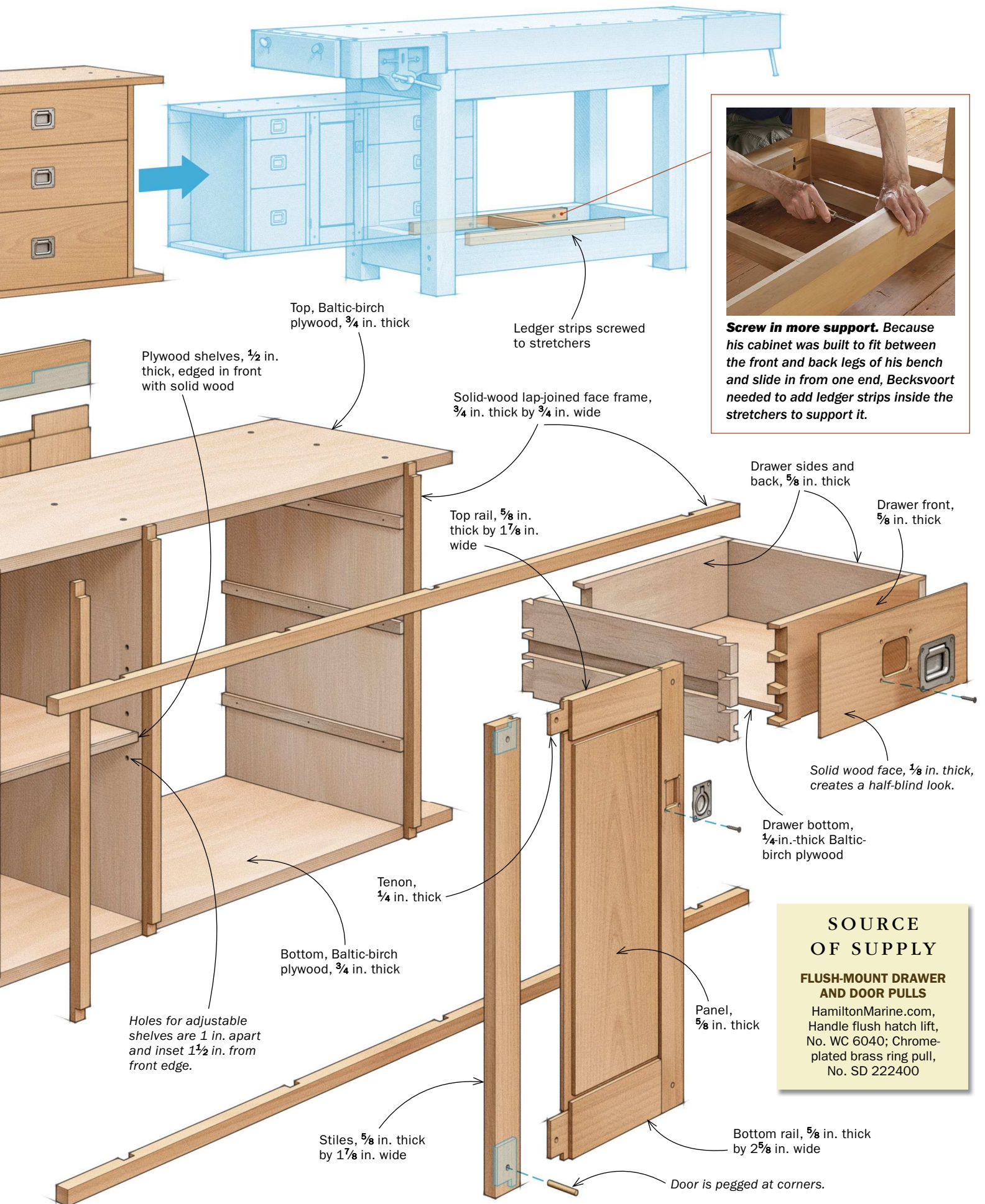
When I designed my wall-hung tool cabinet I made scaled graph-paper cutouts of my tools to find the best fit. But here I simply laid things out on the bench to see how they fit together. I cut a scrap to the length of the cabinet, arranged the tools, and marked the door and drawer sizes on the stick.



UNDER-BENCH CABINET

Plywood and dados make for a quick, practical carcass; a cherry face frame and frame-and-panel back dress it up.





SOURCE OF SUPPLY

FLUSH-MOUNT DRAWER AND DOOR PULLS

HamiltonMarine.com,
Handle flush hatch lift,
No. WC 6040; Chrome-plated
brass ring pull,
No. SD 222400

BUILD THE CASE

No-frills carcass. Becksvoort's native language may be solid wood, but he built the carcass of this utilitarian cabinet with plywood—dadoed, glued, and screwed.



Plywood case and simple joinery

Since this is a shop project, I used plywood for the carcass, cut simple dado joints, and screwed it together. But I dressed it up with a solid face frame in front and a frame-and-panel back. When you cut the plywood to size, subtract $\frac{3}{4}$ in. from the width for the face frame and $\frac{5}{8}$ in. for the paneled back. Cut out the shelves at the same time, subtracting $\frac{1}{4}$ in. for solid lip-ping on the front edge.

At the tablesaw, use the dado set to cut dadoes in the top and bottom for the dividers and in the ends and the vertical dividers to accept the runners for the side-hung drawers. Then glue and screw the case together. The screws are driven from the top and bottom, so they won't show. With the case assembled, drill holes for adjustable





Dressing up the basic box. A $\frac{3}{4}$ -in.-thick, lap-joined face frame of solid cherry dignifies the front of the cabinet. Becksvoort marks the vertical members to length directly from the cabinet (1). The verticals then get rabbeted with the dado blade on the tablesaw (2), and the horizontals are dadoed (3). With the horizontals dry-fitted to ensure proper location, he glues and nails the verticals one at a time (4).

1



2



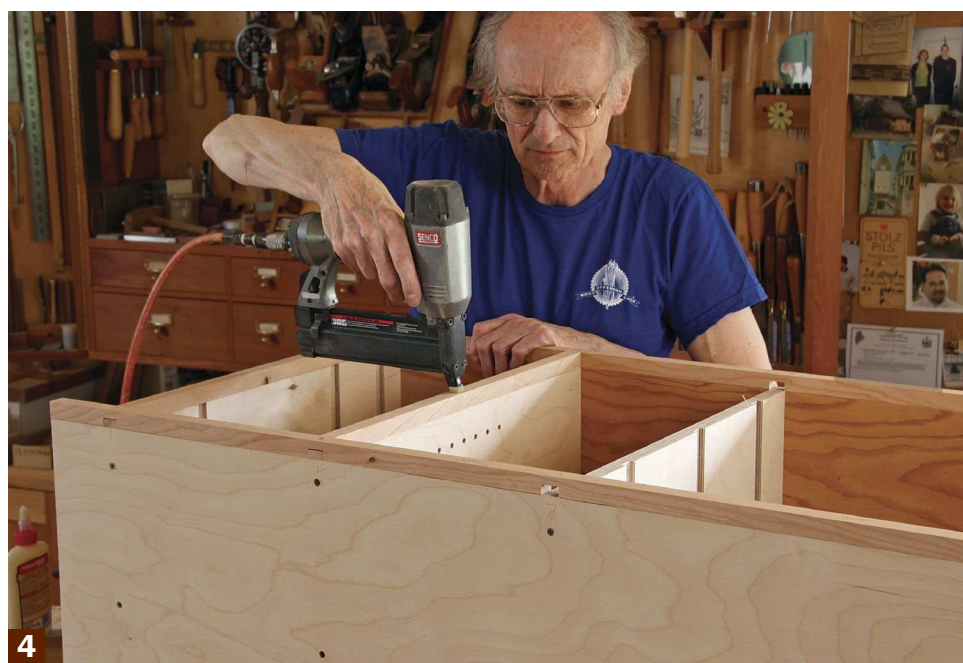
3

shelves. I make a hardwood template on the drill press, making a series of holes 1 in. apart. I use that template with a hand drill to cut the holes in the carcass.

Solid-wood details

To make the face frame, mill your stock to $\frac{3}{4}$ in. square and mark the pieces to length directly from the carcass. Cut the lap joints at the tablesaw, then glue and nail the face frame to the carcass. I use a nail gun for this, and later I fill the small nail holes with wood putty.

Next it's time to build the frame-and-panel back. After cutting the rails and stiles to size, cut their mortise-and-tenon joints (or dowel or biscuit joints if you're so inclined), and groove all the parts to accept the panels. Then dry-assemble the frame. Measure the panel sizes directly from the



4

HANG THE DRAWERS



Careful transfer. With the drawer in place, transfer the location of the runner dado from the case to the drawer side. Becksvoort uses old credit cards as spacers beneath the drawer.

frame, and cut the panels to fit. Assemble the back, and set it aside to cure. After the drawers are fitted, you'll glue and nail the assembly to the back of the carcass.

Smart storage areas

I made the side-hung drawers from solid wood, joining them with dovetails and then cutting grooves in the sides for the drawer runners. You could make the drawers from plywood if you wish, though the action of the runners will not be as smooth. At this point, install the runners inside the case and check the fit of the drawers. I like a drawer to be about $\frac{1}{16}$ in. narrower than the drawer pocket. Once the drawers are fitted, I mount the pulls. Flush pulls are preferable, since any protruding hardware may get in the way of clamping from above. I bought my pulls from Hamilton Marine; similar pulls are available from White Chapel.

Finally, make the mortise-and-tenoned frame-and-panel door. Fit it, install its pull, and hang it. Then apply your finish of choice to the cabinet and start putting all that stray stuff in its place. □

Contributing editor Christian Becksvoort builds Shaker furniture in New Gloucester, Maine.



Rout for the runners. Cut stopped grooves in the drawer sides to accept the solid-maple drawer runners. Becksvoort puts tape on the router table's fence to establish the location of the bit (above). Clean up the stopped end of the runner groove with a chisel (left).



Fix the runners. Becksvoort glues in the maple runners, using brads instead of clamps to hold them in place.

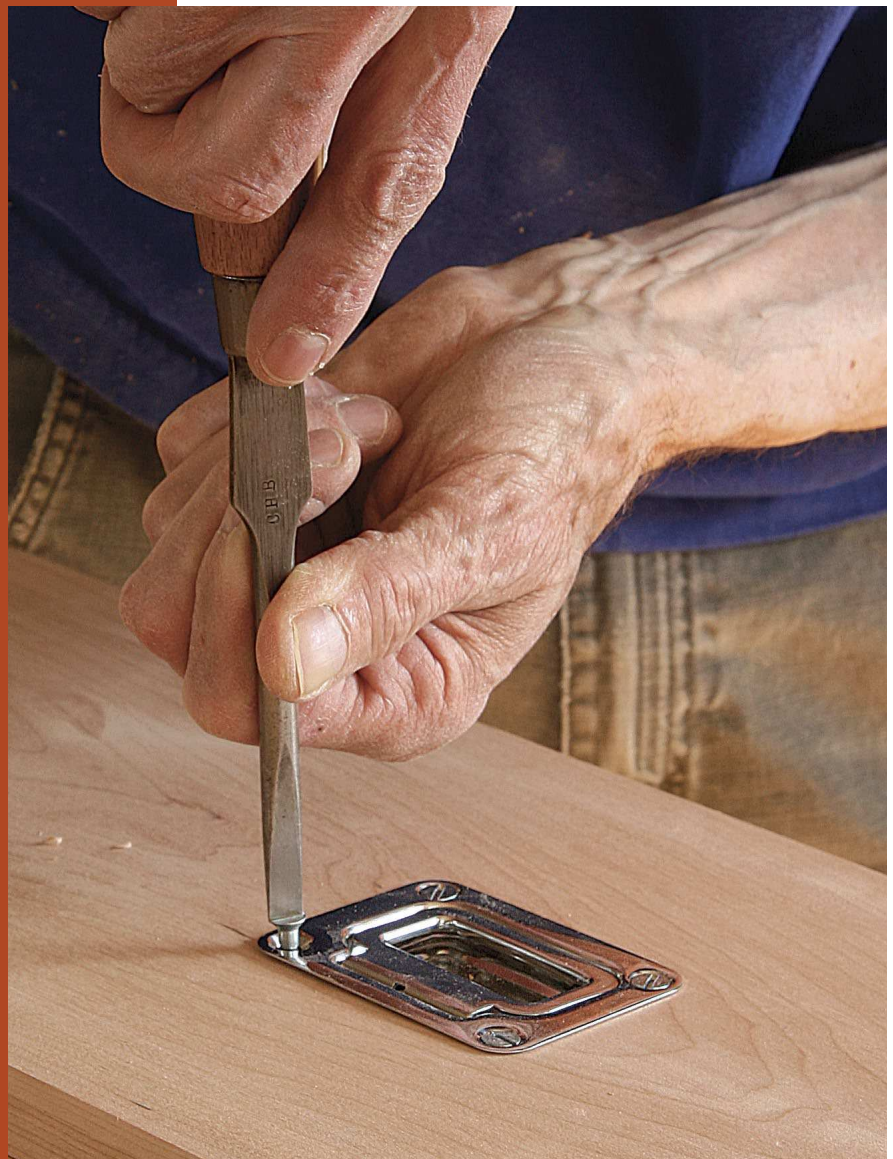


Beautify the back. With the drawer fitting finished, Becksvoort glues the solid cherry frame-and-panel back to the cabinet.

Fitting flush-mount pulls



After roughing out a recess with a trim router to accept the main part of the pull, Becksvoort uses a countersink bit (top) to create clearance for the screw dimples at the corners. Carbon paper and a gentle tap with a mallet (above) marks the areas that need further excavation with a chisel.



Polyurethane

Veteran pro builds a strong case
for using this misunderstood
adhesive

► Why make the switch?

EASY ASSEMBLY

The lack of water in polyurethane glue means joints do not swell and lock up. And its inherent slipperiness makes assemblies slide together easily, a big advantage with fussy joinery like sliding dovetails.

Is My Go-to Glue

BY CRAIG THIBODEAU

For a long time, my go-to woodworking glue was yellow glue. Then a respected pro recommended that I try Gorilla Glue for veneering. Because of the glue's lack of moisture, the sheets of veneer didn't curl, which made the work easier. I also discovered that the glue created a very rigid glueline, a big plus with bent-lamination work. As I tried the product on other types of glue-ups, I soon discovered other advantages. Once I got through a short learning curve, I began to use polyurethane glue more and more.

Polyurethane is inherently slippery and contains no water. These are big advantages on almost all joints, but especially those that can be difficult to assemble.

There are two main downsides, one easy to deal with and one less so. The sticky squeeze-out is no problem if you apply less glue to start with and then let it dry before

touching it. The other downside is that polyurethane glue underperforms in gappy joints. Unlike yellow glue, which has minor gap-filling ability, polyurethane has none, expanding to become featherweight foam in spaces bigger than 5 or 10 thousandths of an inch. This is why some woodworkers mistakenly think polyurethane glue lacks strength in general.

But in my experience, polyurethane glue—when used correctly—is every bit as strong as other glues, as long as your joinery is sound and clamping pressure is sufficient.

Today I use polyurethane glue for almost all of the joinery I produce. As a working pro, I wouldn't do that unless it made serious sense. I encourage you to give it a try. It just might become your favorite, too.

Craig Thibodeau is an award-winning furniture maker in San Diego.

EASY CLEANUP



Polyurethane creates a much harder glueline, meaning you won't get the raised gluelines that sometimes pop up on panels after a few years of wood movement. When dry, the squeeze-out is rigid and easy to remove.

STRONGER MITERS



Polyurethane soaks more deeply into end grain than yellow glue, making it stronger on miter joints, and even adding strength to butt joints in plywood construction.

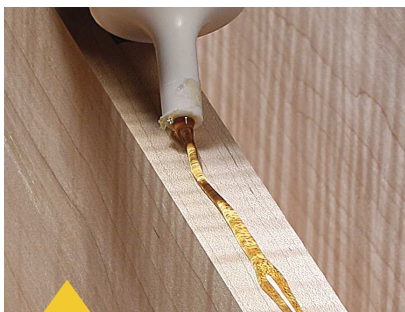
BETTER ON CURVES



With polyurethane's rigid glueline and lack of moisture, bent laminations and veneered panels stay the exact same shape as the form they were made on.

TIPS FOR SUCCESS

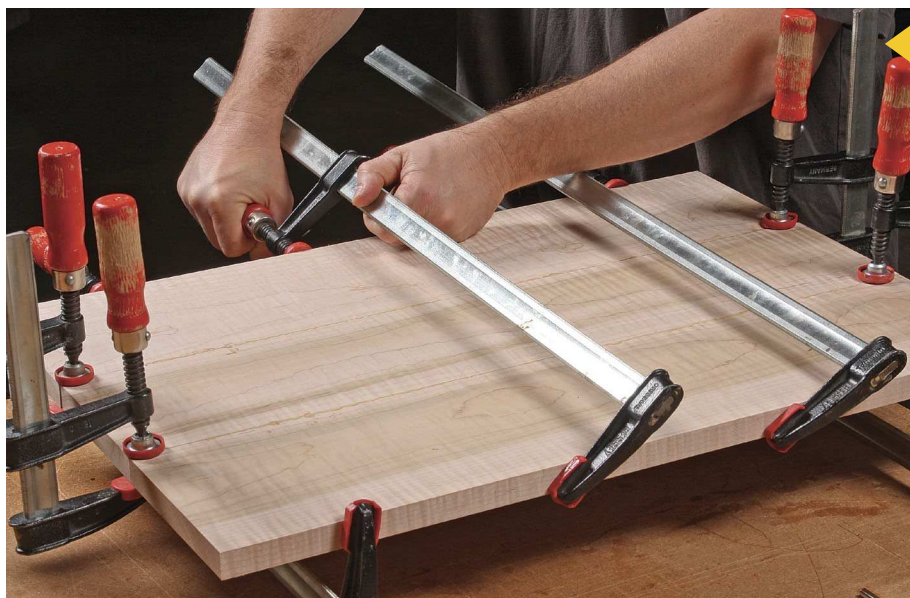
Mostly because of improper usage, when many woodworkers think of polyurethane glue, they think of sticky, foamy squeeze-out that is impossible to clean up. Here's how to avoid that problem on a panel glue-up, and make the most of this great glue.



Use a thin layer. Apply it to just one surface and use a brush, roller, or stick to spread it. The goal is a thin bead of squeeze-out that will be easy to remove.



Add moisture if needed. Use a damp paper towel to lightly moisten the mating glue surface in each joint. Moisten biscuits or slip tenons before inserting them. In humid environments, you won't need to do this.



Clamp well and wait. Polyurethane needs tight joinery and lots of clamping pressure. It also makes parts very slippery, so keep the boards aligned with biscuits or use clamps at the end of each joint. The glue will begin to foam up after 10 or 15 minutes, weakening its bond, so work fast. When dry to the touch, it will chisel, scrape, and sand off very easily.



TIGHT TENONS ARE NO PROBLEM

Polyurethane glue loses its strength in gaps, so trim your tenons for a snug fit. No worries—the lack of moisture will prevent swelling and the slipperiness will ease assembly. Thibodeau uses 60-day blue tape around the joint to make squeeze-out easier to remove.



Peel away squeeze-out. After the squeeze-out is dry, Thibodeau uses a chisel to loosen it on one surface (above), and then peels away the blue tape to remove it from the other (left).

Glue the mortises, wet the tenons. Don't squirt in too much glue, or it will end up as foamy squeeze-out. Spread it evenly with a stick (left). Then moisten the tenon lightly immediately before assembly. Again, a moist paper towel does the trick (right).

STRONGER MITERS

Thibodeau has had better results using polyurethane instead of yellow glue for miters. He thinks the polyurethane soaks deeper into end grain for a stronger hold. Still, he reinforces all miters with some kind of joinery (for more on how he cuts and clamps miters, see "Tablesaw Sled for Miters," FWW #257).



Two faces and two coats. Miters are one case where you should put glue on both mating surfaces, double-coating them in fact. In dry climates, start by moistening both surfaces with a damp paper towel. Then apply a coat of glue, wait a minute or two for it to soak in, and apply a second coat before assembling the joint.



Good pressure is essential. Thibodeau glues angled offcuts to the workpieces that allow the clamps to provide pressure across the joint without slipping. Once completely dry, the squeeze-out peels off easily with a chisel. Thibodeau then bandsaws off the angled cauls (far right), and planes the parts flush.

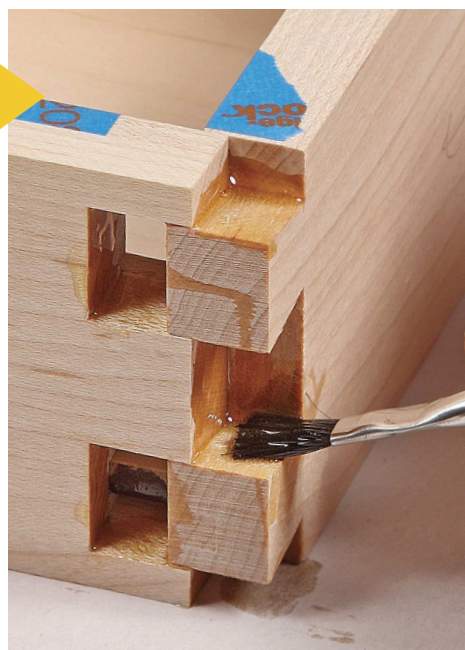


DOVETAILS GO TOGETHER EASIER

Tight, gap-free dovetails can be difficult to assemble. Polyurethane glue lets you drive them home with hand pressure only. Thibodeau finds it unnecessary to wet dovetail joints prior to gluing. If you do, a light swipe with a damp paper towel will do the trick.

Neat as a pin.

Thibodeau tapes the inside corners to catch the squeeze-out. Start by inserting about $\frac{1}{8}$ in. of the pins between the tails. Then apply glue to both pins and tails. The partially assembled box goes together easily. As the joints slide home, they spread the glue, sending most of the squeeze-out to the outside, where it is easier to remove.



SLIDING DOVETAILS THAT ACTUALLY SLIDE

These are notorious for seizing up and locking in place half-assembled, but with polyurethane glue even the longest sliding dovetails slide home easily.

Slide it home.

Apply glue to just the slot. Don't apply too much, and spread it evenly with a brush. Then wet the dovetail. Again, a damp paper towel applies plenty of moisture. Insert the panel from the front of the case to push any squeeze-out toward the back.

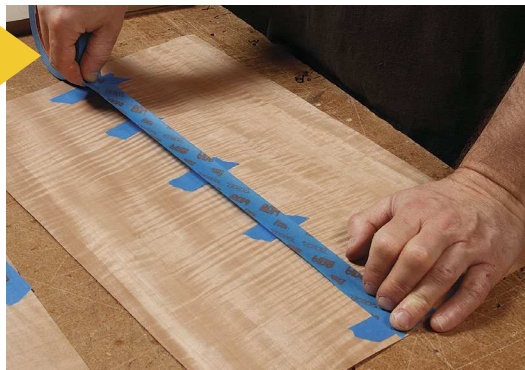


GREAT FOR VENEER AND CURVES

It's easy to spread a thin layer and, because there's no water, veneer sheets don't buckle and curved panels don't change shape as the glue cures. The rigid glueline also means that panels will hold their shape over time. Be sure to use a layer of plastic between the parts being glued and the cauls and forms, because this glue sticks to everything.

Avoid gum tape.

The glue is nearly impossible to remove from gum tape and difficult on standard blue tape. So Thibodeau uses normal blue tape only across the joints, then follows with the thinner, weaker 60-day type for the seams.



Roll and spritz.

A short-nap roller spreads a thin coat of glue on large surfaces like this substrate (right), and a spray bottle puts a very light mist of water on the veneer (far right).

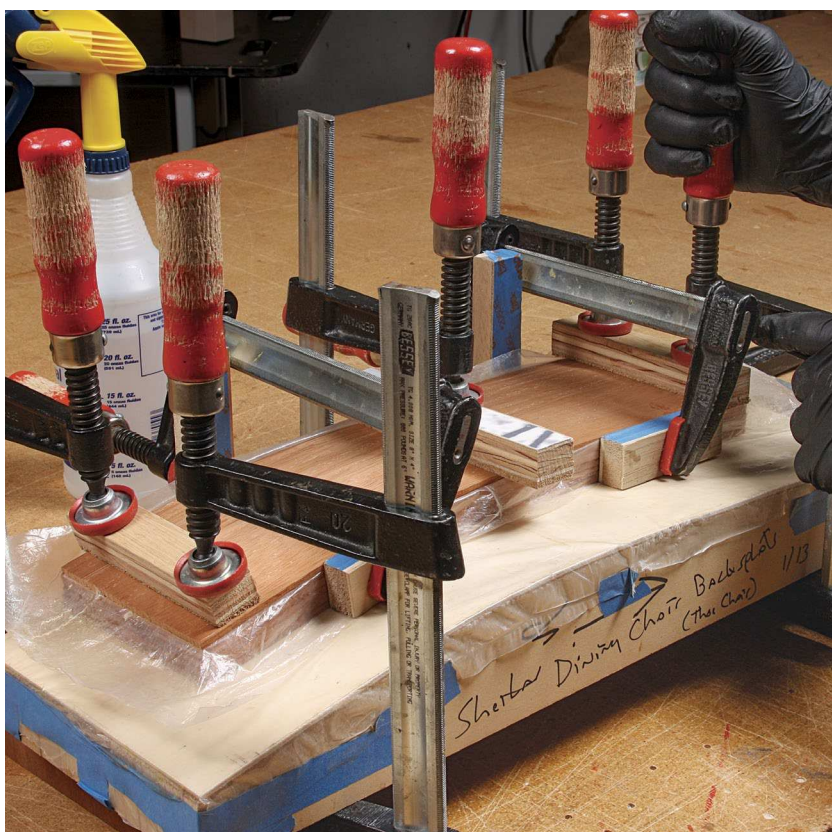


Use a caul for clamping veneer.

Without sufficient pressure, polyurethane glue will foam up and expand, so it is critical to place an MDF caul over the top veneer in a vacuum press. A lot of bleed-through means you used too much glue, a few spots (left) mean that you got the amount right. None at all means use more glue next time.



Add clamps for curves. Vinyl or nitrile gloves let you align the wet edges of the plies without getting glue on your hands. Use plenty of clamps, and use cauls to distribute the pressure evenly. Leave the clamps on for 24 hours to ensure a full cure and no springback.



Build Your Own Handsaw

A professional-quality saw, custom-fitted to your hand

BY TOM CALISTO

Handsaws are a great introduction to tool making. The parts are few and readily available, and there's no huge investment in time or money to create a top-notch saw that fits your hand perfectly. The only tasks that require care are shaping the handle and cutting the slot for the blade and the mortise for the spine, both of which are easy for a furniture maker to tackle.

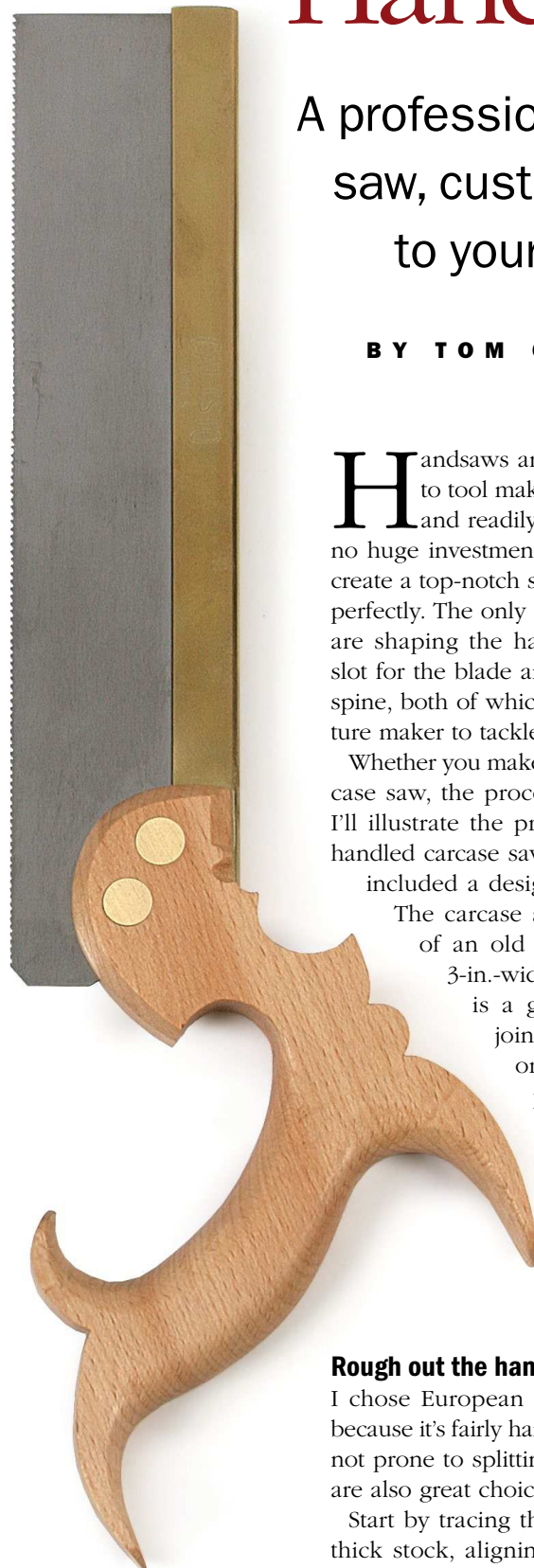
Whether you make a dovetail saw or carcass saw, the process is the same. Here I'll illustrate the project using a closed-handled carcass saw (far left), but I have included a design for a dovetail saw.

The carcass saw is my adaptation of an old Disston pattern. The 3-in.-wide by 12-in.-long blade is a great size for cutting joinery—tenons, notches, or miters—and cutting parts to final length. I tweaked the handle design and some dimensions to end up with a classic-style saw that fits the hand better than the original.

Rough out the handle

I chose European beech for the handle because it's fairly hard, closed-grained, and not prone to splitting. Cherry and walnut are also great choices.

Start by tracing the pattern onto $\frac{7}{8}$ -in.-thick stock, aligning the grain so that it

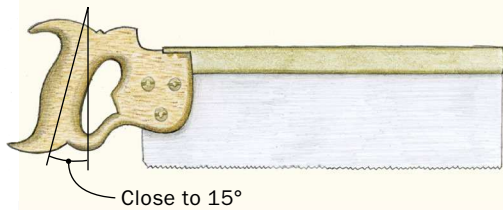


TWO HANDLE ANGLES

A saw's hang refers to the angle of the grip in relation to the tooth line. It plays a critical role in the way the saw handles.

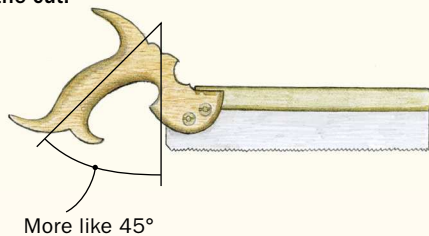
CARCASE SAW

A carcass saw has a low handle angle that directs most of the cutting force forward along the tooth line and relies on the saw's weight to apply pressure.



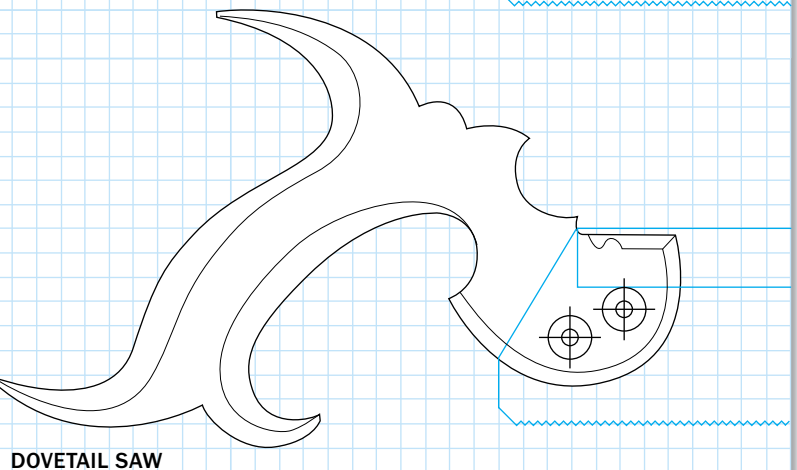
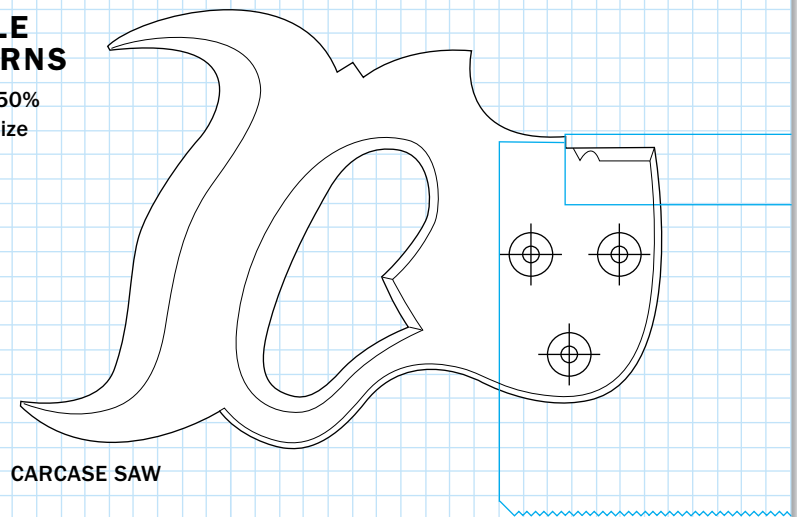
DOVETAIL SAW

A dovetail saw has a more severe handle angle, which helps the lighter-weight saw direct more pressure downward and into the cut.



HANDLE PATTERNS

Shown at 50% of actual size



CUT THE HANDLE TO SIZE



Saw and file. After laying out the handle's shape on the blank, saw out the exterior at the bandsaw and the interior at the scrollsaw (above). Fair the edges (right), using a rasp to clean up the mill marks left by the bandsaw. Be sure to keep the faces perpendicular to the sides.



MAKE WAY FOR THE SAW PLATE AND SPINE



Lay out the slot depth. Set the plate on the handle, and mark both sides of the handle where the slot will end. Transfer these marks across the edges as well.



Mark a cut line. Set a marking gauge to half the thickness of the handle, and score a line between the two edge marks.



Online Extra

For a demonstration on how to cut a perfectly straight saw slot, go to FineWoodworking.com/258.

Saw the slot. Clamp the handle upright and saw the slot into the handle following the marking-gauge line. It's vital that this slot is straight and doesn't waver.

Mark for the spine mortise. Put the spine on the plate, slide it all the way to the back of the slot, and lower it onto the top of the handle. Mark the mortise length. Then mark the depth of the mortise by placing the spine on the front edge of the handle.



Chisel out the mortise. A thin chisel will quickly clear out the mortise for the spine. When that's done, pare the walls and test for a snug fit.

runs in line with the saw plate. Make the exterior cuts at the bandsaw and the interior on the scrollsaw. After the pattern has been cut out, remove the milling marks with a rasp, but don't start shaping yet.

Cut the slot for the saw plate

Sawing an accurate slot is a critical step, and I always saw the slot for the plate and mortise for the spine before doing any shaping. This way, you can use the flat and parallel sides to mark for the joinery.

Start by establishing the plate's depth in the handle. Assemble the plate and spine and place the assembly on the handle with the spine parallel to the flat on the nose of the handle blank and roughly $\frac{1}{8}$ in. above it. Mark the depth of the plate along the sides and the top and bottom edges of the handle. It is important to have enough room for the saw nuts to engage the plate without having them right on the edge of the handle.

After marking the depth of cut, set up a marking gauge to scribe a line marking the slot for the saw

TIP



ERROR-PROOF SLOTTING OPTION

If you don't own a saw yet or aren't confident in your sawing skills, clamp the blade to the bench between two pieces of hardwood. The bottom piece must be milled to half the thickness of the handle, which will place the slot exactly where it needs to be. Draw the handle against the blade until the slot is cut.

SHAPE THE HANDLE



Pencil lines guide the work. Mark a centerline along the entire outside edge of the handle and mark chamfer lines in the grip area so that you can evenly remove the bulk of the material for shaping.

plate. Scribe all the way along the edge of the handle between the layout marks.

The quickest way to cut the slot is to use another backsaw with a similar kerf. If you're a little shaky with a saw or this will be your first saw, I have a simple trick to make this task painless.

First, you'll need the toothed and sharpened saw plate and some hardwood scraps. Mill a piece of scrap to half the thickness of the handle material; this will space the plate off the bench to cut a perfectly centered slot. Lay the saw plate on top of the spacer, put another piece of scrap over it, and clamp it to the bench with the teeth pointing away from you. Lay the handle flat on the bench and draw it back over the saw plate until the slot reaches the depth marks. When you're done, you should have a perfectly straight slot for the saw plate.

Mortise for the spine

To mortise the handle for the spine, insert the spine and saw plate as a single assembly into the slot with the back of the plate flat against the slot in the handle and the spine against the top edge of the handle. Pencil around the spine to mark the mortise length (see photo, opposite). Then reposition the assembly so that the spine is against the front of the handle to define the depth, and remember to leave the back about $\frac{1}{8}$ in. proud of the handle.

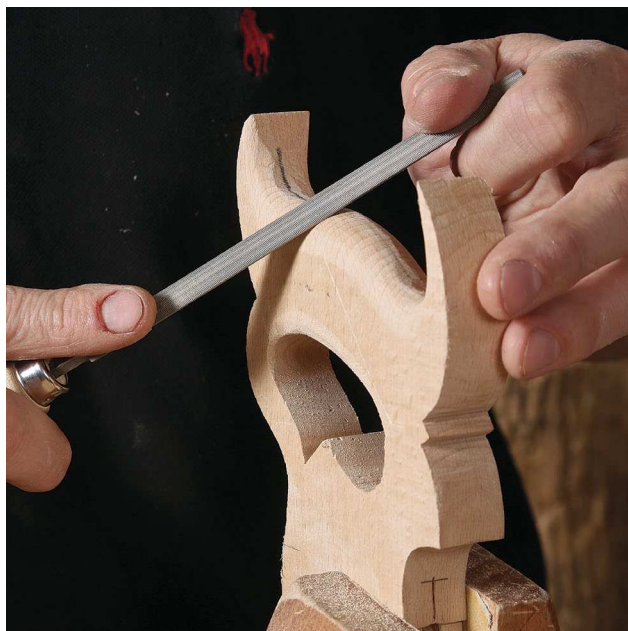
Carefully chisel out the mortise. Check the fit to make sure the entire assembly sits straight in the slot and mortise. Once it's perfect, you can move on to shaping the handle.

Handwork for the handle

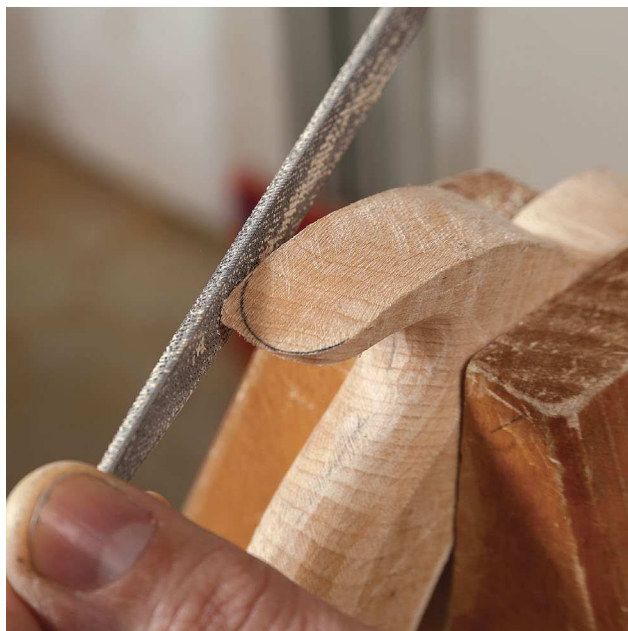
Getting the handle symmetrical and comfortable can seem daunting, but with careful layout it's simple.



Rasp removes the waste quickly. Start with a rasp and work down to the chamfer lines (above). Work with the grain to avoid tearout.



Ease the transitions. Use the rasp to ease the chamfers into complete curves. Be sure to check the grip with your hand to make sure the shape is a good fit.



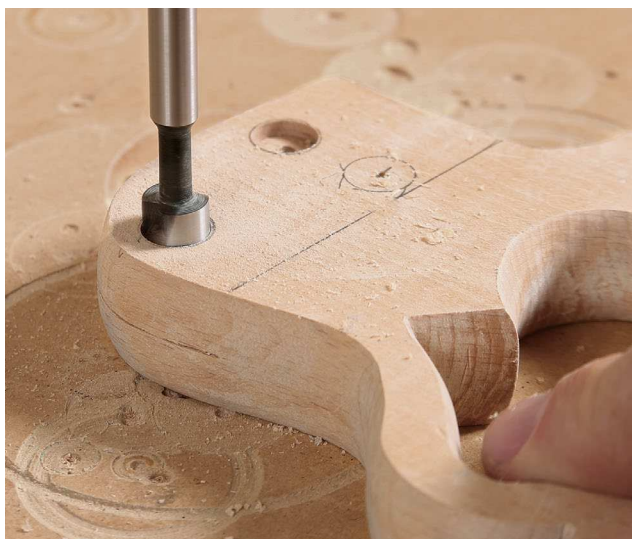
Round the hard edges. The horns at the top and bottom of the grip are rounded off with a rasp. The remaining interior profiles and lower edges of the handle's exterior can be lightly pillowed.

DRILL THE HANDLE

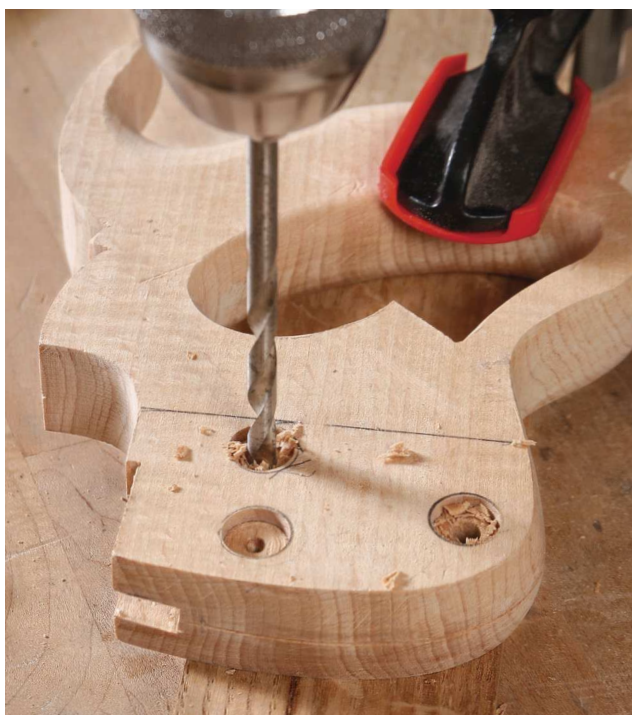
Start with pilot holes. After marking the locations of the saw nuts, drill a $\frac{1}{16}$ -in. pilot hole for each one. This will ensure the multiple holes and bores are aligned from side to side.



Counterbore for the heads. Use a Forstner bit in the drill press to counterbore for the head of the saw nuts on both sides of the handle. Set the depth stop to leave the saw nuts just proud of the handle. The nuts will be leveled flush later.

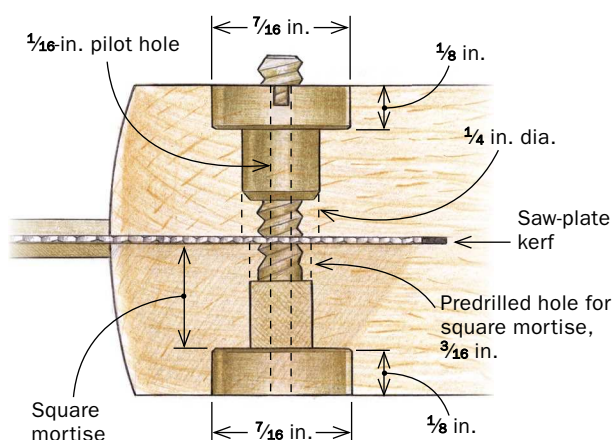


Drill for the shank and shoulder. The shoulder of the saw nut is square and one side of the handle needs to be bored—and later chiseled—to match. Drill the bore for the square shoulder and stop at the saw plate slot. Flip the handle and drill for the shank of the saw nut.



SAW-NUT HOLES MUST ALIGN PERFECTLY

Each saw-nut hole has counterbores for the heads on each end, a standard hole for the shank, and a square mortise for the square shoulder.



Begin by drawing a centerline down the handle and adding some chamfer lines along the edges. The chamfer lines are guides for removing the bulk of the material equally. Start the shaping process with the grip area. Rasp off the corners to the chamfer lines and round over this section with a file and sandpaper. The shape should be elliptical in the grip area and flow nicely into the other sections of the handle, and most importantly feel good in your hand.

The sharp-edged horns on the back of the handle also get rounded, and the underside of the handles and other inside faces of the grip cutout can be pilloved with a soft roundover. After roughing things out with rasps, move on to files and finally sandpaper.



Square up the hole. Chisel the round hole square to match the shoulder on the saw nuts. The fit doesn't have to be perfect, but it must be snug to keep the nut from spinning.

DRILL THE SAW PLATE

One hole at a time. With the spine attached to the plate and seated full in the slot, mark one of the saw-nut locations with a transfer punch.



Drill the first hole. For the greatest accuracy, use a straight-fluted carbide bit in the drill press to make the first hole. Clamping the thin blade to the table and against a fence is a must.

Drill the handle and plate for the saw nuts

The brass fasteners that hold the saw plate to the handle are called saw nuts. To make these fit and function, the handle must be bored for the shoulders, heads, and shanks of the nuts. All these bores need to align on both sides of the handle, so start at the drill press, drilling a $\frac{1}{16}$ -in. pilot hole through the handle at each saw-nut location. The pilot hole will guide subsequent bits from either side of the handle. Drill the counterbores for the saw-nut heads with a Forstner bit, leaving the holes slightly shallow so the head will be slightly proud of the handle. Next, drill one side for the screw



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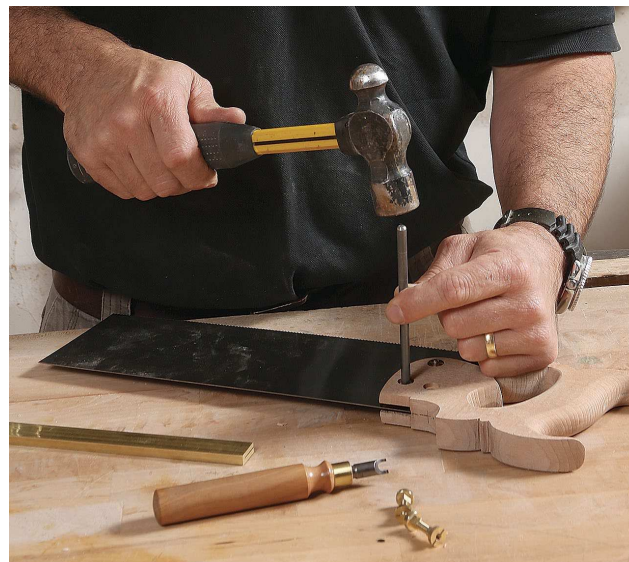
Calisto Tool
windwardwoodworks.com

shank and square it with a chisel to accept the screw's square shoulder. Drill the opposite side slightly larger to accept the shoulder of the nut.

There are several ways to make the holes in the saw plate, but the best I've found is a straight-fluted carbide drill bit in the drill press. Just make sure that the teeth are going in the right direction before you drill. I have seen a few push saws morph into pull saws.

Assemble all the components, line everything up, then mark one hole with a transfer punch. It's important to start with only one hole first to prevent misalignment. Pull the saw apart and drill the first hole. Drilling thin sheet stock can be dangerous, so make sure everything is clamped down; otherwise, you risk having a saw plate swinging around at 1,000 rpm.

Once the first hole is drilled, remove any burrs with a file and reassemble the saw. Place a saw nut into the first hole, mark the others, and drill those in the



Reinstall the saw plate. Clean up the burrs from the drill press and install the plate with one saw nut. Then transfer the locations of the remaining two holes to the saw plate and drill those as well.

ADD THE SPINE



Pinching the spine. A few good smacks with a dead-blow mallet will tighten up the spine. Calisto uses a log as an anvil, but a sturdy bench works too.



Round over the spine. A shopmade scraper rounds the spine to look like a traditional folded spine. The same effect can be done with files and sandpaper.



Soften the end. A file quickly and effectively gives the end of the spine a slightly rounded profile.



A quick polish. Whether it's a uniform sanding with 320-grit sandpaper or a full polishing, clean up the spine to get it ready for installation on the plate.

same way. If the holes don't line up perfectly, adjust them by opening the holes slightly with a round file.

Pinch the spine

The spine is the last major component and is attached to the plate with a friction fit, which means the slot in the spine is squeezed to clamp the saw plate in place. The spine comes fitted loosely to the plate. While building a saw, I take the spine on and off many times, so I find it easier to pinch them together as a final step.

The most effective way to pinch the spine is to use a dead-blow hammer to close the gap. Angle the hammer and concentrate the blows on the slotted side, taking the time to sneak up on the fit. It should be tight enough that a few light mallet blows will seat the plate on the back, but not so tight that it is impossible to start.

As a final touch, I use a small, shopmade scraper to round over the spine and give it a more traditional look. Once you've shaped the whole top of the spine, smooth the roundover and either sand the spine to a uniform luster with 320-grit paper, or polish it fully.

Put it all together

Final assembly begins with joining the saw plate to the handle. Slide the plate into the handle and insert the saw nuts. Don't force the saw nuts into the handle; the steel plate can easily strip the brass threads. Lightly tighten the saw nuts, as the spine must be installed before fully torquing the fasteners.



Slowly seat the back. After installing the plate in the handle, line up the spine with the mortise and tap on the spine gradually until it is seated fully on the plate.

FINISHING TOUCHES



File down the saw nuts. Take down the threaded portion and head on each saw nut until it's just shy of flush.



Lap the sides flat. Sandpaper glued to a sheet of Baltic-birch plywood is flat enough to level the brass saw nuts and handle sides to a uniform plane.



Finish when fully assembled. Calisto uses wipe-on polyurethane to finish saw handles because it is durable and easy to use. Use mineral spirits to clean off any finish that lands on the saw plate.

Align the spine flush with the back wall of the mortise and place the sawteeth on a soft wood block. Gently tap the spine with a soft mallet or dead-blow mallet to drive it onto the plate. Work your way along the spine, driving it deeper with each pass. Do this gradually to avoid bending or twisting the saw plate.

With the spine seated, tighten the fasteners and flush the saw nuts to the handle—first with a file, then with sandpaper on a flat surface. Last, give the handle a final sanding and polish the metal parts with fine steel wool. I finish the handle with wipe-on polyurethane, a durable and easy-to-apply finish. I apply it to the assembled saw and use mineral spirits to clean up anything that gets on the saw plate or spine. After three coats, lightly rub out the surface with a non-woven abrasive pad and apply some paste wax to the entire saw. □

Tom Calisto is a saw maker and teacher from Apex, N.C.



Wax the whole thing. When the finish is dry, a layer of wax over the entire saw will protect the handle, blade, and spine from dirt and moisture.

Workshops in the city

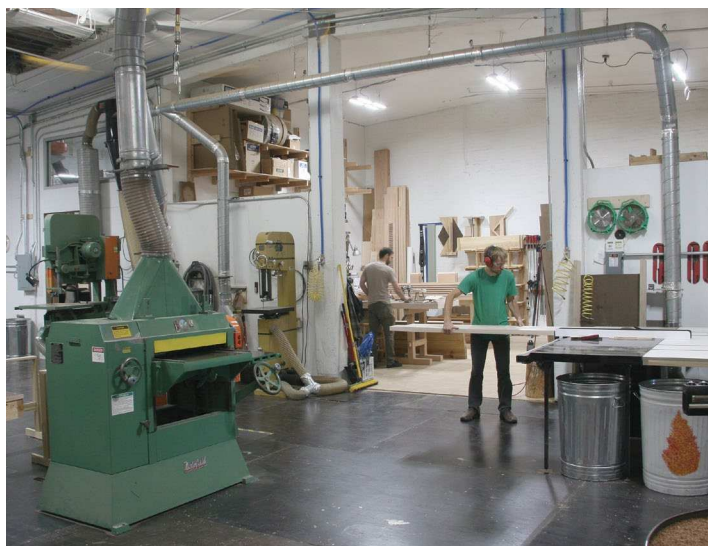
AROUND THE WORLD, THE BOOM IN GROUP SHOPS
IS A BOON FOR URBAN WOODWORKERS

BY JONATHAN BINZEN

BROOKLYN, N.Y.

Woodwork in a warehouse

Canadian furniture maker Reed Hansuld has seen all the advantages and difficulties of group shops up close. He worked in six such shops—in Toronto and New York City—before he and three friends founded Liberty Labs, a collective workshop in the Red Hook section of Brooklyn, last year. Joined in the venture by former publishing executive John Kotten, who provided a no-interest loan and a dose of financial savvy, the group formed a corporation with nonprofit status and a mission to provide affordable shop space to emerging designer-craftsmen. Then they spent three months converting raw space in a warehouse on the waterfront into what Hansuld hopes will be “the best place in the city to make this kind of career happen.” In addition to a collection of superb machines, Liberty has six bench rooms for its 16 craftsmen, a kitchen and dining area, office space, and professional photo gear available to anyone in the group. All members pay the same fee, and it covers use of the space, utilities, internet service, and maintenance of the machines. Routine tasks in the clean-as-a-whistle shop are divided into discrete jobs, which are rotated among the members weekly. For all the amenities the shop offers, one of its biggest assets, Hansuld says, “is just having other people around doing the same thing. We help and critique each other—and feed off the creative energy.”



A group shop grows in Brooklyn. Brooklyn's Liberty Warehouse, named for a certain statue just offshore, is home to a multitude of craft shops, including Liberty Labs (left), a 16-person collective. Members there include Pat Kim (rockets, below) and Jon Billing (textured cabinet).

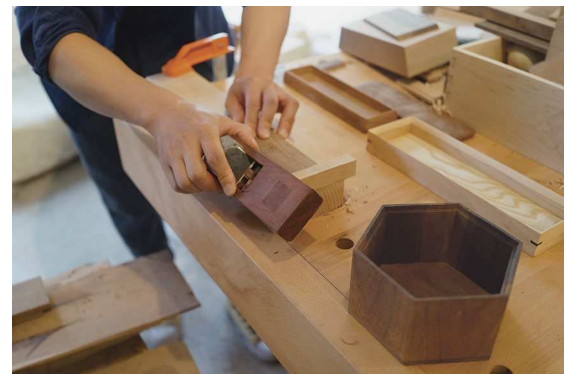




BEIJING, CHINA

Toward a new dynasty

According to 28-year-old Chinese furniture maker Li Chen, in his country, despite its long history of exemplary furniture making, “people don’t think of woodworking as something happening in the present. They think it ended in the Ming or Qing dynasties.” Chen hopes to change that. After studying furniture making at Rochester Institute of Technology for three years and then spending a year assisting John Sheridan in his San Francisco Woodshop, Chen returned to China, where he joined forces with Wu Wei, an accomplished furniture designer who had been conducting woodworking classes for five years in Beijing. This year Wei and Chen renovated a space in Beijing where they design furniture and also offer short courses in the basics of woodworking. In 2017, drawing in part on Chen’s experience at the San Francisco Woodshop, they plan to introduce a membership system, renting bench space and access to the machine room to individuals and small businesses, making something of a hybrid school and collective shop. In a city with such high rents, it will be satisfying to offer more affordable access to a full shop. But there’s more to it than that for Chen, who says, “the ultimate goal is to popularize woodworking in China.”



Craft in China. Li Chen (teaching at left) and his partner Wu Wei renovated a space in Beijing where they design furniture and teach introductory woodworking. They also intend to create a membership system for individuals and small businesses.

EDINBURGH, SCOTLAND Creative corner

In 1995, when Isabelle Moore graduated from Parnham College, the English woodworking program founded by John Makepeace, she returned to her native Scotland in search of shop space. Then as now, workable spaces for furniture making were scarce and expensive in Edinburgh, but she found a home in a group shop at the Albion Business Centre, a former soda bottling plant in the center of the city. The building's imposing neighbors include a 20,000-seat stadium for the Hibernian Football Club, which accounts for "the chorus and stamping of fans in the stands that reverberates through many a weekend working in the shop." Twenty-one years on, Moore, who travels frequently for residencies and teaching, still maintains studio space there, though in a different shop. In the years since, development in the area "has gone bonkers," she says. The Albion is filled with small creative companies, and in addition to more than a dozen furniture makers, there are other shops with leatherworkers, jewelers, glassworkers, guitar makers, even a gin distiller and a taxidermist.



Scots shop. Set in the heart of Edinburgh and in the shadow of a soccer stadium, the Albion Business Centre houses a wide variety of small creative businesses. The collective woodshop at left is home to a dozen makers, including Namon Gaston and Alasdair Campbell (table, below), and Isabelle Moore (rocking bench and stool).





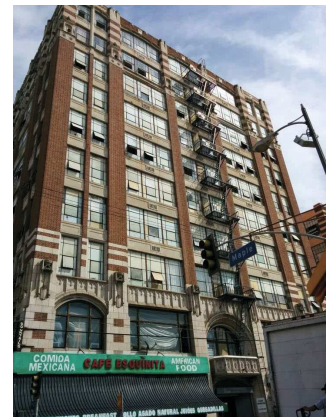
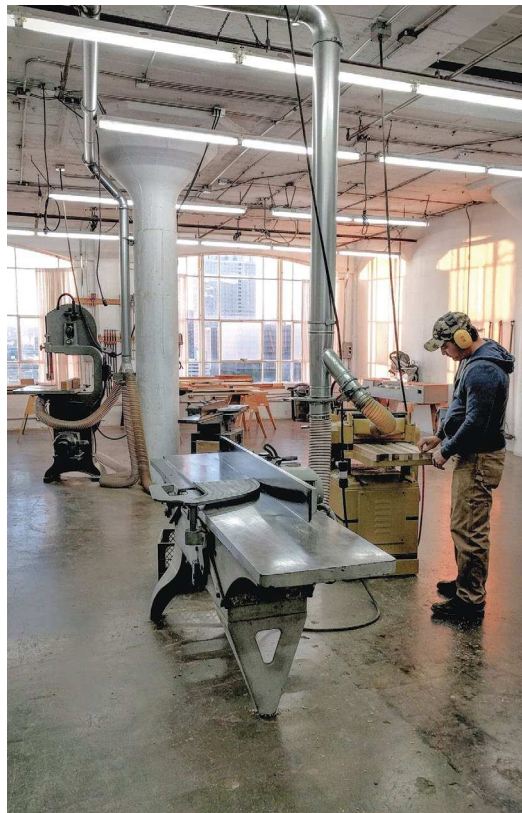
LOS ANGELES, CALIF. Elevated craftsmanship

When Laura Zahn moved back home to Los Angeles after spending a year studying furniture making at the College of the Redwoods in northern California, finding a place to work wood in the city was a struggle. She eventually rented bench space at Offerman Woodshop and enjoyed



her two years working there so much it prompted her to found a group shop herself: "I wanted to be able to offer other furniture makers what I was looking for when I moved back to L.A.—quality tools, a bench to call my own, and a community of furniture makers." She's done just that with her Allied Woodshop, a well-equipped

collective shop on the 10th floor of a downtown building with a broad view of Los Angeles. Zahn owns the machines and sublets space to six other furniture makers. Not content to provide shop space for a handful of furniture-making colleagues, Zahn has also set up a program of monthly workshops for beginning woodworkers, taught by members of the collective. The idea behind them, Zahn says, "is to share our love of the craft, to increase exposure to what we're doing, and to educate people about what it means to make custom furniture."



Going up. Laura Zahn's Allied Woodshop is a collective workspace on the top floor of the Allied Crafts Building in L.A.'s garment district. The shared machinery is geared toward fine furnitery making, and the space is home to seven woodworkers.

handwork

Get a grip on your work

FOR BENCHTOP CLAMPING, NOTHING BEATS THE HOLDFAST

BY JOHN PARKINSON



EASY ON, EASY OFF

A sharp hit just in front of the bend wedges the holdfast securely in the hole. Another pop with the mallet, this time on the back of the stem, releases the pressure.





Hold tight for joinery. Whether you're paring dovetails (opposite) or chopping mortises (above), a single holdfast is often enough to prevent the workpiece from moving under the force of the chisel.

Nothing more than a steel rod with a bend in it and a flattened pad at one end, the holdfast has been treasured in the woodshop for more than 300 years as a simple, quick, and effective method for holding work on the bench. All you need is a perfectly located hole in your benchtop. Drop the holdfast into the hole with the workpiece under its arm. Whack the holdfast from above to lock it in place and secure the work. Time to remove it? Knock it on the stem and it comes loose. It's that easy. I'll show you some ins and outs, along with a few examples of the holdfast's versatile workholding abilities.

A strong arm for handwork

Simplicity is part of what makes the holdfast so great. Inserted into a hole slightly bigger than the diameter of its shaft, the holdfast wedges into the hole when struck from above. Smack it on the back and it's no longer wedged. The speed and simplicity of the process encourages you to adjust the holdfast repeatedly as you're working so that you can orient the workpiece for more efficient chopping, planing, paring, or sawing.

The ideal clamp for benchwork

The holdfast's offset stem and low-profile pad allow you to get pressure close to where the work is happening without getting in the way. The key is finding the right spots to drill holes for it (see p. 84).



An extra hand for jigs. It takes more than a cleat on the underside of a sawhook or shooting board to keep it steady during use. A holdfast on top of the fence eliminates all movement.



Never in the way. Unlike clamps, holdfasts don't hang off the front of the bench, which means you can position them so that they don't interfere with the work at hand.



3 GOOD OPTIONS

There is no shortage of well-made and great-working holdfasts. Gramercy Tools makes excellent holdfasts (left), as does Lie-Nielsen Toolworks (center). You can also buy holdfasts made one at a time by blacksmiths like John Switzer at Black Bear Forge (right).

HOLDFASTS TO AVOID

Beware of inexpensive, imported cast metal holdfasts. In Parkinson's experience, they can be very weak at the bend, and a strong whack can crack the holdfast at that critical location.

Because the holdfast's stem is offset from the workpiece, it's rarely in the way of your tool. The clamping pad is low profile as well. You can place it close to the action and not worry about hitting it with a chisel or plane. Try that with an F-clamp.

For such a simple tool, the holdfast applies a tremendous amount of clamping pressure. Under its grip, a workpiece or jig simply won't move, and this makes working with hand tools easier and safer.

Now you need some holes

To use a holdfast, you need a hole through your benchtop. The key is making sure the holes are drilled square to the surface.

I've found that the easiest and safest way to drill holes for a holdfast is with another centuries-old tool, a brace equipped with an auger bit. Used in conjunction with a guide block, it drills a hole 90° to the surface of the benchtop with no trouble.

To make the guide, mill up a piece of stock at least 2 in. thick and long enough to reach more than halfway across the top's width. At the drill press, drill a hole through the guide. As I mentioned, for the holdfast to work properly, the diameter of the

PROTECT YOUR WORK

One downside to holdfasts is that their steel pads can dent the workpiece. To prevent this type of damage, put a more forgiving material, such as wood or leather, between the pad and workpiece.



Leather softens the blow. Soft enough to prevent damage but dense enough to transfer the holdfast's pressure, leather is the perfect material to cover a pad. Glue it on, and you'll never need to go looking for it.



Wood makes a good pad, too. A piece of scrap would work, but a dedicated pad stays with the holdfast and spreads out the pressure a bit.



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hole should be slightly larger than the diameter of the holdfast's stem— $\frac{3}{4}$ in. dia. in most cases.

Before you drill the holes, plan out where to put them. To do this, think of how you work. When you pound on a mortise chisel to clear waste from a mortise, you're working over a leg. So, you need a hole offset from the leg that allows the holdfast's pad to land on the workpiece. Put any jigs you use (shooting board, saw hook) on the bench where you use them. Locate the hole so that the holdfast can lock down the jig without being in the way. Work through all the other tasks that need a holdfast and you'll identify where to put the holes.

To drill the holes, clamp the guide to your bench, put an auger bit in your brace, and drop the bit into the guide's hole. Depending on the thickness of the top and the length of the bit, you might need to stop partway through and remove the guide to drill all the way through the top. The hole in the top serves as a guide for the remainder of the cut. □

John Parkinson is a professional furniture maker in Durham, N.C.

How and where to drill



Be thoughtful when drilling holes in your bench for the stem. Locate them where you do most of your handwork. A brace and bit work best for drilling. An auger bit moves quickly but leaves a nice hole. A drilling guide, made at a drill press and clamped to the bench, ensures that the holes are square to the surface.

HOLES ONLY WHERE YOU NEED THEM

It's not a good idea to create holes willy-nilly in the benchtop. First identify the area on the bench where you perform a task, such as chopping mortises or shooting end grain, and drill a hole that will locate the holdfast in the best place to assist in the job.



Near a leg for mortises and dovetails



In the center for shooting boards, sawhooks, and other jigs



Along the front edge for long, narrow work, or tough-to-clamp jigs like a benchtop vise



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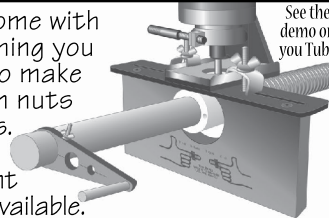
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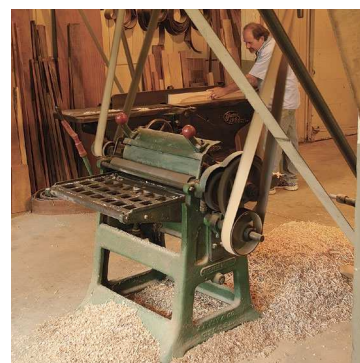
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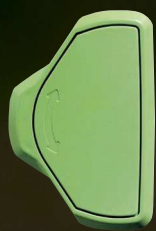
Belt-Driven Beauties

When Bob Berghorst, of Zeeland, Mich., went looking for equipment to create a woodworking shop as it might have appeared in 1900, he didn't have to go very far. Because in that era, nearby Grand Rapids was the hub of the largest concentration of furniture factories in the country, all of them stocked with robust cast-iron machines driven by line shafts. Berghorst, who built prototypes and models for the furniture industry and then ran a business making custom plywood, had acquired and restored many old machines over the years. But when he decided to turn back the clock on one section of his metal-clad, pole-built shop, he began frequenting old factories and salvaging shafts and pulleys, belts and beams, lights and windows. Working amid the whirring belts is transporting, he says: "It's an amazing feeling." He invites others to visit the shop (blberghorst@hotmail.com). —Jonathan Binzen



Audio Slide Show To see many more photos and Berghorst's descriptions of the shop, go to FineWoodworking.com/258.

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