

Fine
WoodWorking

The essential
hand-tool kit, p. 24



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58
SHOPMADE
SAWHORSES



72
UNPLUGGED
SHOP



34
WORKBENCH
PROJECT

features

34 Build a Stout Workbench

Tail vise is at the heart of this versatile bench

BY CHRIS GOCHNOUR

44 Keep Your Tools Out in the Open

COVER
STORY

Make tools visible and keep them orderly for a beautiful and more efficient shop

BY JIM PUTERBAUGH

48 Tune Your Tablesaw

A few key adjustments get your saw cutting smoothly

BY ELLEN KASPERN

53 Heating and Cooling Your Shop

Ductless HVAC systems ensure that the weather doesn't limit your shop time

BY BARRY NM DIMA

58 Superb Sawhorses

Sturdy designs in two sizes excel on the floor and on the benchtop

BY LEN CULLUM

68 Work at the Right Height

Optimize the elevation of your bench for the task at hand

BY CHRISTIAN BECKSVOORT

72 The Snug, Unplugged Workshop

A woodworker's space evolves along with him

BY DAVID FISHER



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departments

6 On the Web

8 Contributors

10 Letters

12 Workshop Tips

- Drill-press table has built-in work supports
- Glue-cap puller for tired hands

18 Tools & Materials

- Stout lathe with standout details
- Track gives circular saw extra skills

24 Handwork

The only hand tools I really need

30 Shop Design

Fine shop in a former garage

78 Gallery

Readers show off their shopmade tools

84 Fundamentals

The physics of machine safety



24
HAND-TOOL KIT



30
ONCE A GARAGE,
NOW A SHOP



18
LATEST LATHE
FROM LAGUNA



84
MACHINE SAFETY



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VIDEO

Tim Coleman's favorite tool

When we asked Tim, a frequent contributor, to name his all-time favorite tool, we were surprised when he pulled out a ruler. He'll explain why he reaches for one particular rule time and time again.



VIDEO

Everything in its place

Custom furniture maker Mike Korsak (p. 30) has a whole lot of machinery in his 20x24 shop. Learn why he placed each machine where he did.

VIDEO

The power of the push stick

Now that your tablesaw is tuned up and ready to go (p. 48), you're going to need a push stick to help you use it safely. Ellen Kaspern, an instructor at North Bennet Street School, argues why her push stick is the last one you'll need.

VIDEO

Tour a "minimalist" shop

Vic Tesolin is known as "The Minimalist Woodworker." You'll see what that means when we show you how many tools he has stashed away in his shop.

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VIDEO WORKSHOP

Carved greenwood bowl

Using tools usually relegated to firewood preparation, Dave Fisher turns a rudimentary log into a refined bowl that brings to light the beauty of the wood within. You'll learn how to:

- Read a log and decide where a bowl lies within it
- Rough-carve the bowl with an axe and drawknife
- Shape the inner bowl with an adze
- Chip-carve a decorative necklace around the rim



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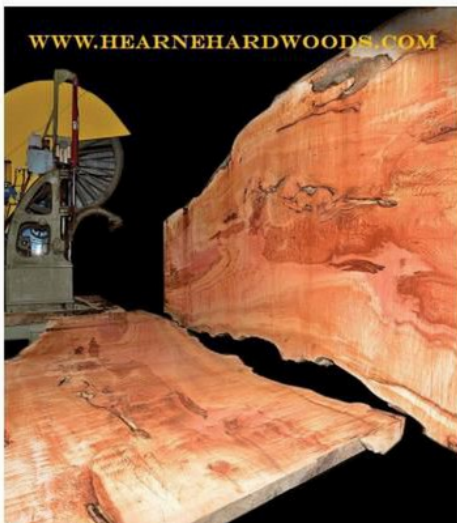
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contributors

Len Cullum ("Superb Sawhorses") was working in the Chicago theater world as a scenic carpenter a couple of decades ago when he became fascinated with Japanese woodworking. He looked for an apprenticeship but never found one. Instead, he says, "I learned by looking at pictures in books I couldn't read." He worked things out well enough that he wound up getting commissions to build everything from furniture and shoji screens to foot bridges and tea houses. Ten years ago he and his partner, Tina, moved to Seattle, where he continues to do splendid Japanese-style woodworking. He's still pining for an apprenticeship—but with a Japanese hammer maker.



In 2003, **Ellen Kaspern** ("Tune Your Tablesaw") graduated from the Cabinet and Furniture Making program at North Bennet Street School in Boston, where she has been teaching as an adjunct instructor for the past 13 years. She is a member of the cooperative Fort Point Cabinetmakers in Boston, where she designs and builds custom furniture, built-ins, and small objects for her business (ellenkasperndesign.com). Her work has appeared in galleries and she has given talks about woodworking around much of the northeastern United States.

Jim Puterbaugh ("Keep Your Tools Out in the Open") practices internal medicine at Providence St. Vincent Medical Center in Portland, Ore. He bought his first tablesaw in 1974 for \$25, shortly after getting married, to make some flower boxes. Later, a decision to turn wooden spoons led to a bandsaw and a lathe. Along the way, he got a subscription to *Fine Woodworking* and read James Krenov's books. He built his shop in 1990, and in it, he has done everything from school projects and helping with neighbors' needs to making furniture and building tree houses.



When **Mike Korsak** (Shop Design) is not building furniture in his renovated shop or restoring old woodworking machines for it, he's often exploring Pittsburgh's vibrant culinary scene with his wife, Jen. Nothing bland emerges from their own kitchen, either, and after a beautiful meal with home-baked bread, dessert might include blueberries—any of the seven varieties they grow on the hill above Mike's shop.

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

Fine Woodworking®

Publisher **Renee Jordan**
rjordan@taunton.com

Director,
Advertising Sales
& Marketing **Alex Robertson**
203-304-3590
arobertson@taunton.com

Director of Digital
Advertising
Operations **John Maher**
jmaher@taunton.com

Senior Advertising
Sales Assistant **Diana Edwards**
203-304-3829
dedwards@taunton.com

Sales & Marketing
Assistant **Tricia Muzzio**
203-304-3415
tmuzzio@taunton.com

Marketing Manager **Matthew Ulland**

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Spotlight

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July/August 2017
p. 43

Rustic shaving horse

Around the time that the August issue of *Fine Woodworking* offered Tim Manney's excellent shaving horse plans, I caught an episode of Roy Underhill's "The Woodwright's Shop" that talked about using "forks" from trees. This episode offered some historical examples of how forks had been used as the clamping arm in shaving horses.

I'd been looking for a project that would allow me to use a cedar tree that I had turned into rough lumber using an Alaskan mill along with a couple of forks I'd cut from a white oak after watching Underhill's show. I decided to use the forks



as legs, which certainly lends a different look from Manney's horse. I really enjoyed Tim's article, plans, and recommendations. I also enjoyed adapting a few ideas from "The Woodwright's Shop" to arrive at a historically inspired modern shaving horse.

Thanks Tim Manney, Roy Underhill, and, of course, *Fine Woodworking*.

—DAN EDWARDS, Woodbridge, Va.

Suggestion to change recent tip

I found Andy Olerud's tip on using groove-joint pliers (Workshop Tips, *FWW* #262, p. 18) interesting. I have used this method for many years in picture framing.

However, I would like to suggest one change: The pliers should be reversed, that is, the short lower jaw should be on the inside of the frame. Because of the length of the upper jaw, the lever arm tends to angle the brad as it's pulled in. Reversing the pliers allows the brad to be kept straight as it enters.

This method is also useful for driving glazier's points when re-glazing windows.

—DON LODGE, Southwest Harbor, Maine

Sage woodworking advice, and a tip

I have almost all of your magazines—my earliest is from 1977—and I use my issues almost daily for entertainment and instruction. Most of the tips from all the woodworkers I have learned the hard way by figuring out myself, but a huge amount of time has been saved by reading the issues and seeing what

others have discovered. Thanks, guys.

I have been a woodworker/cabinet maker for over 40 years and am self-taught. What started out as a hobby has helped me raise three daughters and live comfortably. I don't consider myself a fine woodworker—a wood prostitute probably would fit me better. I have done what I do for money more than fun these last 35 years. Now don't get me wrong, I love my work. There is a saying: Pick a profession you love, and you'll never work a day in your life.

The Tidewater area of Virginia has been my home and working ground since 1967. I started Tidewater Custom Cabinetry in 1977. Commercial projects, military bases, and homeowners have made up a wide array of jobs. I am retired now, meaning I don't punch in or keep long hours. People still find me and commission smaller projects from my backyard shop. My mantra now is if you are not in a hurry and it's not too big, I will put it in line. I'm sure that someday a project will get left undone, but you take your chances with old workers.

My tip for the magazine: Instead of spending valuable time building a workbench, look for a distributor of Bally Block countertops. These tops are built of solid wood and are reasonably priced. Mine is hard maple and was going for \$25 a foot at 30 in. wide. Get the seller to save you a dinged one—mine was hit with a forklift and cost me about half that price. Add an undercarriage of 2x4s, add some cubbies for tools, and in half a day you'll have a bench that will outlive you.

—THOMAS FRIZIELLE, Portsmouth, Va.

The "why" behind the stop block tip

Thanks to Tom McKenna for making my crosscut stop block tip into a video. What I did not tell *FWW* is that a few years ago my wife made a crosscut against the fence on my tablesaw; within minutes I was driving her to a hospital to have sutures put in her nose.

You can appreciate my inspiration for designing the magnetic block, and my thanks for making the effort to broadcast the safe use of a stop block on the tablesaw.

—ROBERT GUNN, Mississauga, Ont., Canada

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To contact us:

Fine Woodworking
The Taunton Press
63 South Main St.
PO Box 5506
Newtown, CT 06470-5506

Send an email:

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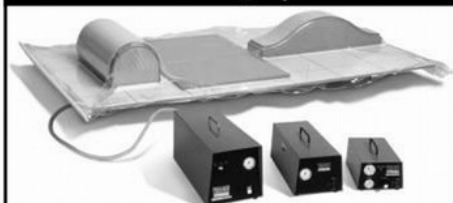
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workshop tips

Best Tip



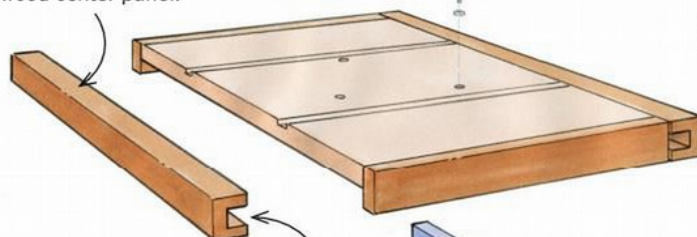
Kamran Firooz has been a woodworker for most of his life, building furniture and cabinets for his home and his kids, and showing work in galleries. Retired from the high-tech industry, he now lives in Colorado in the summer and Florida in the winter, with shops in both places.

Drill-press table has built-in work supports

Whenever I drill a long piece that extends beyond my drill-press table, I struggle to hold it down safely. My new shopmade table solves this problem effectively and economically. Make the center panel from any sheet goods you have lying around, and mill extrathick edging for all four sides. Then rout a precise groove through the front and back edge pieces to enclose $\frac{3}{4}$ -in.-square aluminum tube stock. I attached 5-in.-wide particleboard panels to the top of the bars (with a rail below each panel to stiffen it), which then slide in and out of the main table to create very stable extension wings. Couldn't be simpler.

—KAMRAN FIROOZ, Loveland, Colo.

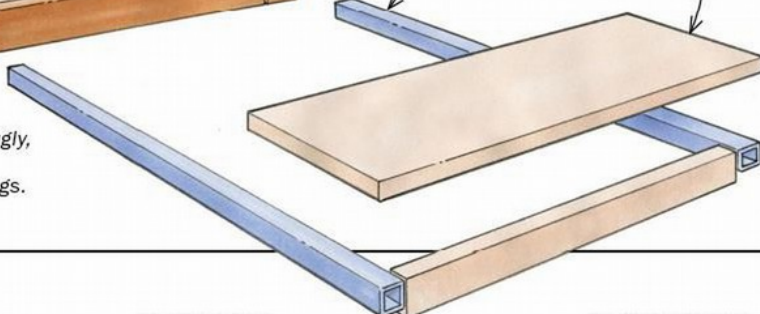
Thick, solid-wood edging is glued to double-thickness plywood center panel.



Grooves are sized to hug aluminum tubes snugly, and are spaced from the top edge the exact thickness of the plywood or particleboard wings.

Hollow aluminum tubes, $\frac{3}{4}$ in. square

Wings, 5 in. wide, attach to tubes and are flush with tabletop.



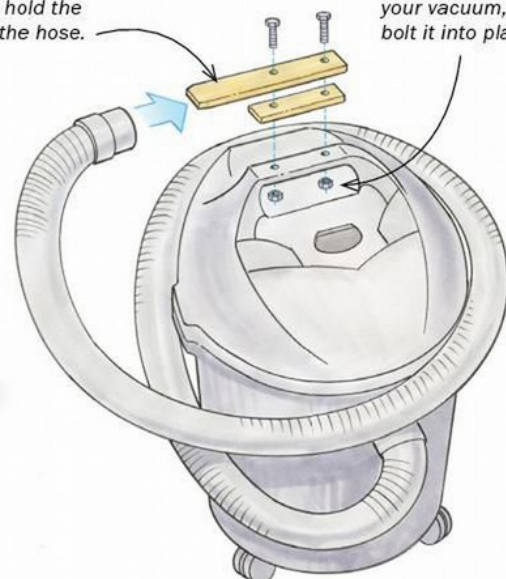
Simple stick tames vacuum hose

To keep the hose on my shop vacuum out from underfoot between uses and make it easy to scoot the vacuum around the shop, I added a small wood cleat to the handle on the vacuum. To stow the hose, I wrap it once around the top of the vacuum and slip the open end on the cleat. Problem solved.

—BOB PETERSON, Beaverton, Ore.

Cleat extends past handle 5 in. to hold the end of the hose.

Adapt wood cleat to the handle on your vacuum, and bolt it into place.



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Rubber disk keeps dust bag down

Cyclone dust collectors are a wonderful improvement over their single-stage counterparts. Many woodworkers like to line the collection drum with a plastic bag, as it is easier to empty a bag than the heavy drum. But some cyclones aren't designed for bags, and will suck them upward, rendering them useless. There's a simple solution. Just cut out a circular piece of heavy rubber matting and toss it into the bottom of the bag. The weight of the mat will hold down the bag. After dumping the sawdust into the compost bin, I retrieve the disk and plop it back into the bag. I purchased the rubber mat at a local hardware store that sells scraps of bulk materials. Another source is those rubber squares sold as floor covering for gyms and garages. Look for the rubber type, not foam, around ½ in. thick.

—WILLIE SANDRY, Camas, Wash.

Cut a circle from a heavy rubber mat, just smaller than the bottom of the barrel.

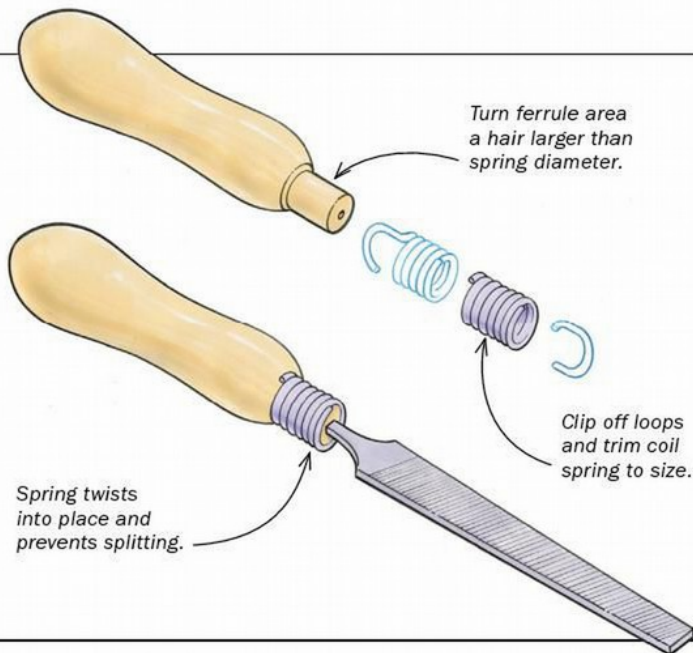
Drop it into the bottom of the empty bag.



Use coil springs as tool ferrules

I turn a lot of handles in my shop for different tools I use, so I am always looking for items I can use as ferrules, which keep the tang of a metal blade from splitting a wood handle. While looking through some of my "treasures," I spotted some coil springs and had a brainstorm. The springs make great ferrules for custom handles. I turn the handle down to the approximate size and then screw the spring onto the handle for a durable and long-lasting ferrule.

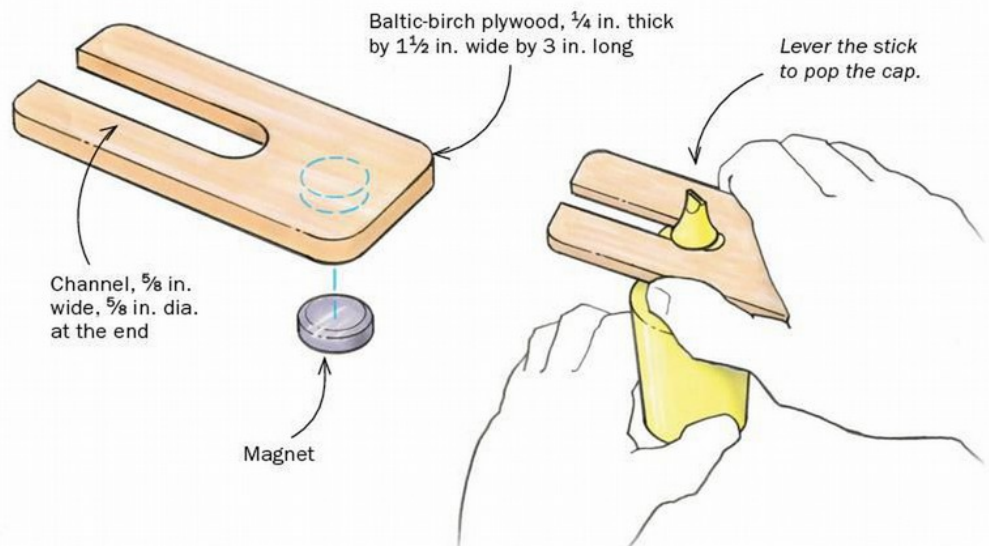
—NEIL LONG, Mound City, Mo.



Glue-cap puller for tired hands

My fingers don't have the strength they used to, and I sometimes struggle to open glue bottles after they sit for a few days. This little cap puller is the answer. I drilled a ⅝-in. hole in a piece of thin plywood and made a couple of bandsaw cuts to fashion this simple device. It slips under the cap and gives me all the leverage I need. I stuck a magnet in the back to hang it where I store glue.

—SEAN MONTAGUE, Raleigh, N.C.



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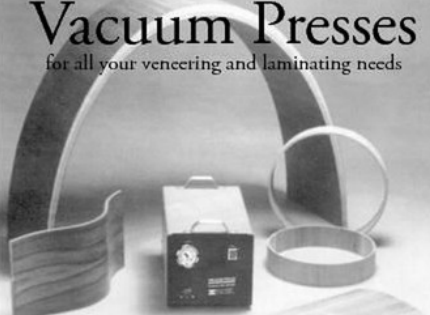


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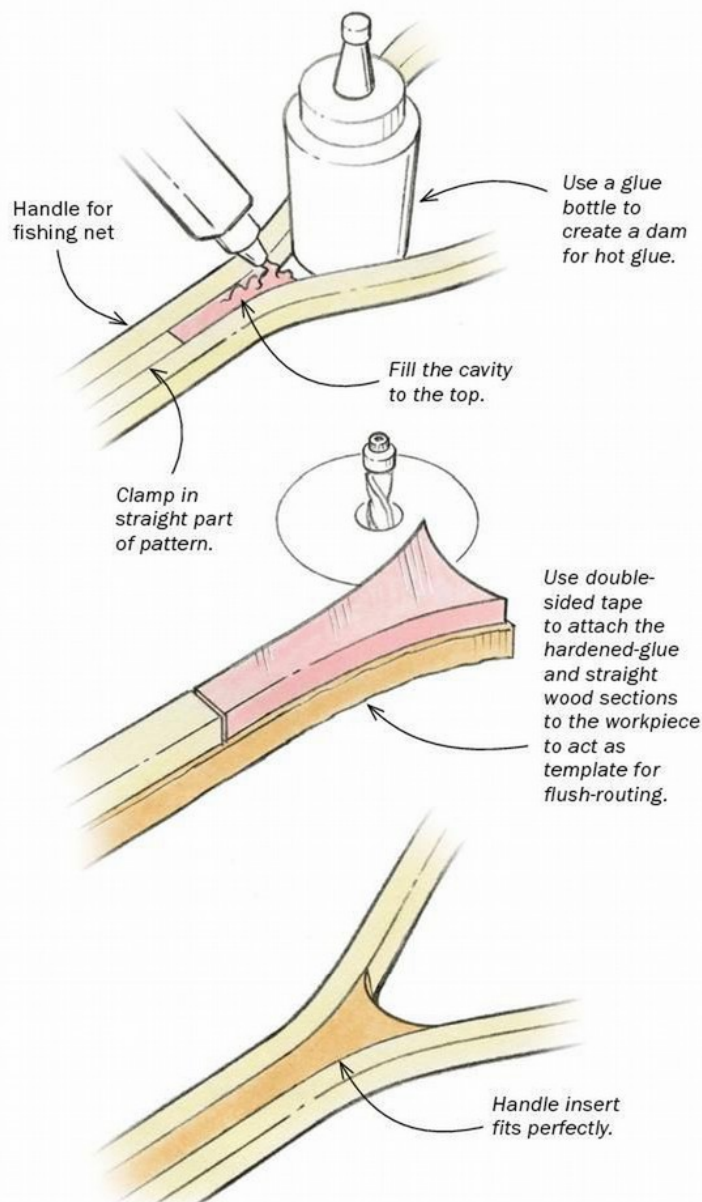
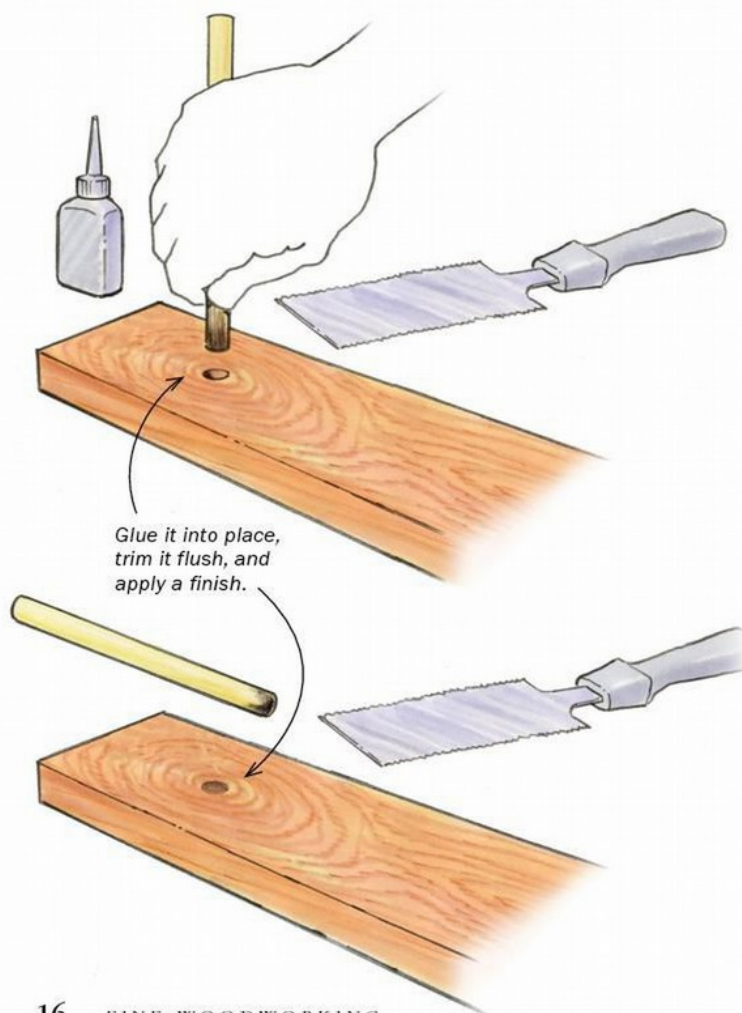
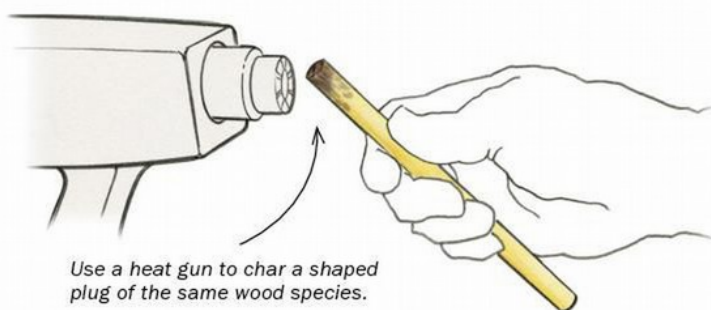
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When a knot's not there, try a heat gun

I am working on a step-back cupboard based on Mike Dunbar's great article from *FWW* #165 (October 2003). I like to leave natural imperfections in the wood, but in this case a knot was missing entirely. To create a darkened plug that looked like the missing knot, I used my heat gun on a shaped piece of scrap from the same wood. I've tried burning the plug in the past, but that obliterated the grain. The heat gun works wonderfully, letting me toast the wood to the color of the knot hole while letting the grain show through. To hold the plug in place, I used a cyanoacrylate glue designed for wood.

—BILL HUFFMAN, Snoqualmie, Wash.



Hot-melt glue forms template for oddly shaped workpiece

I recently made a frame for a fishing net, using steam-bent maple strips, but one step had me flummoxed. I just couldn't cut a V-shaped piece that would fit tightly into the narrow section of the oval. I was about to give up and leave the gap when I realized I could use hot glue to make a perfect pattern for the odd shape. First I made the straight part of the pattern from wood and clamped it in place. Then I used a normal glue bottle to create a dam, and loaded up the triangular cavity with hot glue. Once the glue cooled completely it peeled away pretty easily. I attached the triangular piece to the straight piece to form a perfect pattern for the entire insert, which I made from Spanish cedar.

I traced the pattern onto the stock to rough-cut it on the bandsaw, and then used double-sided tape to attach it to the piece for final trimming on the router table, using a spiral flush-trimming bit. The fit was perfect, and so is the fishing net.

—JOE NEWMAN, Loveland, Ohio

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■ MACHINES

Stout lathe with standout details

THE NEW LAGUNA REVO 18/36 LATHE, which has 18 in. of swing and 36 in. between centers, arrived at my shop just in time for bowl-roughing season. While most lathes would not be up for the task, the Revo 18/36 managed well.

Someone clearly put a lot of thought into this machine. The 2-hp motor is very powerful, and adjusting the speed is smooth and quiet. The conical nose on the headstock is a great feature that will aid in power sanding and removing tenons from the bottoms of bowls. The tailstock has all the features it should have, most importantly a locking mechanism that holds it securely to the bed. The quill is laser etched with a measuring scale and travels more than 4 in. The banjo is very user friendly and clamps down securely. The tool rest is well designed, allowing the user to place it directly in front of the work without anything getting in the way. It also has a hardened steel rod across the top that allows tools to glide smoothly.

With an additional outboard attachment (\$500), you can lengthen the lathe's capacity by 20 in. for spindles and its maximum swing for bowls to 32 in., and since the headstock slides, you can handle these big bowls between centers. But while the sliding headstocks on most lathes are inherently weak—they can't be tightened enough to dampen vibration, especially when you're using a bowl-coring tool—the Revo managed better than most.

One outstanding feature is the lathe's center-point alignment and slide clearance adjustments. If a lathe rests on an uneven floor, the tailstock can twist out of alignment with the headstock. The adjustment features ensure that if the lathe settles, it can be realigned. There are also two optional articulating floodlights that are very user friendly compared with the after-market lamps I own. There is no such thing as too much lighting around your lathe. Overall, the engineers at Laguna have made a machine that should be around for a long time and will challenge its competition.

—Michael Mahoney is a professional wood turner in California.



No problem with settling. The Revo's adjustments for center-point alignment and slide clearance make sure that the lathe can always be brought back in line.



Lathe by Laguna
Model: Revo 18/36
\$2,400 for 110-volt
\$2,500 for 220-volt



Headstock stays where you want it. The sliding headstock on the Revo is stout and glides across the bed with ease. It fastens more securely than other movable headstocks.



Offset banjo makes it easy to play. The banjo has an offset design that allows the turner to get very close to the work.

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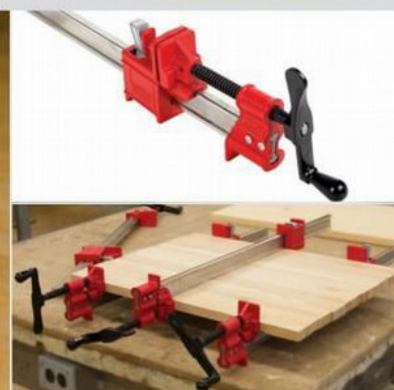
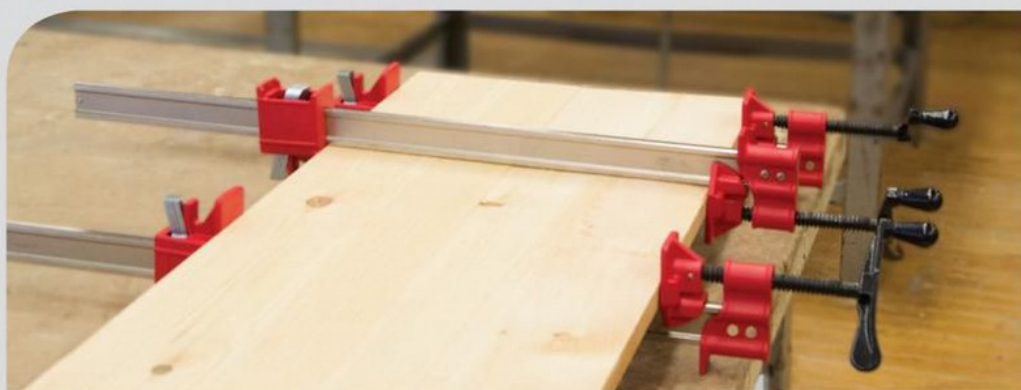
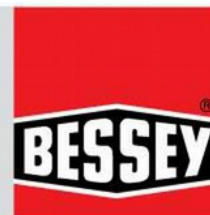
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■ ACCESSORIES

Plug cutters for hand drills

PLUG CUTTERS TEND TO COME in two basic flavors—those that cut straight-sided plugs and those that cut tapered plugs. The straight-sided cutters are a little more versatile because, in addition to plugs, they can be used to cut round tenons on small parts such as drawer pulls. When I make plugs to fill screw holes, I prefer tapered cutters, which make for a tight, gap-free fit during installation.

The Montana Brand plug cutters that I tried are tapered, but they offer a slight twist. They're the only cutters I know of that are self-centering and can be used with a handheld drill as well as a drill press. I'd only ever used a drill press for plugs, but I decided to try a hand drill this time around. I started out a little wobbly, but got the hang of things after a couple of attempts. The cutters work as advertised, and the key is a spring-loaded retractable centering tip on each bit. If you need to cut tapered plugs away from the shop or you don't have a drill press, I'd recommend adding these to your tool kit.

—Michael Pekovich is FWW's creative director.



Plug cutters by Montana Brand
Model: MB-65823
\$28, set of three
($\frac{5}{16}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in.)



Plug away freehand. The self-centering bit means accurate results with simply a handheld drill (left). The bit is tapered just a little, so plugs will fit snugly.



Screw, set, saw. Securing the sled to the saw is simply a matter of tightening some set screws. Once in place, the sled rides along the track for a non-slip cut.

Circular saw track by Kreg
Model: Accu-Cut
\$80

■ ACCESSORIES

Add a track to your circular saw

THE KREG ACCU-CUT lets a standard circular saw act like a track saw, and it works with almost any conventional circular saw. It has a 53-in.-long track (made up of two 26½-in. tracks and connector plates), a sled that mounts to your saw, and a starting block that rests against the edge of the work and guides the sled onto the track. The maximum cutting length is about 48 in. Assembling the tracks is simple, but check the assembly with a straightedge; I had to tweak mine slightly. The sturdy aluminum track has replaceable plastic guides along the edges and strips of nonslip rubber underneath that grab the workpiece, which is crucial, because Kreg deems clamping unnecessary (optional clamps are \$15). The guide strip lets you align the cut and helps reduce chipout. Because there are guide strips on both edges, you can use the second one when the first gets worn—just move the starter block to the opposite end. The sled rides with as much as ½ in. of play, so while cuts are good, they are not perfect. Also, you can't make bevel cuts. Still, this is an affordable way to turn a circ saw into a reasonably competent track saw.

—Tony O'Malley makes furniture in Pennsylvania.

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Getting geared up after AWFS

The Association of Woodworking and Furnishings Suppliers (AWFS) fair, held every other year in Las Vegas, is a massive woodworking trade show. The show recently wrapped up, and while most of its merchandise was geared to industrial use, it was also teeming with new and exciting tools from top manufacturers that suit the smaller shop. Here are a few that look pretty sharp.

FESTOOL SANDERS

Festool introduced a trio of cordless sanders. The company says they can run for 30 minutes at full power on their 18-volt batteries, which can recharge in 25 minutes. Roland Johnson, our resident power-tool guru, was particularly impressed with the sanders' weight and feel, calling them "downright feather-light."



ETSC 125
CIRCULAR PAD
\$195

RTSC 400
RECTANGULAR PAD
\$260

DTSC 400
DIAMOND PAD
\$260

VERITAS MICRO-ADJUST GAUGE

The Veritas Micro-Adjust Gauge has been a fixture in shops for years, but some users have felt its fine adjustment mechanism had room for improvement. Enter the company's new gauge, which has that mechanism built into the shaft—taking out some of the guesswork.



\$50



BESSEY IBEAM BAR CLAMP

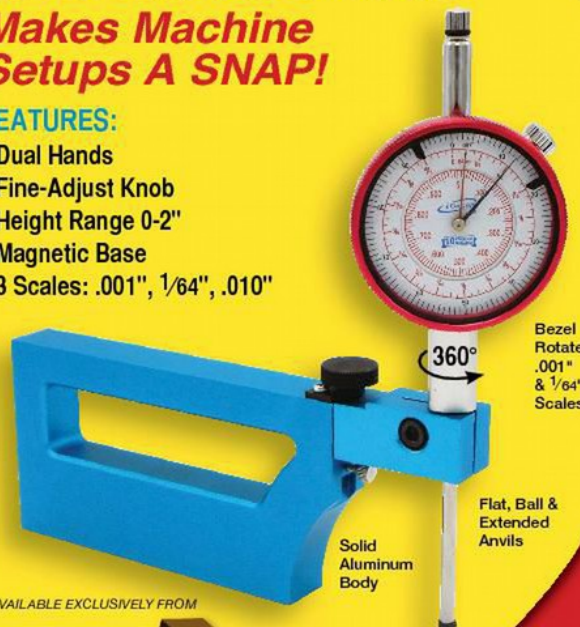
"Whoa, those look hearty" was a common first reaction at the show to Bessey's IBeam Bar Clamps. They come in varying lengths from 24 in. to 96 in., and if their weight's any indication, they could prove to be go-tos for gluing up large panels and other sizable parts that may need a little extra persuasion.

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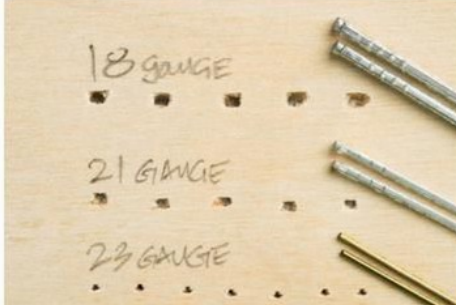
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FROM MILLING AND LAYOUT TO FITTING JOINTS AND SMOOTHING, THIS TIDY KIT DOES IT ALL

BY GARRETT HACK

I am fortunate to teach woodworking classes around the United States, in Canada, and in faraway places such as Japan and Germany. I learned early on that I need my own tools with me when I teach, ones that I know well and that are dependable, perfectly tuned, and sharp. Through the years, I've worked to minimize the number of tools in my kit. It has to be complete enough to build a whole project, yet light enough to carry through airports and on buses and trains. Although I am still fine-tuning my kit—replacing a tool with a lighter version, for example—it's proven to be lean and capable of a wide range of work. When it comes to hand tools, this kit contains all I need.

Garrett Hack is a contributing editor.





LOW-ANGLE JACK PLANE AND EXTRA BLADE

Good for everything from jointing stock to smoothing and shooting. The extra blade is cambered for smoothing.



CARD SCRAPERS AND BURNISHER

Card scrapers level surfaces and clean up squeeze-out. The burnisher is necessary for setting up the scrapers.

PLANES AND SCRAPERS

Choosing planes to include in the kit was tough, because they should be few in number but able to perform a wide variety of work. A jack plane and two block planes can handle just about any planing task outside of joinery, and a shoulder plane gets the job done there. One spokeshave is all you really need for curves. Keep some card scrapers on hand, too.



A PAIR OF BLOCK PLANES

The large one is set for fine shavings, and used for chamfers, flushing inlay, and other delicate work. The small one is great for coarse work like roughing out an edge profile.



SHOULDER PLANE

The right tool for fitting joints.



SPOKESHAVE

Indispensable for shaping and refining curves.



One bench plane is all you need. A low-angle jack plane, along with an extra blade cambered for smoothing, can do everything from jointing to smoothing. And because it lacks a frog, it weighs less than a standard jack plane.



Flat-sole spokeshave for curves. Hack prefers one with an adjustable mouth and a cambered blade. No other tool handles both convex and concave curves as well.



Don't forget the block plane. In fact, have two: a small one like a violin maker's plane for coarse work and convex curves (shown), and an adjustable-mouth block plane for fine work.

BENCH CHISELS

These workhorses handle most of the chisel work.

CHISELS AND SAWS

It's possible to get by with just three or four chisels, but it's better to have more, so you'll always have the one that allows you to work most efficiently. In place of a very wide one, you can use the blade from your low-angle jack plane. Throw in a pair of small saws, and you're ready to cut and fit most furniture joints.



LONG-BLADE SOCKET CHISELS

The length of these chisels makes them good for paring.

SHOPMADE DETAIL CHISELS

Perfect for inlay.



FINE-TOOTH GENT'S SAW

Filed for rips and crosscuts, and wonderful for joinery.

JAPANESE FLUSH-CUTTING SAW

Light and precise, it's ideal for delicate crosscuts and the occasional small dovetail.



One saw for joinery. Choose a saw that cuts a fine kerf and has a hybrid file on the teeth, so it's efficient on rips and crosscuts.



A second saw for detail work. A delicate flush-cutting saw can be used as intended, but also for crosscuts on moldings and inlay, small joinery, and other jobs that require precision.



Chisels are for more than chopping and paring. They also can be used to rough out a chamfer (shown) or curve.



FILES

A collection of flat and round files to create new profiles.



SCRATCH STOCK BODY

Made in the shop, with a thumbscrew to hold the blade in place.



CUTTERS

There are at least 10 blades, and each one has at least two profiles cut into it. There are some blanks in the box, too.

SCRATCH STOCK

I couldn't make furniture without my magic box of scratch cutters. Everything I need to make, sharpen, and use them fits into a nifty little box. Equipped with an assortment of profile cutters, a scratch stock allows you to create furniture that is genuinely custom.

STORAGE BOX

Keeps the body and blades safe, as well as other small, delicate tools.



Make your own cutters. A small set of files, like this round one, is all it takes to make custom scratch-stock cutters.



Then make custom moldings. Handmade furniture should be custom from beginning to end, and a scratch stock allows you to turn out one-of-a-kind moldings.



DIAMOND PASTE

Rubbed into a strip of leather or a flat hardwood block, it's a 12,000-grit strop.

DIAMOND PLATE

Use this to reestablish the cutting edge.

SHARPENING

Hand tools are useless if they're not sharp, so no kit is complete without the means to sharpen them. It doesn't take much to hone an edge. When traveling, I get by with half a diamond plate and one waterstone. Around the shop, I use a grinder to maintain the bevel.

WATERSTONE

An 8,000-grit stone is an excellent way to polish and hone a hollow-ground bevel.

SLIP STONES

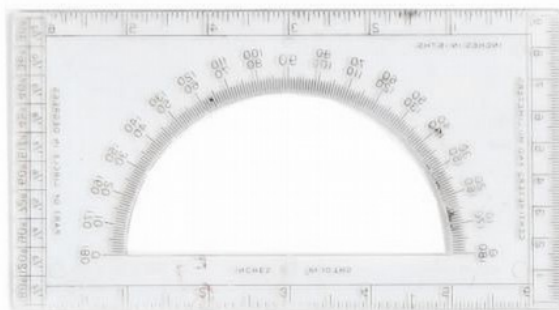
Sharpen scratch stock cutters with these: One fine, one medium, and oil for lubrication.





SMALL COMBO SQUARE

Great for layout, checking joints for square, and setting up machinery.



PROTRACTOR

Paired with the sliding bevel, it ensures accurate angles for joinery, leg splay, and other parts that aren't square.



SLIDING BEVEL

Use this tool for laying out dovetails and transferring angles.



TAPE MEASURE

For those times when a 6-in. rule just isn't long enough.



6-IN. RULE

Great for measuring in tight spots, and for laying out joinery.



CALIPER RULE

Determines the thickness of parts and the size of joinery components.

MEASURING AND LAYOUT

Accurate joinery is impossible without good layout tools. Although many of these tools are small, they are more than up to the job. They're sized perfectly for joinery, and a tape measure extends your reach beyond the length of the rule.



MARKING GAUGES

One suffices, but it's better to have two.



KNIFE

Some layout lines should be cut.



PENCILS AND ERASER

Essential for layout. Colored pencils are used to identify and orient parts.



You need marking gauges. It's the right tool for laying out dovetails and tenon shoulders. You can lay out tenon cheeks with one, but you must change the setting. Two gauges makes it easier.



One tool, many jobs. A combination square can be used for layout, checking joints for accuracy, setting up machinery, transferring measurements, and a host of other jobs.



Accurate angles. Use a bevel gauge to lay out an angled shoulder, transfer an angle from one part to another, and to lay out tails and pins.

Router Table Dovetail Jig

by Leigh



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THOUGHTFUL RENOVATION AND A SAVVY LAYOUT MAKE THIS SHOP EXCEPTIONAL

BY MIKE KORSAK



When my wife, Jen, and I moved to Pittsburgh in 2011, the property we purchased had several outbuildings, one of them a somewhat forlorn two-car garage. Despite its aesthetic shortcomings, the building was structurally sound and well situated, and it made sense that it would become my workshop.

Over the next year and a half, I did a gut renovation, stripping the building to its studs, moving and resizing window and door openings, and replacing everything from sheathing to drywall. I was careful in all my choices, because I wanted the shop to be reflective of the work that would be produced inside: functional, understated, subtly embellished, and meticulously crafted



with lovely materials. Drawing on my experience working in other shops, and on some research, I aimed to create a space that would be comfortable through Pittsburgh's muggy summers and frigid winters, have plentiful natural and

artificial light, and make the most of the building's 20-by-24-ft. footprint.

Working from the outside in

Since the building is fairly small and I was putting a lot of work into the renovation, it seemed justifiable to choose very nice materials. For the siding I used true quartersawn spruce clapboards sawn by Ward Clapboard Mill in Vermont. For the exterior trim I opted for MiraTEC, a pre-primed MDF product designed for exterior applications. I sheathed the soffits with clear, vertical-grain Douglas fir porch flooring, and I built the gable brackets of Douglas fir as well, but with a cabinetmaker's flourish: faceted sapele plugs over the screws. I built the entry door of Douglas fir also, and used sapele for the jambs and sill.

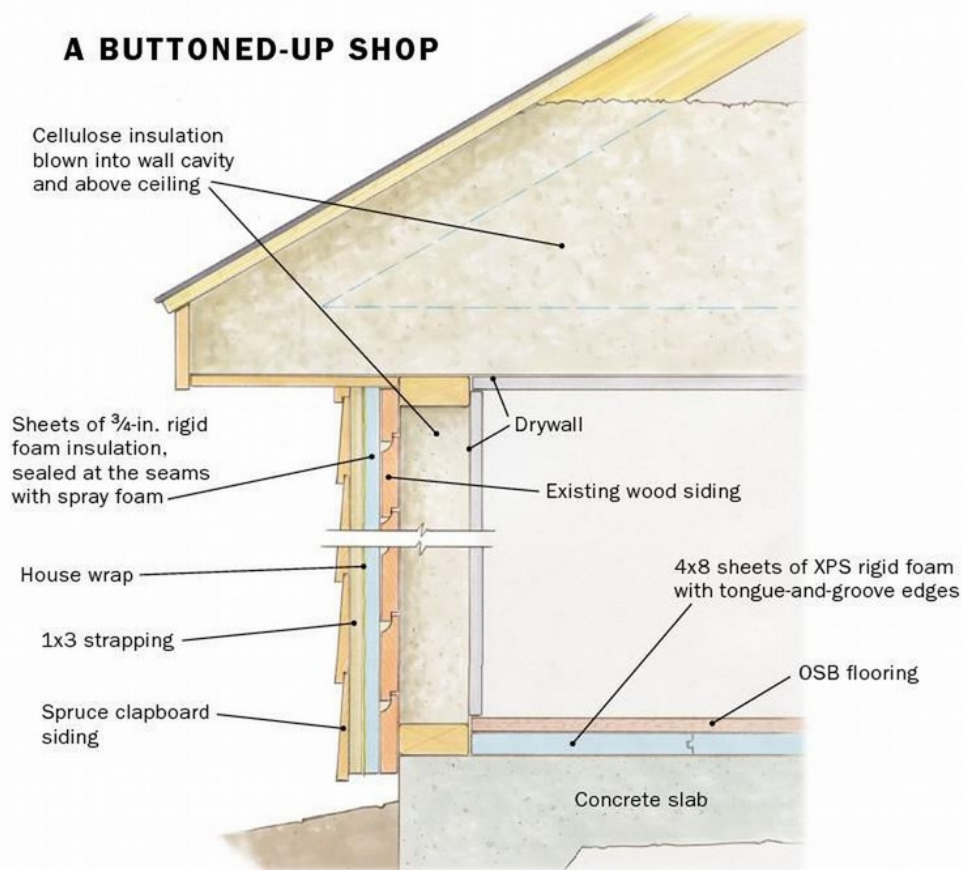


Comfort comes first. To contend with Pittsburgh's humid summers and snowy winters, Korsak buttoned the building up tight and heats and cools it with a mini-split heat pump.

A BUTTONED-UP SHOP

After some deep research, I decided to heat and cool the shop with a Fujitsu ductless mini-split heat pump (see "Heating and Cooling Your Shop," pp. 53–57), which has turned out to be a great decision. With this type of system it really pays to insulate well, and after I hired an electrician to upgrade the electrical service and brought in a drywaller, I had an insulation contractor blow cellulose into the walls and above the ceiling. To provide further insulation, as well as air sealing, I installed sheets of $\frac{3}{4}$ -in.-thick polyisocyanurate rigid foam insulation over the existing siding, foaming all the joints and all around the perimeter. Over that layer went a layer of housewrap, followed by 1x3 vertical strapping as nailers for the spruce clapboard siding.

To insulate the concrete floor slab, I laid down 4x8 sheets of 1-in. extruded polystyrene (XPS) rigid foam with tongue-and-groove edges, and over them



A SMART LAYOUT

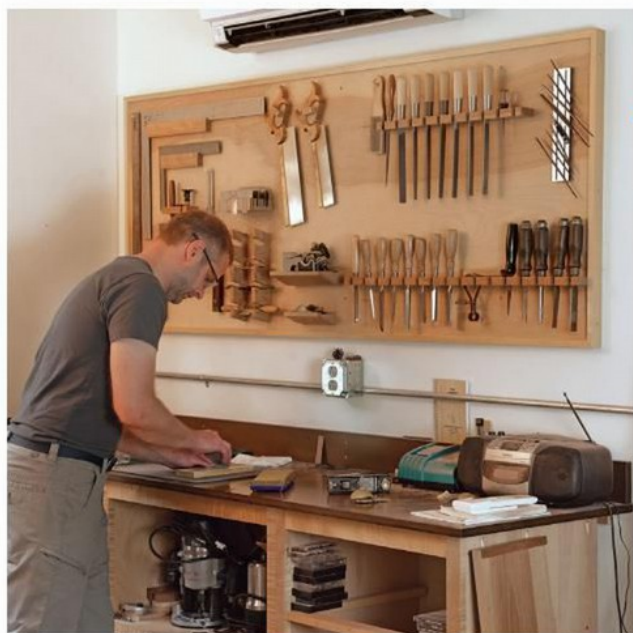
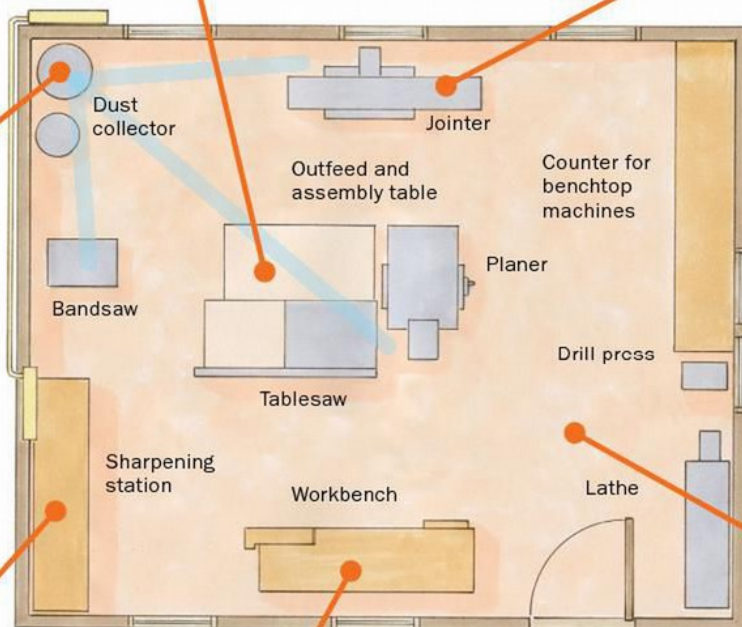
Korsak's shop layout provides efficient dust collection, best use of daylight, and an open space for assembly.



Collection in the corner. With the big machines clustered near the dust collector, only a small amount of ducting was required to serve the tablesaw, planer, jointer, and bandsaw.



Ambidextrous outfeed table. Korsak situated his tablesaw and planer so they share a single outfeed table, which also serves as an assembly table. A shopmade mobile base elevates the planer to make the shared outfeed possible.



A neat array of tools. Many of Korsak's hand tools are fitted in custom holders on the rack above his sharpening station.



Best spot for the bench. Korsak located his workbench along the south wall, where the natural light is best. He made a wall-mounted till to keep his handplanes within easy reach.



New paint on old iron. Korsak has been replacing his machines one by one with vintage American behemoths. He disassembled and completely restored this 1943 Oliver 12-in. jointer.

Online Extra

For more details on how Korsak laid out his shop, watch the video at FineWoodworking.com/265.

I laid a floor of $\frac{3}{4}$ -in. tongue-and-groove oriented-strand board (OSB). I screwed the OSB to the slab with Tapcon screws, just a few screws per sheet.

Consider the layout

With the renovation nearly complete, I began to think about the layout of the space. I knew I wanted my bench to be on the south wall, which would receive the best natural light and provide a view toward the house. I located the jointer on the opposite wall, roughly centered so the direction of feed is parallel to the long axis of the shop. On the other two walls I built long counters, one for benchtop machines, the other for a sharpening station. I put my cyclone dust collector in the far corner of the shop and I placed the lathe, which I use infrequently, behind the swing of the entry door.

That left the center of the space, where I clustered my tablesaw, planer, and outfeed/assembly table. This arrangement made for less dust-collection ducting and less electrical work, and it enabled me to use one outfeed surface for both machines. It also allowed me to keep a substantial area open on one end of the shop where pieces that are in progress can stand clear of traffic and kickback.

Hanging the hand tools

I love machines—and I've been gradually upgrading mine to heavy-duty vintage American models—but hand tools are just as pivotal in my work, and storage for them was a key consideration as I fitted out the shop. I built a wall-hung till to hold my handplanes, with extra room in case (!) I purchase more in the future, and mounted it to the wall adjacent to my bench. Most of the rest of my hand tools are organized on a piece of solid-edged plywood mounted with French cleats to the wall above my sharpening station. I made a variety of holders for the different tools, and attached them with screws driven through the back of the plywood so no fasteners are visible. □



Upright assembly is out of the way. When projects are coming together, Korsak often sets them in the open end of the shop, which means they're out of primary traffic lanes and safe from kickback.

Mike Korsak builds custom furniture in Pittsburgh, Pa.

Build a Stout Workbench

Tail vise is at the heart of this versatile bench

BY CHRIS GOCHNOUR

I've done a fair amount of handplaning during my 32 years as a professional furniture maker, and I've found that the best way to secure a board for faceplaning is between two benchdogs, which can be set below the board's surface so you can plane without hindrance. Clamps and holdfasts, by contrast, seem always to be in the way. And unlike a planing stop, dogs have no trouble holding the board in place when you plane diagonally or across the grain.

Benchdogs require a vise, and when I build a workbench, I like to locate that vise on the end. There are four options for an end vise: a traditional tail vise, a wagon vise, a metal face vise mounted on the end, and a twin-screw vise. All four can be used for face-

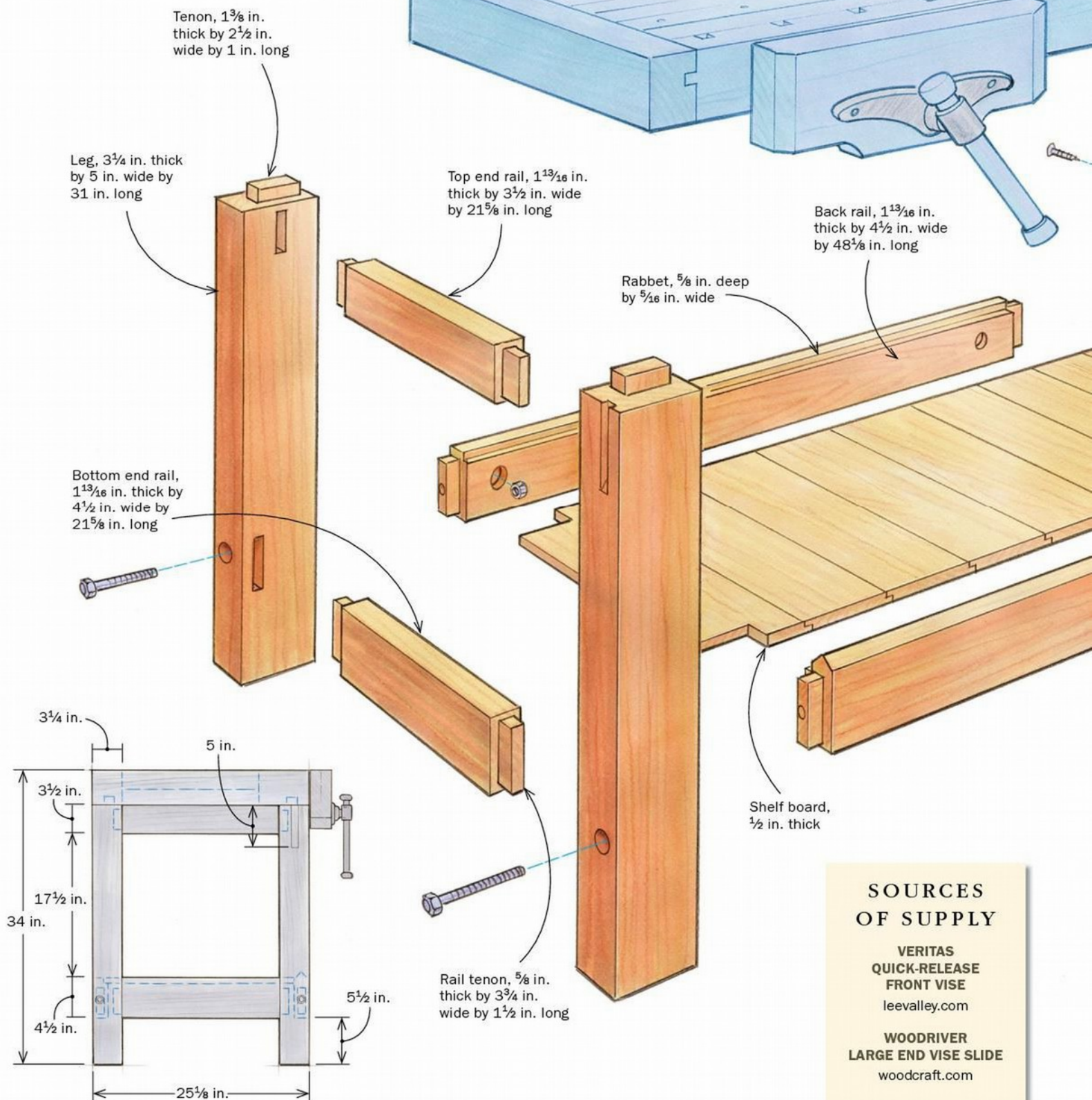


Versatile and effective. A traditional tail vise excels at everything from face- and edge-planing to cutting tenons, a range that other end vises can't match.



Heavy-duty workbench

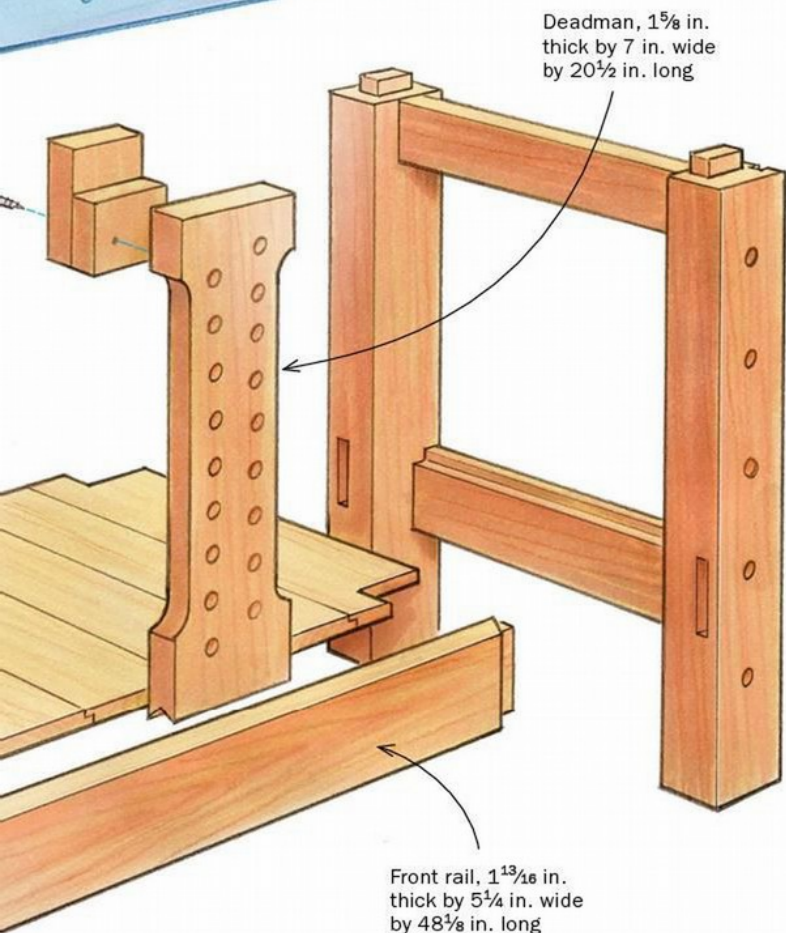
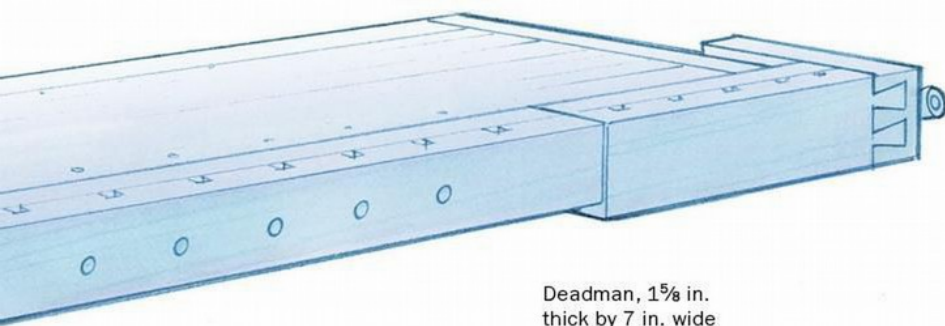
With a strong base and a well-designed top, this bench is a streamlined workhorse. Equip it with a tail vise, and you're ready for just about anything.



SOURCES OF SUPPLY

VERITAS
QUICK-RELEASE
FRONT VISE
leevalley.com

WOODRIVER
LARGE END VISE SLIDE
woodcraft.com



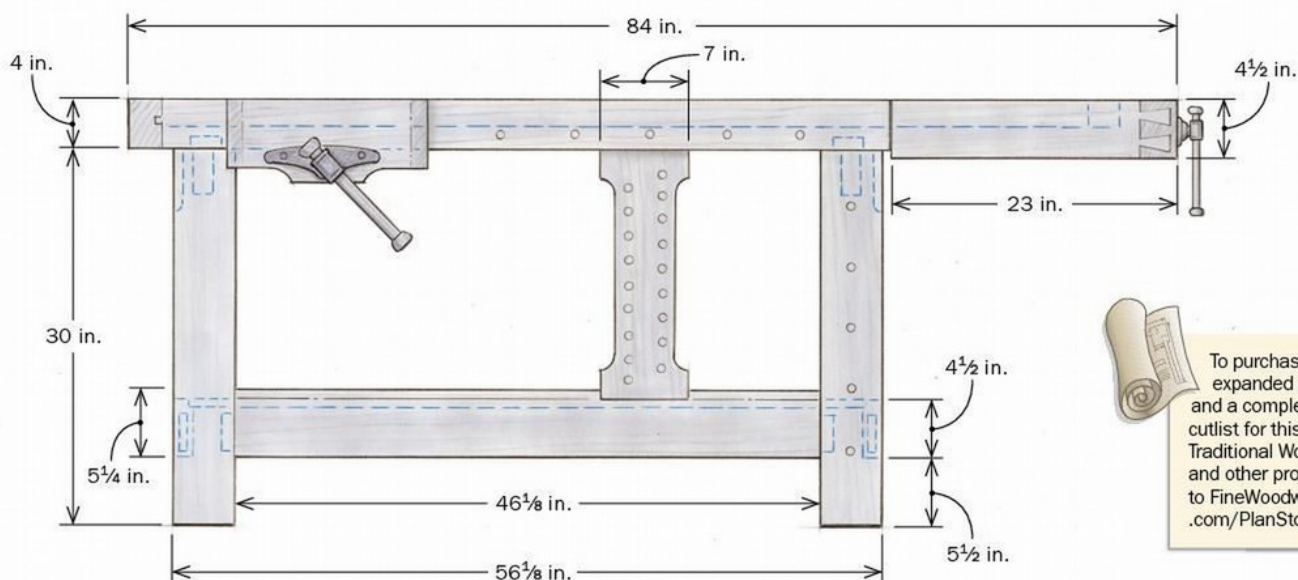
planing boards, but the tail vise has several advantages over the others. With a tail vise, the dog holes can be placed very close to the bench's front edge, which makes it possible to plane narrow boards with a plough plane or similar plane that has a fence that hangs below the benchtop. That's something that isn't possible with a steel vise. Wagon vises work great when the board is flat on the benchtop, but with a tail vise you can also clamp a workpiece vertically, which lets you cut tenons, for example. The fourth option, the twin-screw vise, handles tenons and edge-planing fine, but doesn't support work as well as a tail vise for face-planing. These advantages are why I chose a tail vise for my bench.

For many woodworkers, building and installing a tail vise seems intimidating, but it shouldn't be. I've installed quite a few, both on benches of my own and on student benches, and have developed a process that ensures the vise slides smoothly and doesn't snag. I'll show you how I do it.

The top is thick where it needs to be

Making a bench is a big undertaking, but fortunately most of the work involved is fairly routine. The base of this bench is four big legs joined to the rails between them with mortise-and-tenons. Shiplapped boards set between the lower rails provide a nice place for storing jigs and anything else you like to keep close by. I am going to skip over the base construction here, because the process is relatively straightforward, and focus instead on the top and the tail vise.

The benchtop is thick along the front and back edges but has a wide, thinner section between. The



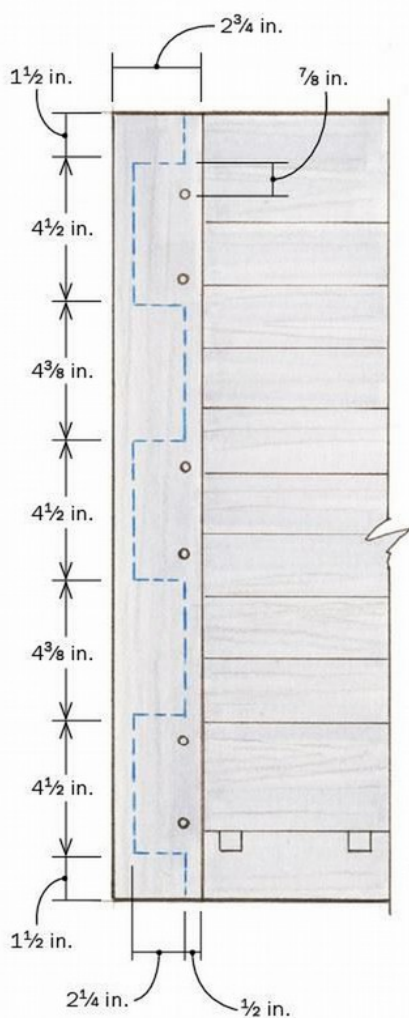
SIDE VIEW



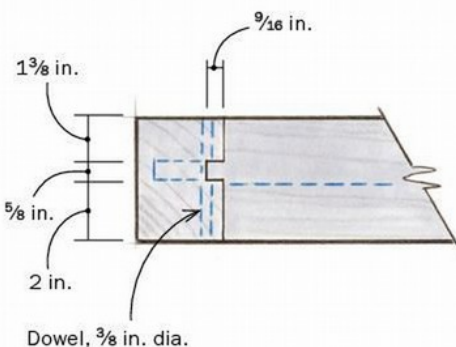
To purchase expanded plans and a complete cutlist for this Traditional Workbench and other projects, go to FineWoodworking.com/PlanStore.

Build a better benchtop

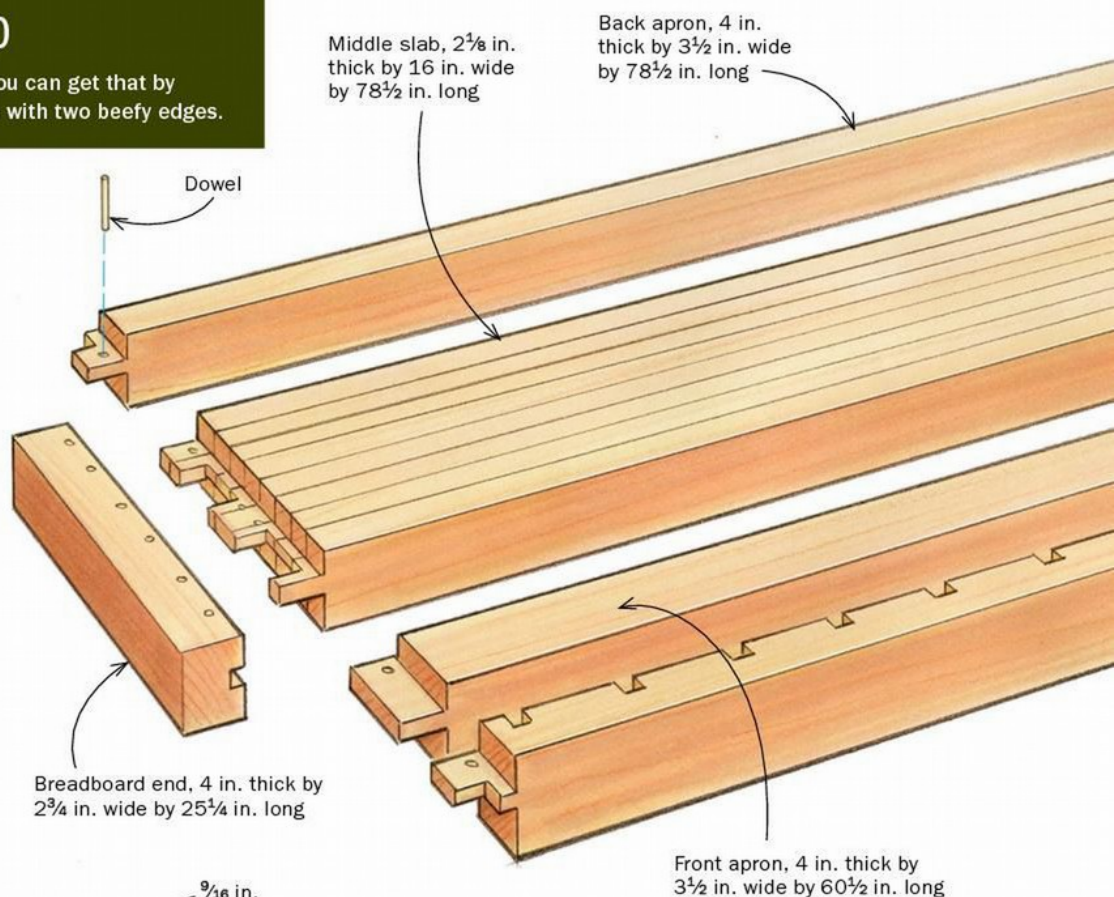
A top needs to be heavy and inflexible, but you can get that by combining a moderately thick center section with two beefy edges.



**BREADBOARD, LEFT END
TOP VIEW**



SIDE VIEW



middle doesn't need to be as thick, because all the pounding on a bench should be done over a leg or a top rail. This bench has a thick back apron, and a front section made up of a thick front apron and an equally thick dog board. Glue up the thinner middle section, and then mill the back apron, front apron, and dog board to their final dimensions.

Next cut the dog holes in the dog board. I do this in two steps. First I hog out the waste with a dado set at the tablesaw. Then I use a router and template to refine the hole and add a wider section at the top so

MAKE THE BENCHDOG HOLES

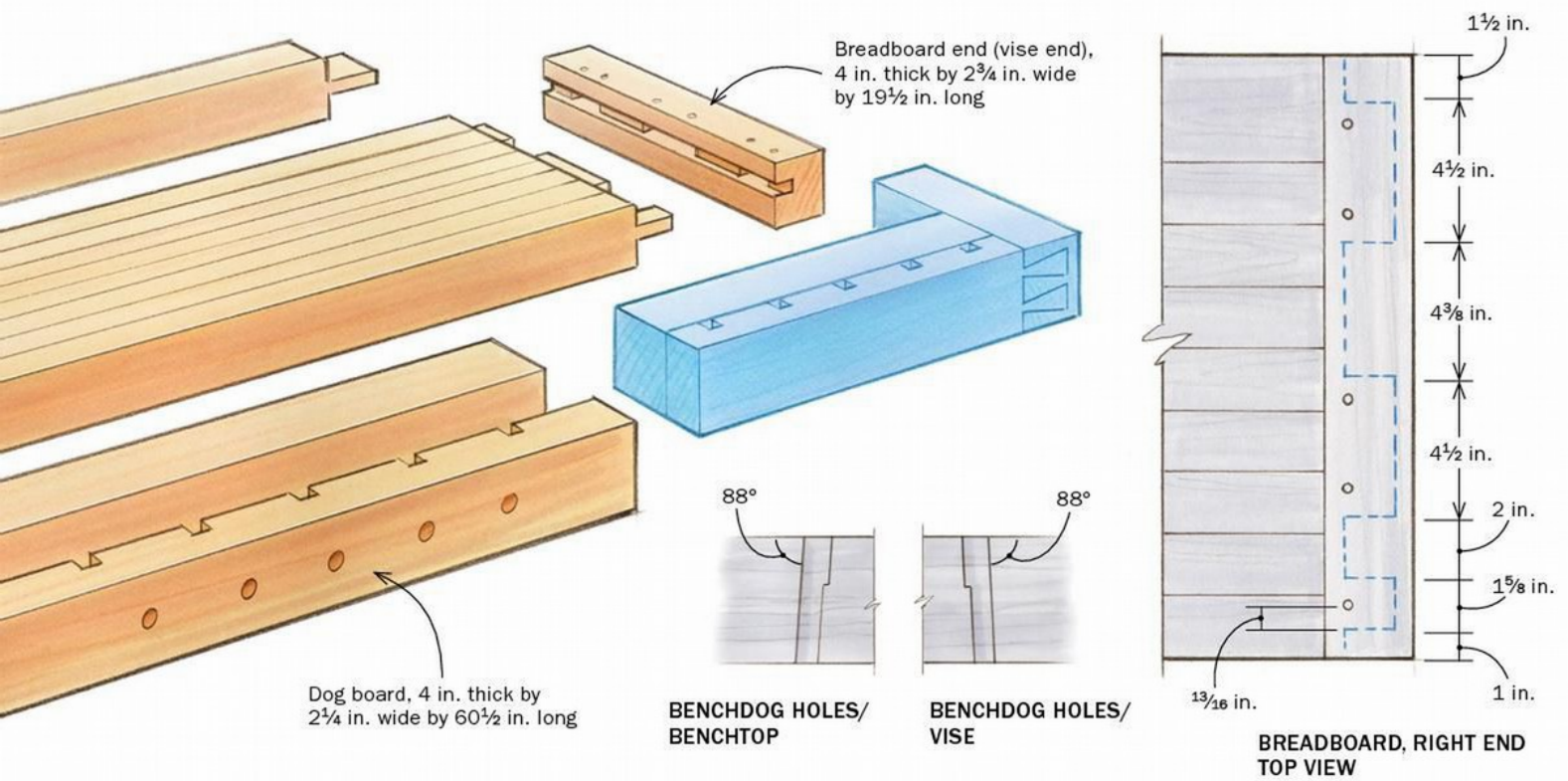
The dogs should angle inward. To make that happen, the dog holes in the benchtop slant 2° toward the vise; in the vise, they lean toward the benchtop.



Cut angled dados. Use a dado head and a miter gauge to remove most of the waste from the dog holes.



Rout the final shape. A template ensures that all of the dog holes are identical. Because the dog holes in the vise jaw face the opposite direction from those in the benchtop, Gochnour uses a template that has a pattern for both directions (left). The pattern has a notch so that a flush-trimming bit creates the pocket into which the dog's head fits (right).



GLUE UP THE TOP



Glue the dog board to the front apron. Spread glue only on the dog board, and keep the glue about ½ in. from the dog holes (far left). Goch-nour uses Festool Dominoes for alignment and plenty of clamps, alternating them from top to bottom (left).

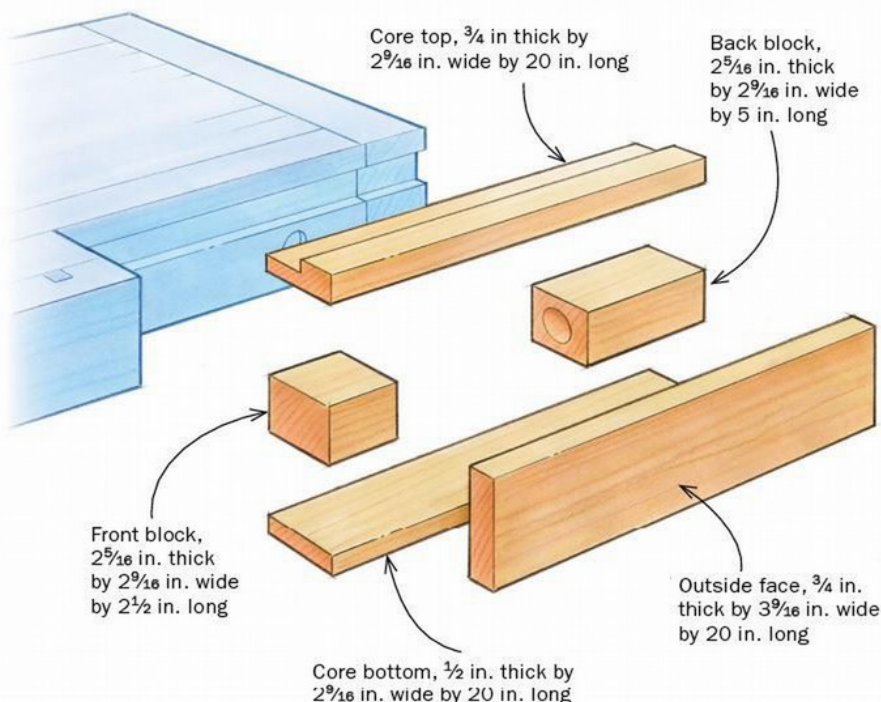


Bring it all together. A plywood spacer under the center section keeps it aligned with the thicker front and back sections. Be sure to add clamps above the top to prevent the thicker sections from slanting inward on the bottom.

Add the tail vise

The success of a tail vise depends on how well the wooden jaw and metal hardware work together. Start with the vise's hollow core, which is the key to smooth operation.

BUILD THE CORE FIRST



Cap the core. After gluing the four pieces of the vise core together, glue it to the outside face, using a piece of melamine to keep them aligned.



Cut a rabbet in the core top. The easiest way to make this wide rabbet is with two cuts at the tablesaw. The vise's top slide fits into the rabbet.

Slides are attached with bolts. Clamp the slides to the core with the vise plate between them. Transfer the bolt hole locations from both slides and then drill the holes at the drill press, coming halfway in from both sides.



that a dog, which has a head that's wider than its shaft, can fit completely into the hole. Cut the dog holes in the vise jaw at this time, too.

After you've completed the dog holes, glue the dog board to the front apron. Let the glue dry, and then glue the three parts of the top together. Give the glue a night to dry before installing the breadboard ends. You're done with the top for now. It's time to get busy making the tail vise.

Make the tail vise in stages

At the heart of this tail vise is some metal hardware. A vertical plate that holds the nut face-mounts to the benchtop. A pair of slides screwed to the wooden jaw grasp the plate. The screw goes through the jaw and threads into the top slide. The jaw has three parts: a



Make way for the vise screw. It takes some serious clamping and an extender for the Forstner bit, but it is possible to drill the hole at the drill press. A fence on the drill-press table helps keep the vise core plumb.

FIT THE CORE TO THE BENCH

Attach the hardware to the bench, and get the vise core riding smoothly on it before you go any further with the vise construction.



Groove the top. Two passes with a rabbeting bit create a slot into which the top slide fits.



Mortise for the nut. The vise screw's nut has a threaded stud that passes through the vise plate. A nut that secures it from behind the plate fits into a shallow mortise. Clamp a straightedge to the benchtop and register the vise plate against it. Transfer the hole to the bench (left). Drill the mortise with a Forstner bit (right).



Screw on the vise plate. Use a Vix bit to center a pilot hole for each screw, and then drive the screws. Make sure the screw heads sit below the surface of the vise plate.



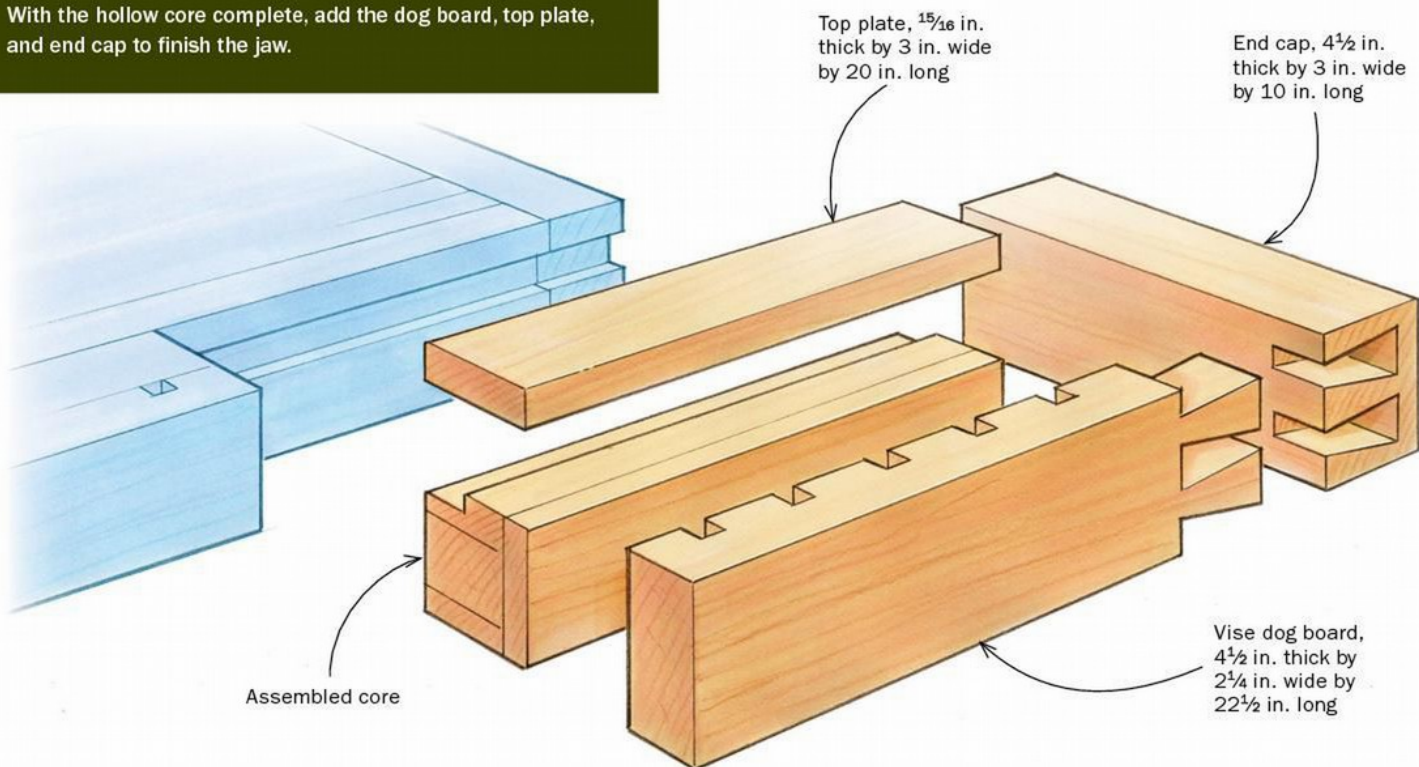
Assemble in place. Gochnour bolts on the slides while clamps hold the vise core snug against the vise plate. Threaded up from the bottom, the bolts are still accessible after the vise is complete.



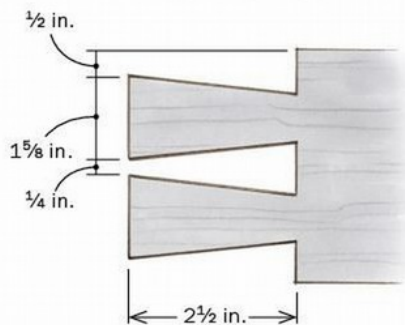
Check the glide. Now's the time to test how well the vise slides. You can trim the rabbet if it's too loose, or add a shim under the bottom slide if it's too tight.

Tail vise continued

With the hollow core complete, add the dog board, top plate, and end cap to finish the jaw.



DOVETAIL LAYOUT



Dovetail the corner. This is the traditional way to join the end cap and dog board. It's strong and looks great.



Add the core. Keep the glue away from the dog holes (right). When clamping, use a caul to bridge the hole in the vise core (far right).





Glue on the top plate. It should sit about $\frac{1}{16}$ in. above the benchtop. Gochnour uses a Festool Domino to strengthen its connection to the end cap (above). Apply clamping pressure both side to side and along the plate's length (right). Then add clamps for top to bottom pressure.



hollow core, the vise dog board, and the end cap. Because the vise's success rides on how well you join the hardware to the core, it's best to start there. Get it right, and then add the dog board and end cap.

The core begins by gluing together four parts: a top and bottom, and a front and back block. A large space in the middle accommodates the vise screw and nut. After the glue has dried, add the outside face to the core. What you have now is akin to a box without a lid. Take it to the drill press and drill a clearance hole through the back end for the vise screw. Next, cut a rabbet in the core top. The vise's top slide fits into this rabbet. Clamp the two slides, with the mounting plate between them, to the core, and mark the holes where the bolts go through the bottom slide and thread into the top slide. Unclamp the slides and drill clearance holes for the bolts.

Now mount the plate to the benchtop and install the vise core on the plate. Give it a slide. If it's too loose, take a shaving or two from the rabbet and try again. If it's too tight, shim the bottom slide. When the core glides smoothly, move on to the dog board and end cap.

The dog board gets a few dovetails; the end cap gets the pins. After you've cut and fitted the joint, but before you glue the two parts together, drill a hole through the end cap for the vise screw. Then cut slots for the slip tenons that join the end cap to the core and top plate. Glue the jaw and end cap together and then glue that assembly to the vise core. The last step in making the vise is to glue on the top plate.

You're ready to mount the completed vise. Check how the jaw closes against the bench. Use a bevel-up plane to shave the jaw's end grain until the vise closes nice and tight. Finally, plane the tail vise flush to the benchtop. Now you can get to work. □

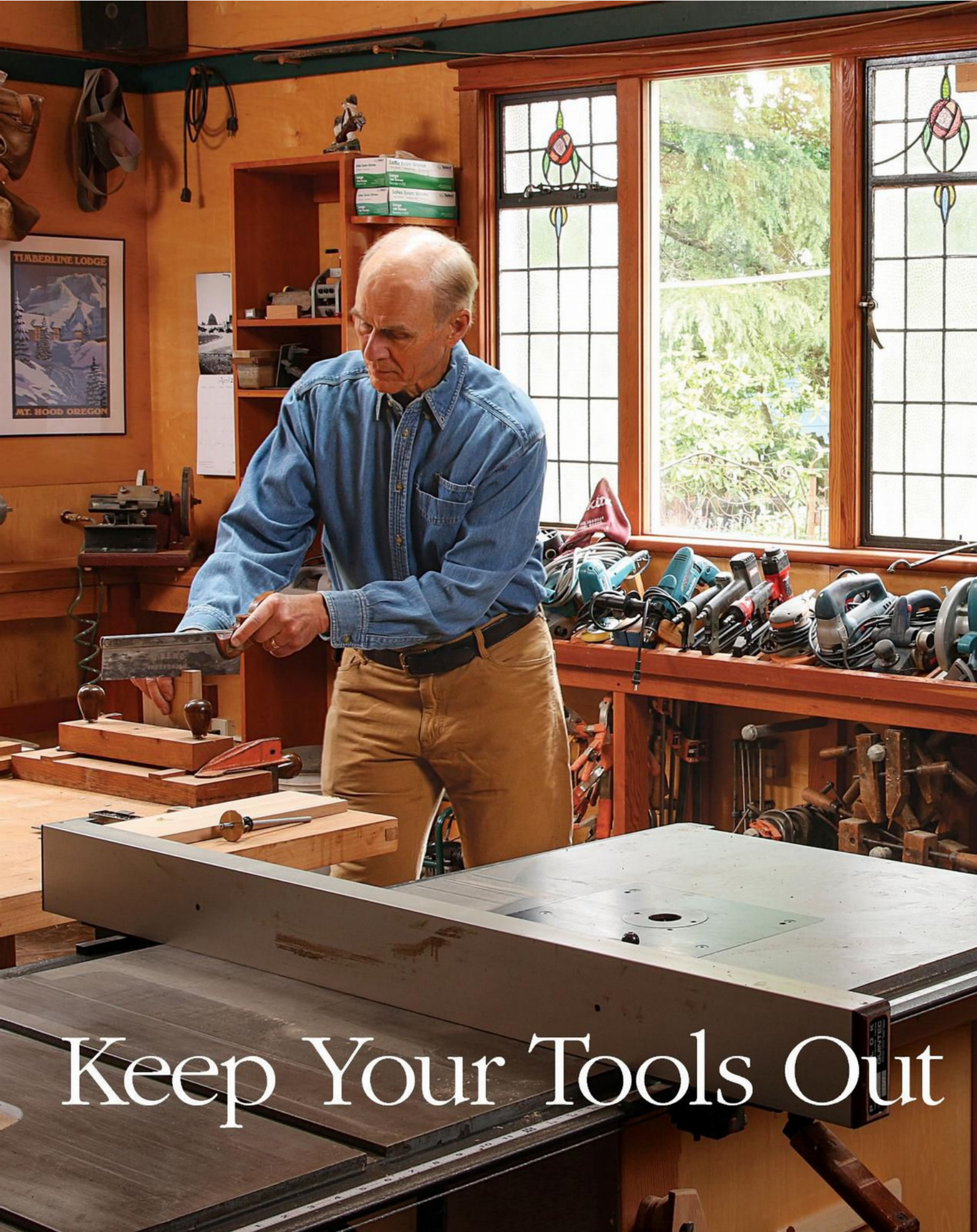
Chris Gochnour is a contributing editor.



Install the vise. Hook the top slide over the vise plate, put the bottom slide in place, and then bolt them together.



Make it flush. After refining the end of the jaw so that it closes tightly against the bench, plane down the tail vise level with the benchtop.



Keep Your Tools Out



Make tools visible and keep them orderly for a beautiful and more efficient shop

BY JIM PUTERBAUGH

The notion of workflow always seems to come up when woodworkers discuss shop design, but it's mostly limited to machinery and workbenches. This is a mistake because workflow also involves smaller things like routers, handplanes, chisels, layout tools, sandpaper, scrapers, and even safety glasses. Where those are located and how accessible they are can have a significant impact on how smoothly your work progresses.

This is why I organized my shop so that as much as possible is visible. With everything out in the open, there's no time wasted trying to remember which drawer holds my countersinks, or where exactly I put those 1¼-in.-long screws. As a result, I can work faster and more smoothly because I can quickly grab a tool and use it.

Don't confuse an open shop with a messy one. To be successful, an open shop must be reasonably organized: a place for everything and everything in its place. A bit of clutter is fine, but too much and the shop no longer functions as it should. I divided my tools into common-sense groups and arranged them around the shop so that they are close to where I use them. Lathe tools are at the lathe, in a wall-hung bracket that has a spot for each tool. Planes are within reach of the bench.

In addition to these practical reasons in favor of the open shop, there is another reason I prefer it over a shop full of cabinets and drawers. Tools and the other trappings of woodworking are beautiful, especially when laid out in a lovely array. An open shop puts that beauty on display where it can inspire you.

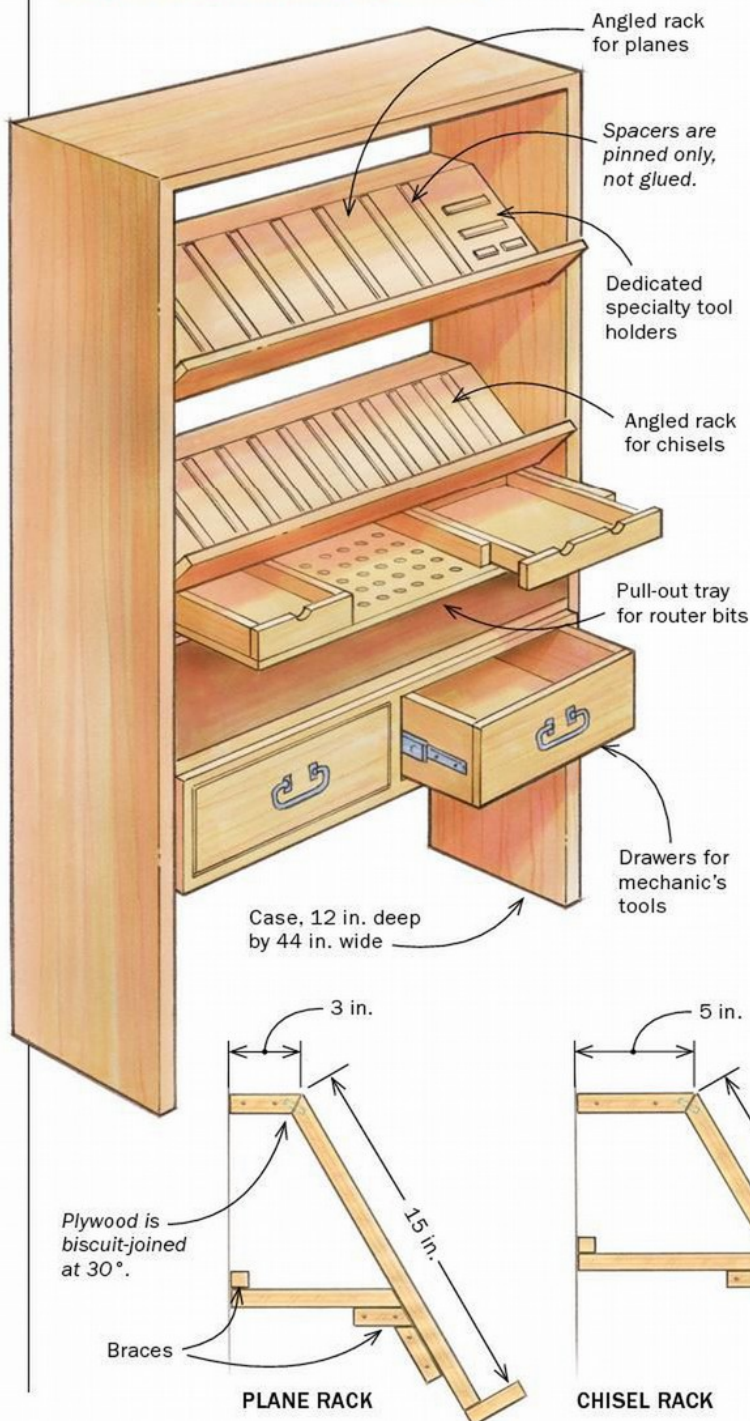
Jim Puterbaugh is a physician in Portland, Ore.

in the Open

Simple storage solutions

RACK FOR HAND TOOLS

Organization is critical in an open shop. The best way to organize hand tools in the open is with a shelving unit. I have an angled rack for my planes, and another for my chisels. The tools run across the rack in a line with dividers between them. There also are dedicated holders for scrapers, spokeshaves, a drawknife, and a variety of other tools. A pull-out tray holds router bits and a pair of drawers houses mechanic's tools. I added shelves on the outside of the case for cordless drills, and I store air tools below the drawers.



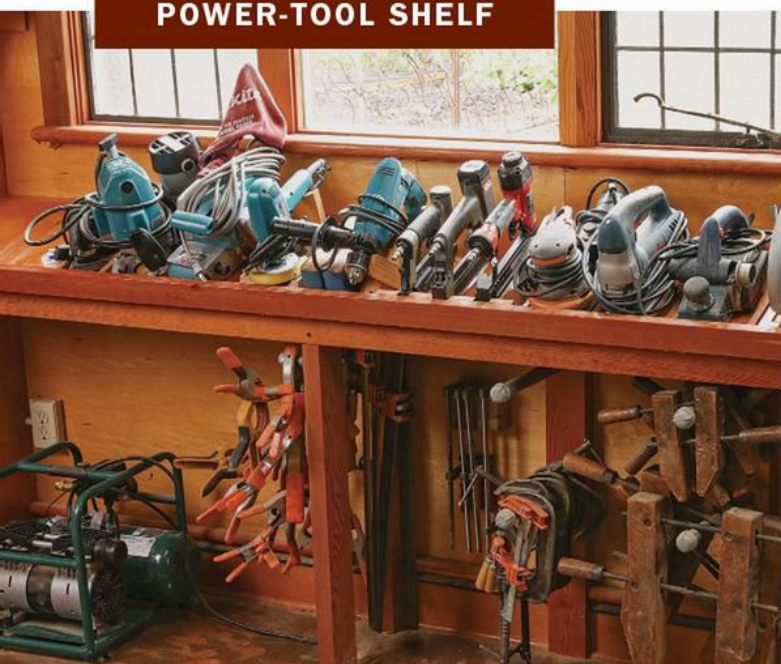
Hand tools at hand. A few steps from his bench, Puterbaugh's planes and chisels are ready for action. Pleasantly displayed, they add to the shop's romance, too.



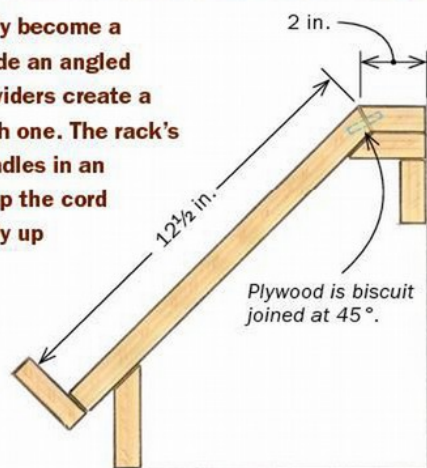
Make a place for every tool. The best way to stay organized is to create a dedicated space for each tool. Open shelves hold power tools (left), while drawers with slotted racks keep wrenches orderly (below).



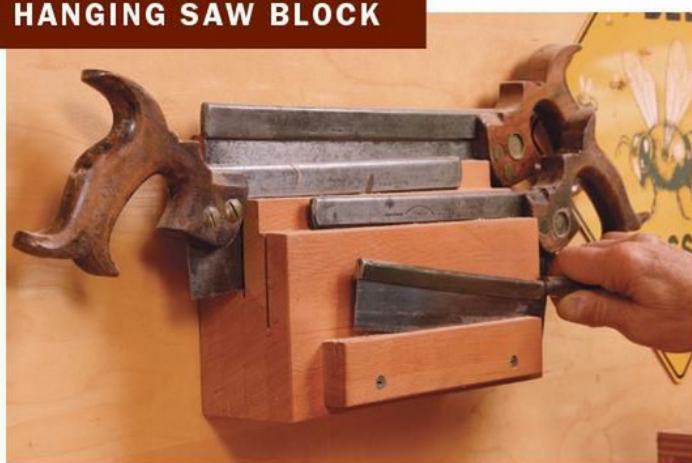
POWER-TOOL SHELF



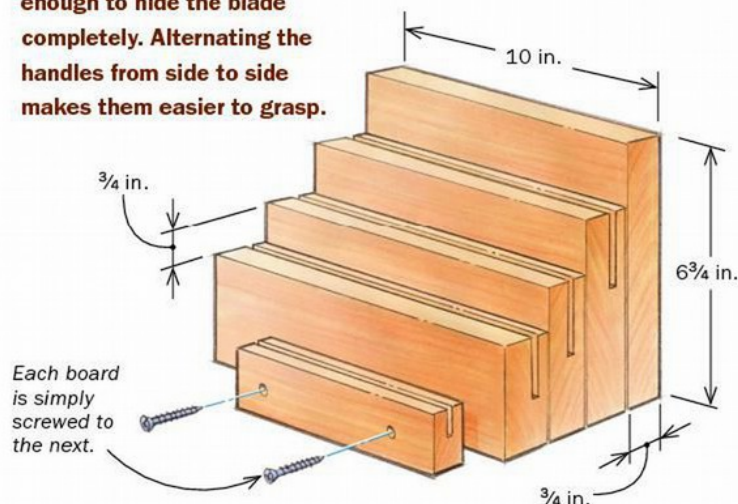
Power tools can quickly become a jumbled mess, so I made an angled rack to store them. Dividers create a dedicated spot for each one. The rack's angle presents the handles in an easy-to-grab way. I wrap the cord around each tool to tidy up the space even more.



HANGING SAW BLOCK



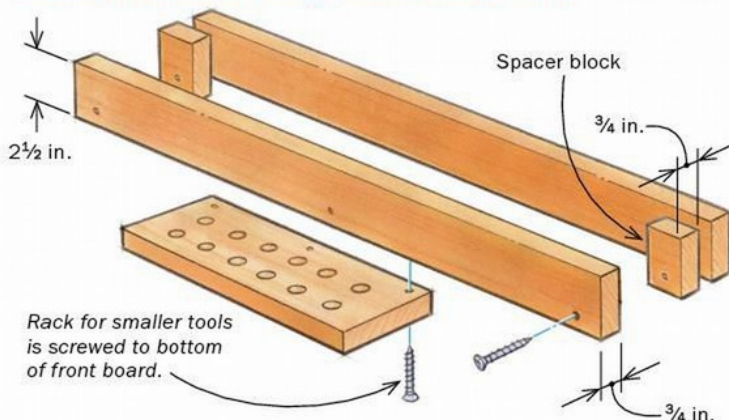
Handsaw blades need protection, so I buried them in a block. Screwed to the wall, the block is a convenient way to store multiple saws within easy reach of my bench. The simplest way to cut a snug slot is to use the saw itself. Cut a kerf deep enough to hide the blade completely. Alternating the handles from side to side makes them easier to grasp.



LATHE TOOL RACK



The most convenient place to have your lathe tools is near the lathe, which is why I built a dedicated rack and hung it on the wall behind mine. The rack is long enough so all the long-handled tools can be spread out in a single row. The rack has no dividers, so tools are quickly removed and replaced.



Tune Your Tablesaw

A few key adjustments get your saw cutting smoothly

BY ELLEN KASPERN

CLEANER RIPS, CROSSCUTS, AND MITERS

No matter the tablesaw, if it's not tuned properly, it won't be capable of fine woodworking—and worse, it could very well be dangerous. But with just a handful of common tools, you can tune up your saw for all manner of cuts in a couple of hours. Let a North Bennet Street School teacher show you how.



Most of my projects revolve around a tablesaw. When it's working well, I can make accurate rips, crosscuts, and even coves. All are safe and efficient with a well-tuned saw. But a tablesaw needs regular maintenance; otherwise, using it is at best frustrating and at worst dangerous. If you run through three simple but crucial steps to tune your tablesaw, you'll be back to accurate and safe woodworking in no time.

The goal of the tune-up is to make the blade, table slots, and fence parallel and square. All I need to set my cabinet saw are a reliable 12-in. combination square, a dial indicator, a socket wrench, and some brass shims.

Start at the blade and slots

The tune-up starts with the blade at exactly 90°. Raise the blade as high as it will go, set the square against it, and look for any light between the ruler and the blade. If you see some, the blade's not square. Adjust it until it is.

Now that the blade is at 90°, you'll adjust the tabletop so the miter-gauge slots are parallel to the blade. Put the square's head against the left side of the right-hand slot and the ruler at the front of the blade. Carefully slide the ruler out toward the blade until it lightly rubs a tooth. If you're using a rip blade, pick any tooth. If the blade's a crosscut or combination, pick a rip tooth or a tooth angling to the right. Once the ruler slightly touches the tooth, lock the square at that setting.

Move the square and the same tooth to the back. As before, the head of the square registers off a good, flat surface. Adjust the blade to 90° and you're ready to begin the tune-up.



TIP

START FLUSH AND SQUARE

Before anything, adjust the insert if necessary; it must be flush with the tabletop so the square registers off a good, flat surface. Adjust the blade to 90° and you're ready to begin the tune-up.



Align the top and fence
for clean rips



1. ALIGN THE TOP TO THE BLADE

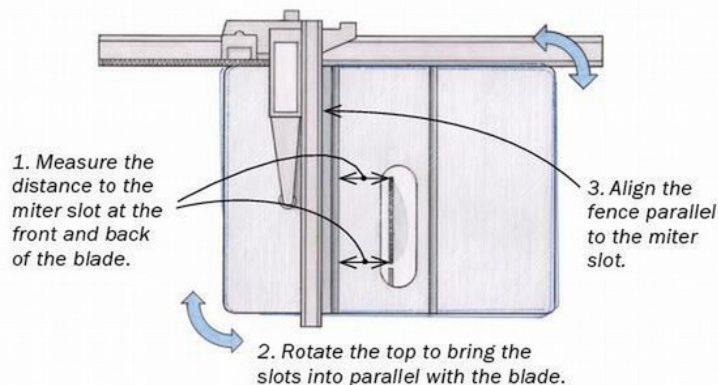
Check the blade at the front and back. With the square's head against the left side of the right slot, slide the ruler until it gently rubs a tooth. Kaspern moves the blade slightly so the tooth rubs the end of the ruler. Lock the ruler here (top right). Rotate the blade and register off the same tooth at the back (bottom right). You want the tooth to rub the ruler the same amount as it did at the front. If it doesn't, you need to loosen and rotate the top.



Tap it home. After loosening three of the bolts that attach the top to the cabinet, use the tight bolt as a pivot point to bring the miter slot into parallel with the blade.

ROTATE THE TOP FOR PARALLEL

If the distance from the miter slot to the blade is different at the front than at the back, loosen the bolts and tap the top to correct it. Check with the square after each tap and again after you retighten the top.



2. ALIGN THE FENCE TO THE TOP



Online Extra

The last push stick you'll ever need? Learn why Kaspern is such a fan of hers at FineWoodworking.com/265.

Feel the fence. Use your finger to make sure the fence is flush to the miter slot at the front. Then check the back. Be sure the fence doesn't overlap the slot at the back, because if it does, you risk kickback. You can double-check for flush with a straightedge.

Adjust the gauge for square crosscuts



Square the miter gauge. No light should appear between the ruler's edge and the miter gauge's bar while the head of the square is tight to the fence. If it does, loosen the handle and fine-tune the setting.



If the slot is parallel to the blade, the tooth will touch the ruler the same amount. If the tooth doesn't touch or it rubs too much, you'll have to adjust the table.

On cabinet saws, the tabletop can be adjusted independently of the blade because the two aren't connected. To adjust the tabletop, loosen three of the four bolts that attach the top to the cabinet. The fourth bolt will serve as the pivot point. Tap the top until the miter slot is parallel to the blade. Retighten the bolts.

Now for the fence and miter gauge

Now that the slot is parallel to the blade, set the fence parallel to the slot. I use the right-hand slot to set the fence parallel. Lock the fence down so it is flush to the right side of the right-hand slot at the front of the saw. Then check to see that the fence is flush to the slot at the back end, too. Use your fingers and verify with a straightedge. If both front and back are flush, the fence and slot are parallel and you're good to go. If not, you'll need to adjust the fence. A particular concern is if the fence toes in toward the blade at the back end. This is dangerous because a fence that approaches the blade as it runs front to back puts you at risk of violent kickback. Adjust your fence per the manufacturer's directions and check again.

With the tabletop, blade, and fence parallel, you can true the



Test cut confirms your setting.

Crosscut a piece of wood with two flat, parallel faces and one jointed edge. With the jointed reference edge against the miter gauge, run the wood through the saw and check the cut with a reliable square.

miter gauge to make 90° cuts. Use your square to verify that the gauge's rod and fence are square.

Dial in the top

Your saw is now set up for clean rips and crosscuts. Sometimes, though, things run awry with beveled cuts, so the last step in the tune-up is to verify that the saw's top doesn't slope up or down from front to back. You won't notice if the table is sloped during 90° cuts, but when the blade is angled, a table that's askew can cause burn marks, poor cuts, and kickback.

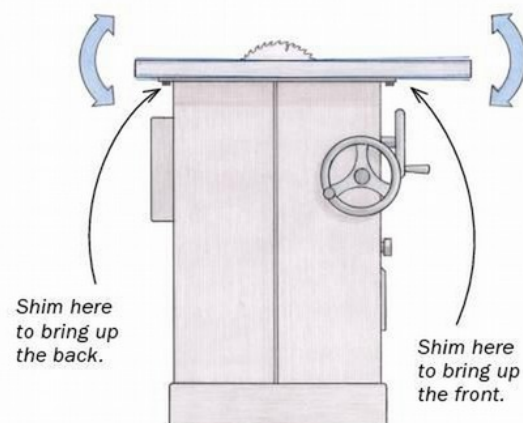
Lock down the fence and angle the blade to 45°. You'll need the fence to be exactly parallel to the blade for this procedure. Place

Level the top for burn-free bevels



SHIM THE TOP TO ALIGN THE BLADE FOR BEVELS

Even if the blade is parallel with the slots, you may still get burning when cutting bevels. The solution is to tilt the blade and then measure for parallel. If it's off, shim the table at the low end to bring it in line.



a dial indicator against the fence and its plunger against the blade. Zero it out. Pull the plunger away and release it to the same spot to make sure it has been set correctly.

Move the indicator along the fence from front to back, rotating the blade so the plunger reads off the same part of the blade. If the needle moves more than 0.005 in., it needs to be addressed. If the needle moves clockwise, shim the back of the tabletop; if it moves counter-clockwise, shim the front.

I use thin brass stock from MSC Industrial Supply. The shims go between the tabletop and cabinet. Notch the shims and place them around the bolts to avoid stressing the cast iron, which is very brittle. Use the dial indicator to check your results and reshim as necessary.

These steps may seem finicky, but they're time well spent. After all, once your table saw is tuned correctly, you can turn up the volume on your projects to 11. □

Ellen Kaspern, a professional woodworker in Boston, teaches at North Bennet Street School.



Measure at the front and back. Move a dial indicator along the fence from the front to the back of the blade, rotating the blade so the plunger reads off the same part. If the needle ascends, the tabletop is sloping down toward the back. If the needle descends, the table is rising. The difference should be less than 0.005 in.

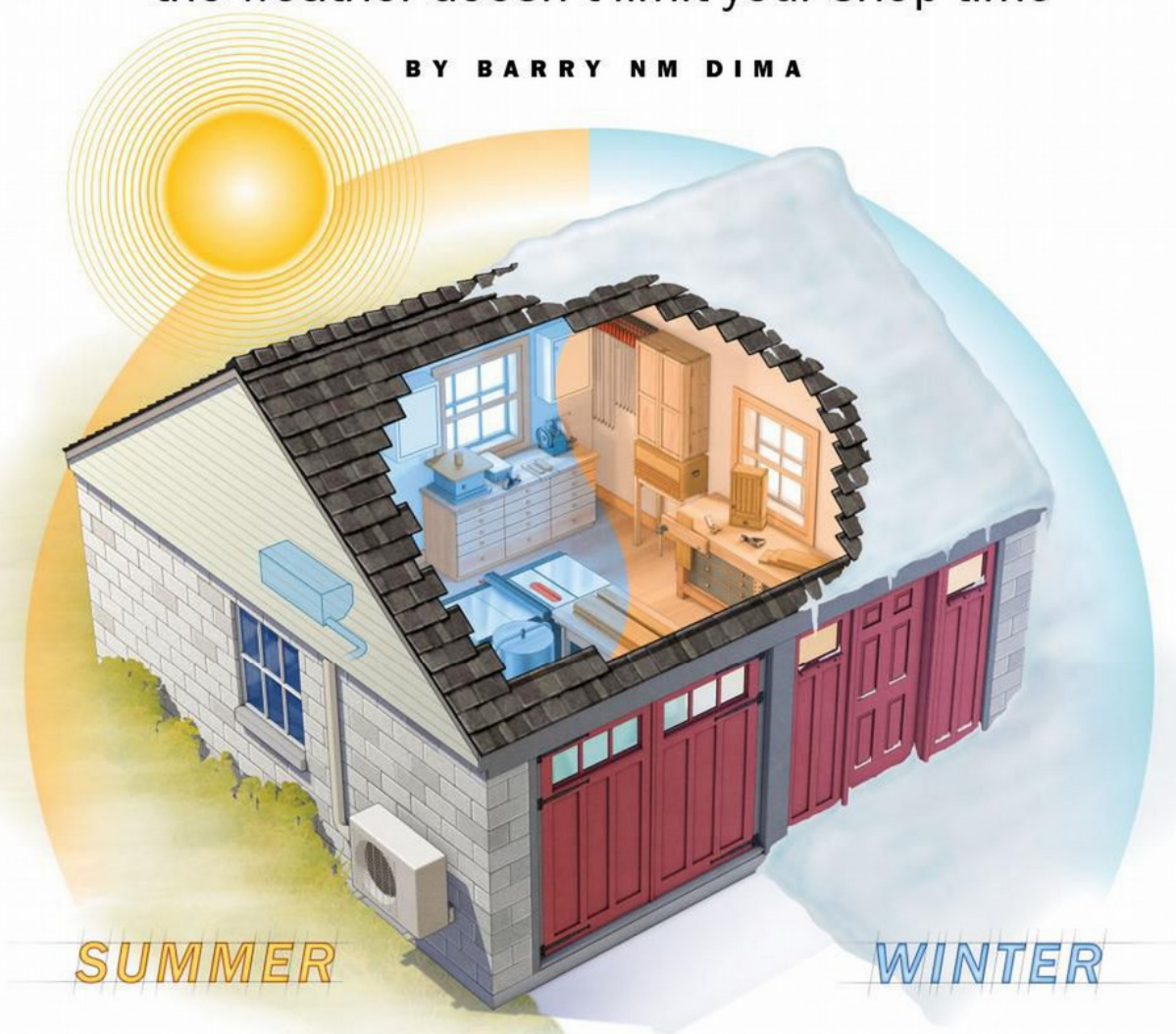


Shim with brass to align the top. To adjust the top, place one or more notched brass shims around the bolts that secure the tabletop to the base. Remember to retighten the bolts afterward.

Heating and Cooling Your Shop

Ductless HVAC systems ensure that the weather doesn't limit your shop time

BY BARRY NM DIMA



A freestanding building can be a fantastic place for a wood shop. But you can't usually hook it up to the heating and cooling systems in your house, and if you live where winter days regularly fall below freezing or humid summer days linger above 90°—or both—the shop will be uncomfortable or unusable for chunks of the year. Plus, weather swings can wreak havoc on tools and materials. If you need to heat and cool a freestanding shop—or a garage that's attached to your house but not to its heating and cooling system—a mini-split or PTAC may be the answer.

These ductless air conditioners or air-conditioner/heater combos are easy to install compared with ducted systems, don't take up much space, and require only a 220-volt circuit. Plus, they can come with you if you move. Both mini-splits and PTACs (packaged terminal air conditioners) are heat pumps. For cooling, they extract heat from a room and send it outside. If they can heat as well, they flip the operation, pulling warmth from outside and

bringing it in (both are thanks to the seeming magic of refrigerant). Because heat pumps move heat rather than generate it, they can be more efficient than other heating methods, such as electric resistance and, generally, fossil fuels. Some heat pumps have limits: PTACs have trouble drawing warmth from the outside below 35° to 40°. They turn to electric resistance heat in colder temperatures. Mini-splits can handle much colder weather; some as low as -15°F. However, they cost a lot more up front, in part because it's advisable to use a pro for installation. Still, they can keep energy bills lower thanks to their efficiency. To get the most out of either type, your shop should be well insulated and well sealed. (For tips on insulation, see *Shop Design*, pp. 30–33.) If the building is leaky, you might as well slip the dollars through the cracks in your wall instead.

Barry NM Dima is an associate editor.

Mini-splits More expensive up front, but more efficient

They are still catching on in the United States, but mini-splits have been popular in Asia and Europe for decades, and they're familiar to many woodworkers. Although the up-front cost is high, these units will transform a shop into the most desirable space in your house—and thanks to their efficiency, the energy bill won't short-circuit your budget.

Mini-splits typically don't have ductwork. They instead pair an indoor air handler with an outdoor compressor via two refrigerant lines, a condensate line, and a power cord. A mere 3-in.-dia. hole, which is later weatherproofed, is all that's needed to feed the connections through a wall. Plus, mini-splits are whisper quiet. While they come in a variety of configurations, the version with a wall-mounted air handler is the most popular.

People in especially cold climates should take extra care selecting a unit, since not all mini-splits are rated for use at extremely low outdoor temperatures. Look into units designed for cold climates, such as Mitsubishi's Hyper-Heat models.

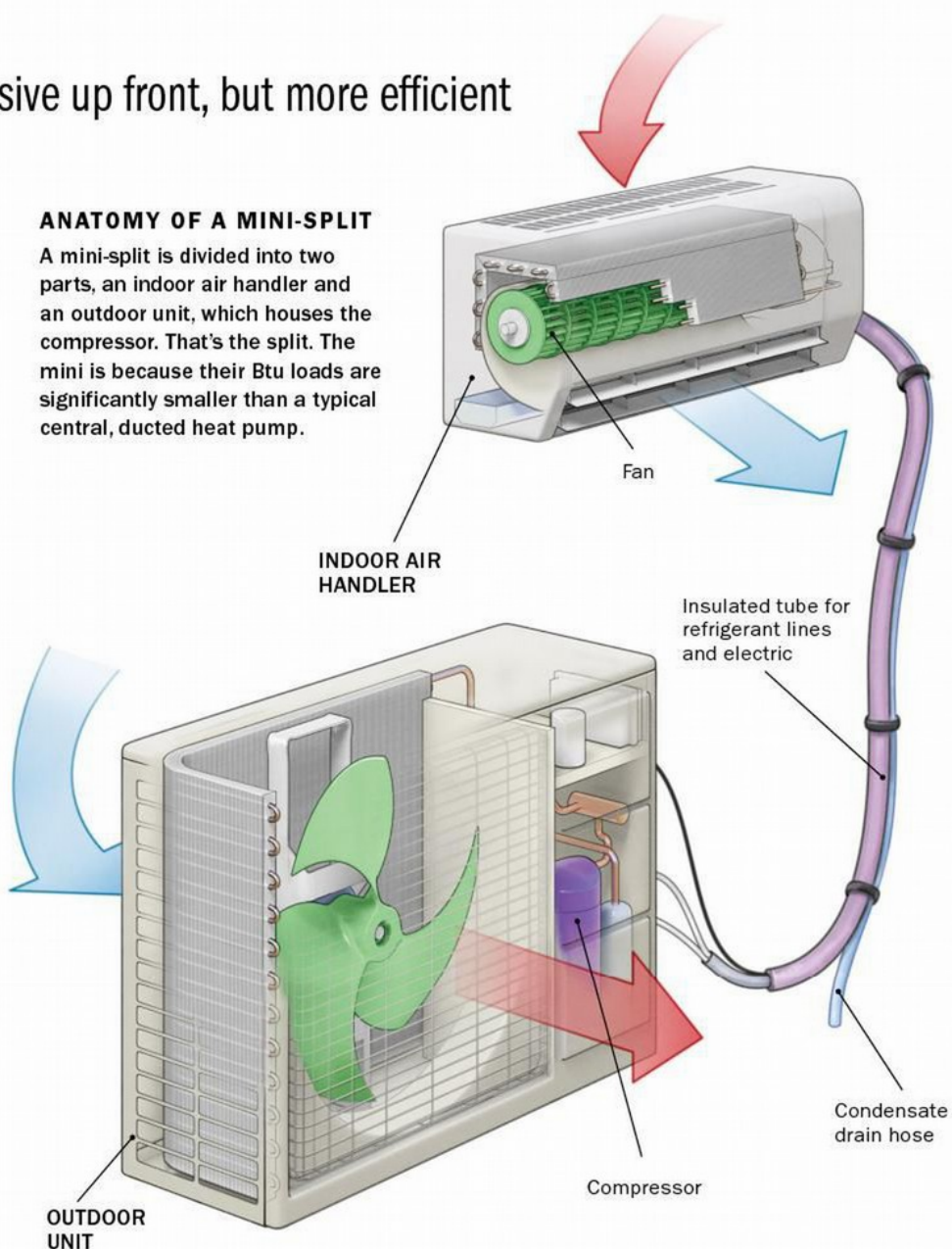
Top-notch efficiency

Mini-splits are incredibly efficient. They typically use inverter compressors—not rotary compressors—to regulate temperature. Inverter technology makes small adjustments to maintain the set temperature within a narrow range. Rotary compressors, on the other hand, cycle on and off, meaning big swings in temperature that require lots of extra energy.

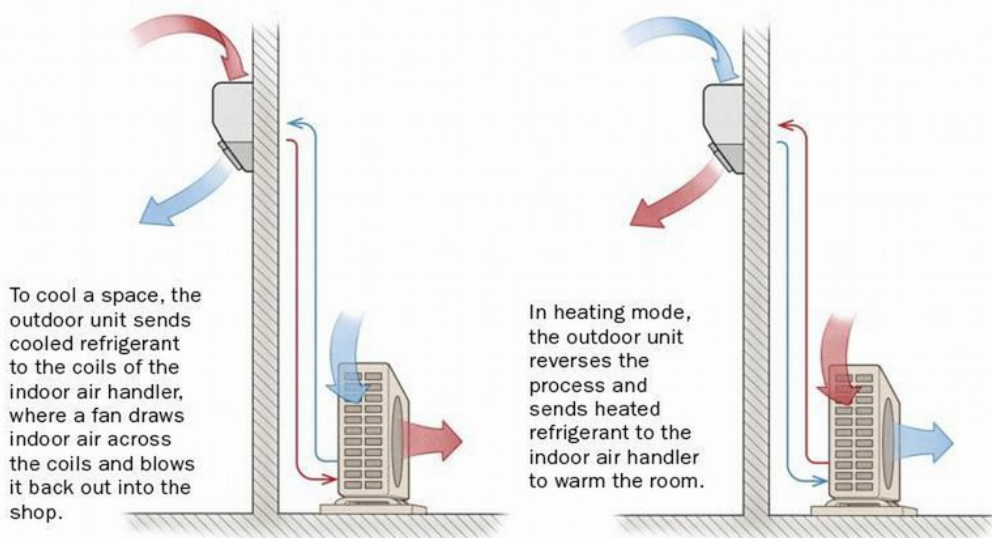
This efficiency means a mini-split should keep utility bills down. Martin Holladay, a senior editor at *Fine Homebuilding* and *Green Building Advisor*, says that while generalizations can be tricky because energy costs vary by region, heating with a mini-split is typically cheaper compared with propane or fuel oil and can be up to a third cheaper to run than electric resistance heat. Consult your local energy prices to determine what to expect for your area—especially considering how cheap natural gas has been recently.

ANATOMY OF A MINI-SPLIT

A mini-split is divided into two parts, an indoor air handler and an outdoor unit, which houses the compressor. That's the split. The mini is because their Btu loads are significantly smaller than a typical central, ducted heat pump.



HOW A MINI-SPLIT HEATS AND COOLS

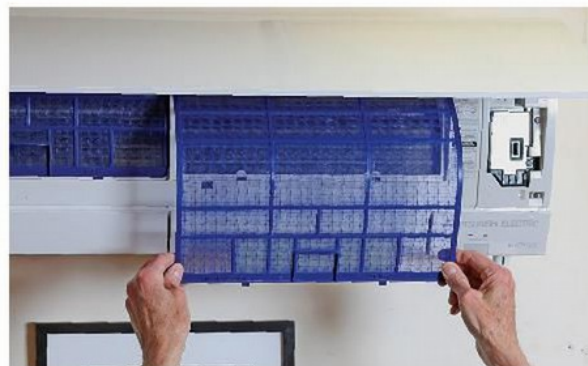




Up and away. Wall-mounted mini-splits, like this one in contributing editor Christian Becksvoort's shop, go high on the wall, so they don't take up valuable shop space.



Strategically placed. Because of the outdoor compressor, the air handler is best placed on an exterior wall to simplify installation. Also, since the outdoor unit is exposed to the elements, it needs to be off the ground. If it snows in your area, the unit must be above the anticipated snow level and under a roof that still allows for ventilation. If it gets buried, it could stop functioning.



Easy to live with. In the three years since buying his mini-split, the only maintenance Becksvoort has done is to blast the filter with compressed air every Saturday.

How much for a mini-split?

The cost for the units themselves and their installation is another consideration. For a 400- to 600-sq.-ft. space, expect to spend \$1,000 to \$1,500 for a unit that only cools. Tack on at least \$300 for one that heats as well. Installation costs can vary depending on the space—how complicated it is to run the hoses, for example.

We invited Dean DeMague, president of Connecticut's High Performance Energy Solutions, a company that installs Mitsubishi mini-splits, to visit a well-insulated two-car garage shop in Connecticut and assess the cost of a mini-split system. DeMague estimated all-in installation—meaning parts and labor—for an 18,000-Btu unit would cost \$3,500 to

\$4,500. Thanks to their efficiency, though, mini-splits may qualify for state and federal refunds and tax credits. Go to dsireusa.org to check.

According to DeMague, although you can do some of the installation yourself, it's likely not worth it. "Our track record with self-installations is that we spend a lot of time and money fixing them," he says. The issue is that beyond the simpler installation tasks, the risk greatly outweighs the reward. "If you get the refrigeration part of the install wrong, lights out. You might as well start over." Plus, you could void your warranty if you're not a certified HVAC professional.

Holladay agrees: "For one person installing one unit, hire a pro."

Also, a professional can pick the appropriate size mini-split for your shop and choose where to put it—both important factors affecting a mini-split's performance. Lastly, you must keep combustible vapors away from the indoor units. Considering possible finishing regimens, hiring a pro is an important step in keeping your shop safe.

When choosing an installer in the United States, Wood Whisperer and mini-split user Marc Spagnuolo advises, "Find an HVAC person who doesn't hesitate to install it" since the technology still isn't as prevalent here as traditional, ducted systems. Spagnuolo also advises buyers to pick a trusted brand.

PTACs Not just for hotel rooms

For some, the up-front cost of a mini-split may be too much to bear even considering the back-end savings. If that's you, look into a PTAC, or packaged terminal air conditioner. Unlike mini-splits, these units aren't at all novel in the United States. If you've stayed in a hotel, you're familiar with them. In cooling mode, these heat pumps operate just like mini-splits. But for warming a room, PTACs rely on electric resistance heat. People in chillier climates may want to invest in a PTHP model—a packaged terminal heat pump—whose heat pump can both warm and cool. It only uses electric resistance heat when temperatures drop too low for the heat pump to operate well.

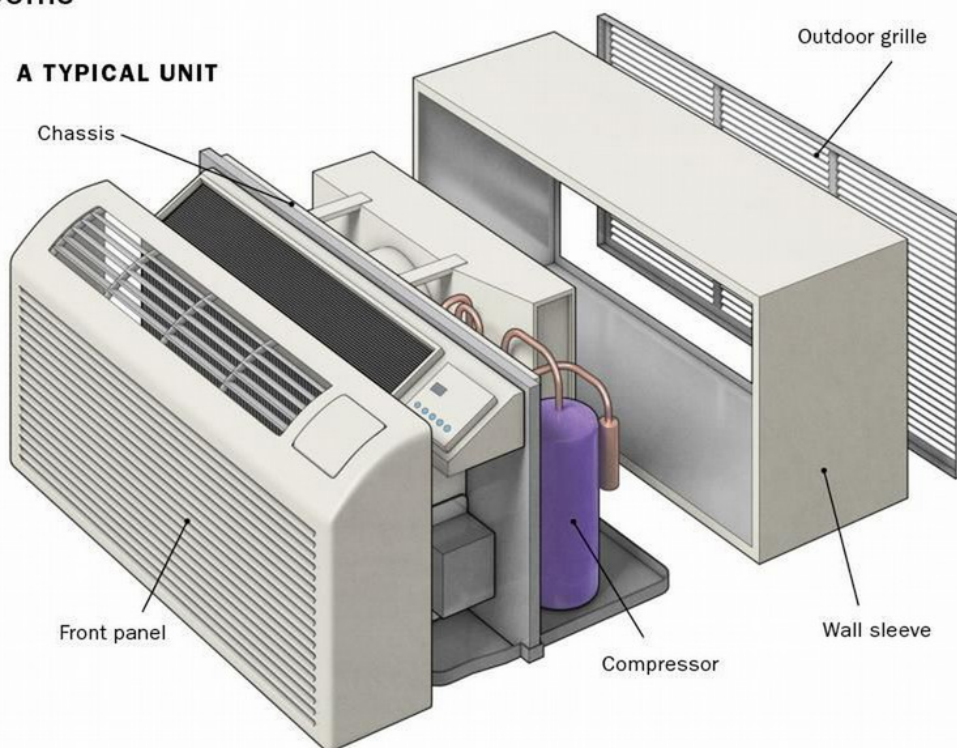
The knocks on PTACs are that they are considerably less efficient overall than mini-splits—sometimes by half—and require an opening about 42 in. long by 16 in. tall through the wall so they can vent. The unit will probably stick out into your shop at least 8 in., and since they have to be mounted low, the space lost will likely be more valuable. Also, some people find them frustratingly noisy. PTACs have one big advantage, though: They'll likely run you about \$1,000 or less, including the necessary components beyond the unit itself, which are a sleeve to support it in the wall and an exterior grill.

Do it yourself to save dough

Maybe the biggest place you can save money on a PTAC is if you install it yourself. Just like with a mini-split, a pro can help you choose the appropriate unit for your space—possibly saving you money and headaches—but you can stop there. PTACs are literally plug and go, so all you have to do is get one through the wall.

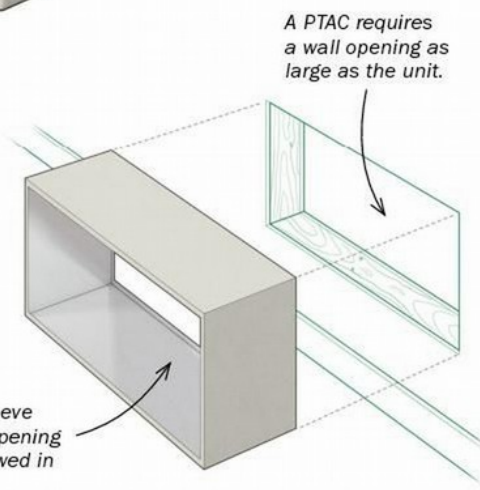
The process is a lot less fussy if you settle on a PTAC before the shop is built, since the plans can simply account for the proper opening and support. Ray Finan, a furniture maker in Vermont, did just that

A TYPICAL UNIT

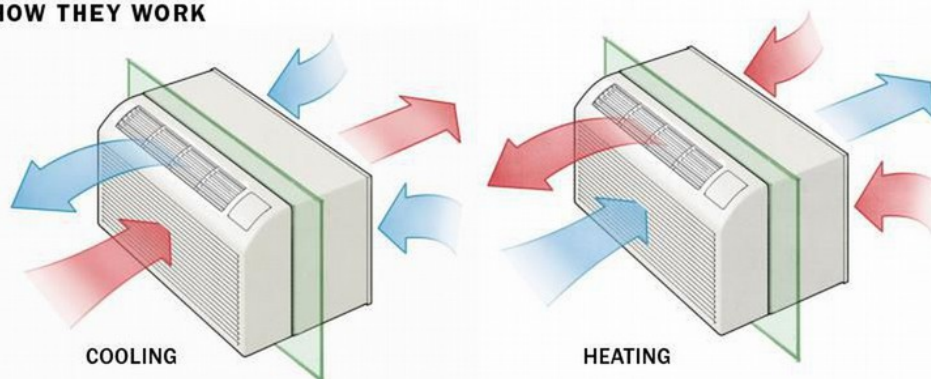


INSTALLATION IS SIMPLE

Cut the appropriate-size hole in an exterior wall and mount the sleeve in the opening. Then slide in the chassis. A few screws hold everything in place. Just be sure the wall can support the PTAC's weight.



HOW THEY WORK



Since they're also heat pumps, PTACs transfer heat in and out of a space the same way a mini-split does. The technology is a little less advanced, though, as they lack compressors with inverter technology and fall off faster as the temperature falls.



Space stealer. You'll have to work around a PTAC, because the units are typically mounted low on the wall and extend about 8 in. into a room. Ray Finan placed his as out of the way as possible while still keeping it effective. Wall-mounted clamp racks make good use of the space above the unit.



All in one. A PTAC's controls are a part of the chassis, making the most of its low placement.

when building his very well insulated, free-standing shop two years ago and hasn't looked back since—even in the state's severe winters. His PTHP model, made by Gree, cost about \$800, and having his electrician run a 220-volt circuit for it was a bit extra. Finan, whose 624-sq.-ft. shop has 9½-ft. ceilings, says the electricity bill for his shop increases by about 50% during February and March, although he admittedly doesn't run the unit much from late May through late October.

Retrofitting a PTAC or PTHP in an existing space is a bit more difficult, but still "easier than installing a window," says Matthew Teague, a woodworker in Nashville, Tenn., and a former managing editor with *Fine Woodworking*. He should know. He started with one in his shop, replaced it after about 10 years, and added one to his basement in between. Teague notes you'll probably want a buddy to help with the installation, though. The units weigh around 100 lb. or more, and because of their size, they can be unwieldy. He had a friend support one end while he drove the two screws to secure his Amana 15,000 Btu PTAC to the sleeve, which houses the unit in the wall. Just be sure you know what you're doing when you choose the location,



Choose your cover. The outdoor grille is an accessory, meaning you have to buy it separately. Frustrating, maybe, but this allows you to pick the grille that looks best.

and make sure it's an exterior wall that can support the unit's weight. Chopping into a wall without having a sound plan is definitely not advisable. If doing the installation at all disquiets you, consult a qualified professional for at least some guidance.

As for the 10 years Teague got out of the first unit, he thinks he came out on the right side of that deal. His unit was about \$700, so he concludes he paid about \$70 per year for a machine that kept his shop comfortable year-round. And as he points

out, shop conditions are tough on any appliance, and he had his on 24/7. Plus, he went from cleaning it daily for the first five to six years to almost never after that. Cleaning, Teague notes, is nevertheless simple and fast: Just vacuum the filter.

Shop time is precious. Luckily, mini-splits and PTACs are viable solutions, albeit with key differences, that can keep Mother Nature from limiting your shop time. If one fits in your shop and your budget, you've cleared a big hurdle to getting your projects done.

Superb Sawhorses

Sturdy designs in two sizes excel on the floor and on the benchtop

BY LEN CULLUM



I can't remember where I first saw a Japanese planing beam on trestle horses, but I do remember my first thought: "I gotta make a pair of those!" Having grown up around wobbly A-frame sawhorses made from 2x4s and festooned with paint spatters, bent nails, and errant sawkerfs, I thought those trestle horses seemed so sturdy, so clean, so intentional. I make them with drawbored mortise-and-tenons, which add another step to the build but provide extra solidity in joints that will see a lot of stress over the years. Because these heavy-duty horses have myriad uses, referring to them as sawhorses sells them short. I prefer to be more accurate: They are workhorses.

The design of the low horses stems from the fact that most Japanese woodwork is done while sitting. I rarely work on the floor, but I use low horses all the time on the benchtop. They elevate whatever I am working on above the fray of tools and shavings that accumulate on my bench. In the years since I made my first pair, I've been recommending them to all of my woodworker friends. I'll tell them that these are essential, 'what-did-I-do-before-I-had-these?' tools; but it isn't until I make them a pair that they really see what I mean—and often go on to make more themselves.

Len Cullum builds furniture and Japanese-style garden structures in Seattle.

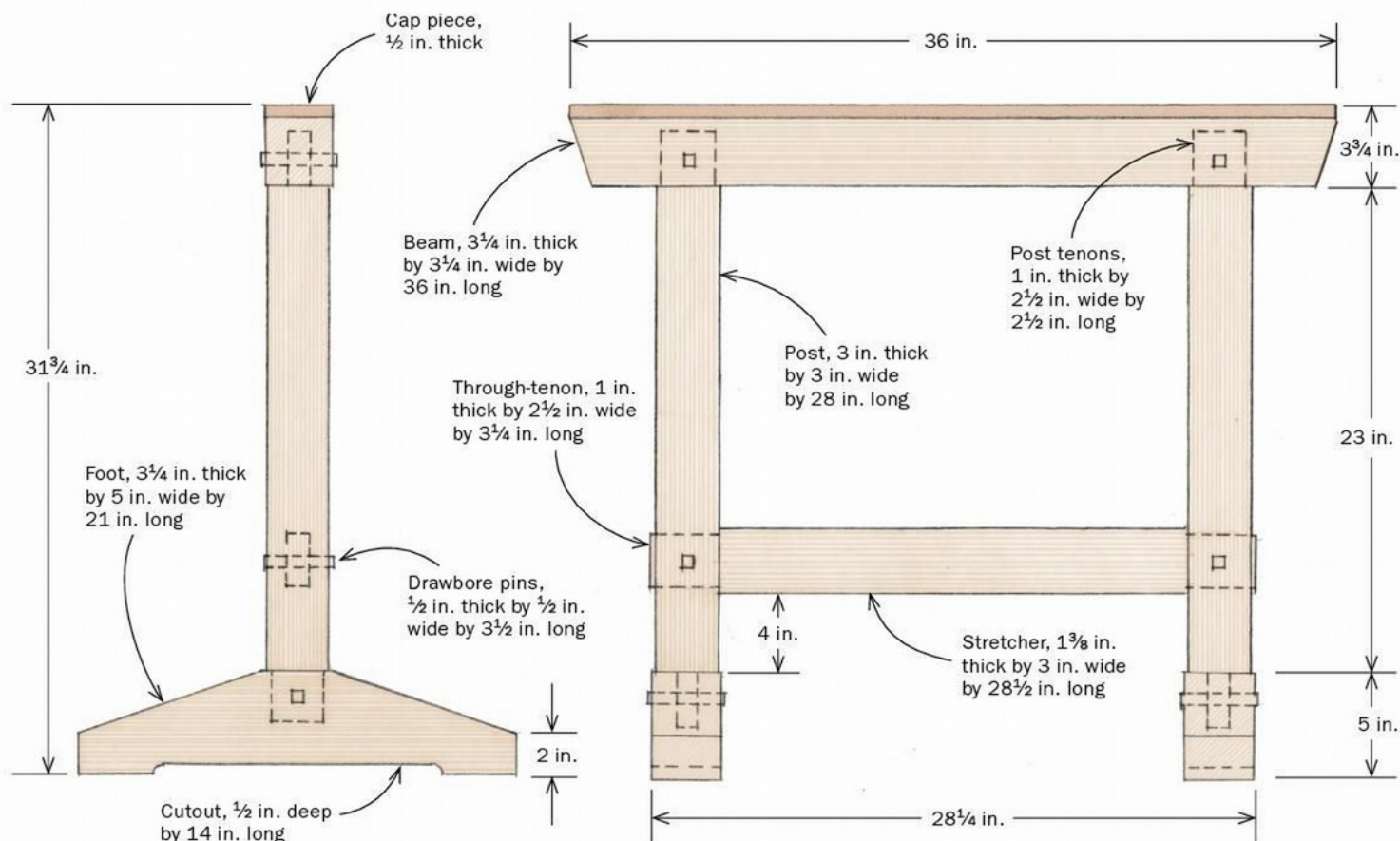
A true workhorse

When I made my first pair of workhorses, I built them with what I had lying around—Douglas fir construction lumber—figuring they would be the test run for a more serious pair made of oak or walnut. But I never looked back. Douglas fir's strength, weight, and sturdiness (not to mention low cost) made it ideal, and I've used it for every pair of full-size horses I've made since. But whatever wood you choose, they'll deliver a lifetime of use. To determine a comfortable work height for your horses, measure from the floor to the bottom of your closed fist. This gives you a good height for sawing, planing, and the like.

The feet and posts are first

I begin the horses by cutting the mortises in the foot blanks. Because the feet are too tall for my hollow-chisel mortiser, I rough out the mortises on a drill press and square them up with chisels. Then I move on to the posts, tenoning both ends with a dado head in the tablesaw. Although the two tenons are oriented in different planes, they are the same size, so they can be cut at the same time using the same stops and blade setup. I clean up the cheeks of the tenons with a rabbet plane and a wide chisel and chamfer the ends slightly to ease assembly.

Once I have those tenons fitted, I cut the through-mortises in the posts for the stretcher. Using my hollow-chisel mortiser,



MORTISE-AND-TENON WORK



Two-step mortise for the feet. Because the foot blanks are too tall for his hollow-chisel mortiser, Cullum roughs out the mortises with a Forstner bit, then refines them with chisels.



Make and fit the post tenons. The tenons at the ends of the post are not in the same plane, but they are the same size, so Cullum can cut them using the same stops and setup. He cleans the cheeks and chamfers the ends with hand tools, then tests the fit (right).

I chop from both faces toward the middle, then clean up with chisels.

Time for the drawbore pins

You often see round drawbore pins, but I like the look of square ones. I cut the holes for them at the hollow-chisel mortiser. First I cut through all the mortised parts. To keep from producing a splintery mess inside the mortise, you can fill it with a scrapwood spacer. With the pin mortises chopped, dry-assemble all the joints and, using a sharp pencil, trace the pin mortises onto the tenons. Then disassemble the parts and chop pin mortises through the tenons. Cut the mortises $\frac{1}{16}$ in. closer to the tenon's shoulder than the pencil marks would indicate; this offset will draw the joint tight when you drive the pins.



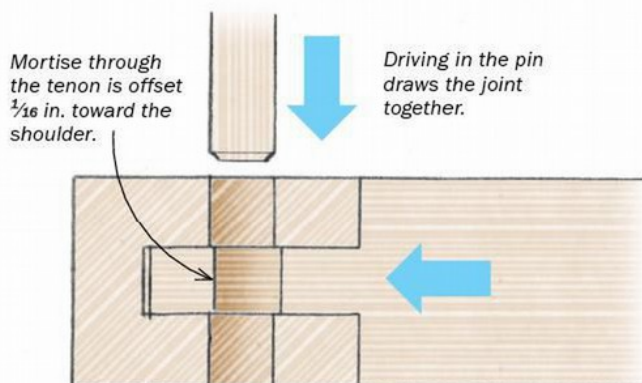
PREPARING FOR DRAWBORE PINS



Both sides now. Cullum cuts the through-mortises for the stretcher tenons at his mortiser, chopping from both faces to the middle.



Make way for the pins. With a sacrificial spacer inserted in the through-mortise, Cullum chops a hole for the drawbore pin.



Footwork

I shape the feet at this point, just before assembly. The first step is to make the long cutout at the bottom, which makes them more stable on uneven surfaces. You can saw this out, but I did it by drilling and chiseling. First, clamp the two feet together bottom to bottom and drill a line of overlapping, half-depth holes with a Forstner bit. Then flip the clamped feet and repeat the drilling from the other side. When the drilling is done, unclamp the feet and clean them up with a wide chisel, leaving the ends of the cutout rounded. To create the sloping top surfaces of the foot, bandsaw just shy of your layout lines and clean up with a few passes over the jointer. Now you can also cut the angled ends of the beam.

How to assemble a horse

Start with the stretchers, slipping their through-tenons into the post mortises. Then carefully drive the pins all the way through the joint. You should see the joint tighten as the pin goes in. Drive the pins until they stick out equally on both sides. With the stretcher pegged, add the beam. Attach the

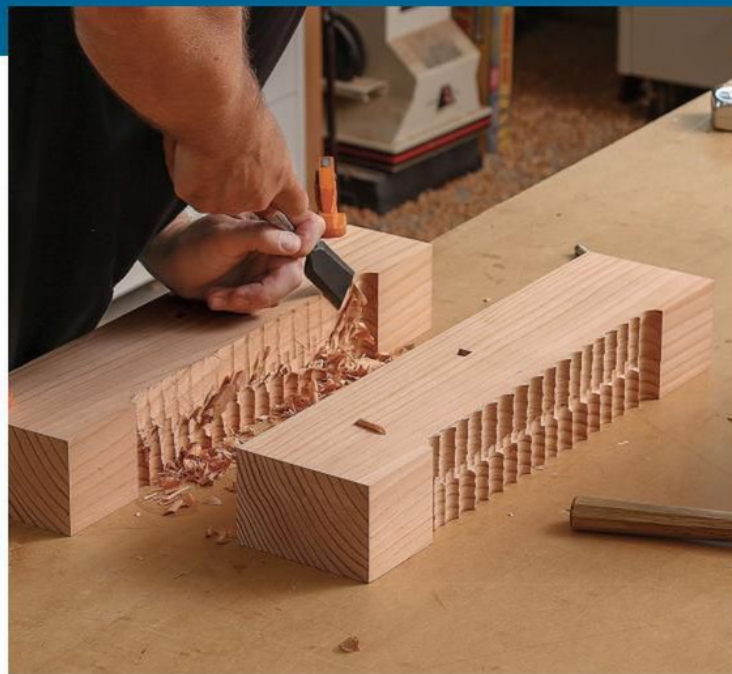


Mark and move. After assembling the post-to-foot joint and marking the location of the drawbore hole, Cullum chops the mating mortise $\frac{1}{16}$ in. closer to the tenon shoulder.

SHAPE THE FEET, THEN ASSEMBLE



Great relief. With the foot blanks clamped together bottom-to-bottom, Cullum drills a row of holes with a Forstner bit, then quickly chisels the washboard flat. Alternately, the relief could be bandsawn.



Quick slant. Cutting close to his layout lines, Cullum bandsaws the foot's diagonals, then smooths out the sawcut with a few passes on the jointer.

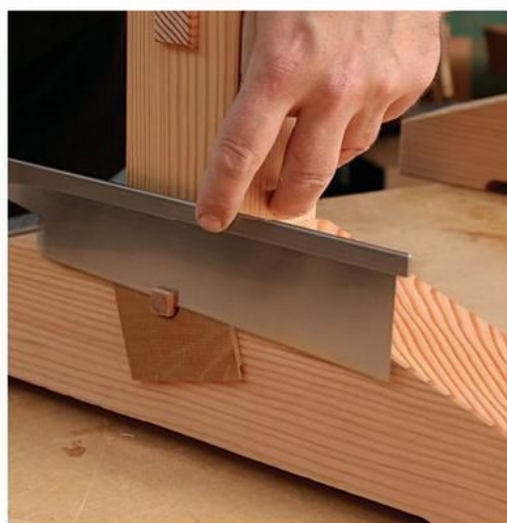
feet last. You can cut the pins flush, but I like to leave them a little proud. The easiest way to do this is to drill a hole in a scrap of wood (about $\frac{1}{8}$ in. thick), slip it over the pin, and saw against it.

Finishing up

The horses are now ready for the finish of your choice. I typically use Danish oil, but anything will do, or nothing at all. Once the finish is dry, the last step is to attach the sacrificial cap piece to the top. Because I work with a lot of softer woods, I use clear cedar for this. That way not only is the horse protected from errant sawcuts and the like, but the work I place on the horses is protected from the harder fir. To make these caps easy to replace—and free of metal fasteners—I attach them with double-sided tape.



Assemble in stages. Cullum first drives the pins connecting the stretcher to the posts, then fits the posts into the beam (right).



On with its feet. Last, the upper frame is fitted to the feet and cinched with pins. Cullum makes the pins overlong and trims them off about $\frac{1}{8}$ in. proud. A thin scrap drilled out at the center protects the horse and determines the length of the pin.



Protect the top. A couple of strips of double-sided tape hold a sacrificial cap piece in place on the beam. The softwood cap protects both the beam and the workpiece from damage.





Strength in a small package

Pony up. Japanese woodworkers use small sawhorses while working on the floor, but for Cullum they serve to elevate the workpiece off the bench.

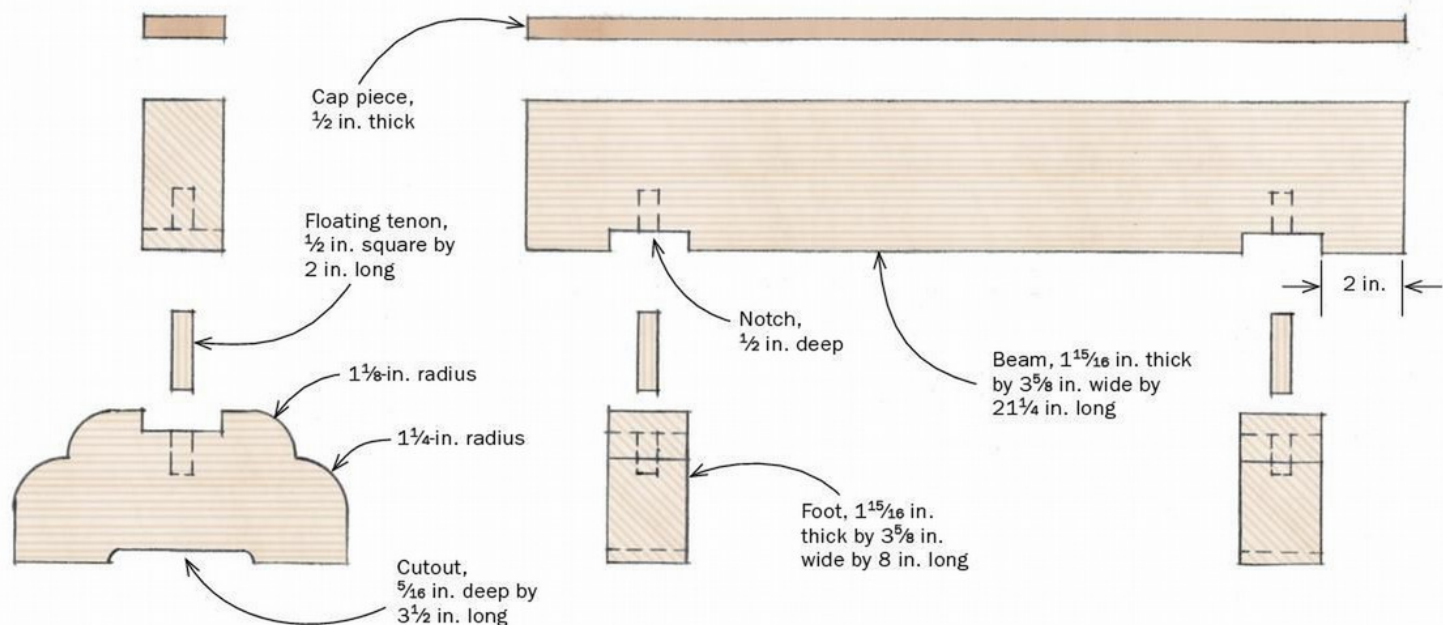
The low horses are a design I continually fiddle with. I have five pairs now, and they're constantly in use. I've made them from different woods, in several sizes, always making tweaks to the design in a quest to find the mythical sweet spot. I built this pair with a full-sawn Port Orford cedar 2x4, which gave me a stouter, taller set than the others.

Half-lap joinery

The feet are joined to the beam with half-lap joints. They are simple to cut, but the layout and fit has to be right on, so take your time and be precise. After cutting all of the parts to the same length,

I mark layout lines on one foot. Then I set a stop on the miter gauge, and using a dado head in the tablesaw, cut and test the joint. When I'm happy with the fit, I cut the other three, and then move on to the beams. To lay out the joints on the beam, I fit a foot to its location and mark lines. Using those lines I set stop blocks on the miter gauge, starting with a fit that's a bit too tight, and adjusting one stop until the fit is right on. Then I cut the other notches with that setup. The fit should be snug but shouldn't require more than a couple of light taps with a hammer to seat.

I generally build low horses with simple, glued half-laps, but I decided to reinforce these joints with floating tenons. If you do the



CREATE THE HALF-LAPS

Notch the feet.

Cullum uses a dado head, flipping the workpiece and using the same stop block for both end cuts. Afterward, he fits the notched foot blank on a beam and marks for the mating notch.



Twin stop blocks for the beam. Cullum cuts the two shoulders of a notch in successive passes using a stop block at either end of the miter-gauge fence. Then he checks the fit.

SHAPE THE FEET



Make way for the internal tenon. To reinforce the half-lap joint, Cullum adds a floating tenon between the foot and the beam. Here he cuts the mortise for it.

same, now is the time to lay them out precisely and cut them with a hollow-chisel mortiser or drill press and chisels.

Make 'em pretty

As far as function goes, these little guys are pretty much done. I could just glue them up and call it a day. But since the cedar is so nice and they'll be around my shop for years, I want to take them further. I have seen examples with feet ranging from simple 45° slopes to curly carved temple brackets. The ones I make fall somewhere in between. I begin by making a pattern from a piece of card stock and tracing it onto each foot. Then I bandsaw it to shape. Just before assembly, I chamfer all the edges with a chisel or a knife, avoiding the areas near the joints.

The glue-up

It's time to apply some glue and knock the little horses together. I don't bother with clamps, but after hammering them together it's a good idea to place them on a flat surface and put some weight on them while they dry. As with the larger horses, I add a sacrificial softwood cap piece to the beam using double-sided tape. Then all that's left is to put them to use.



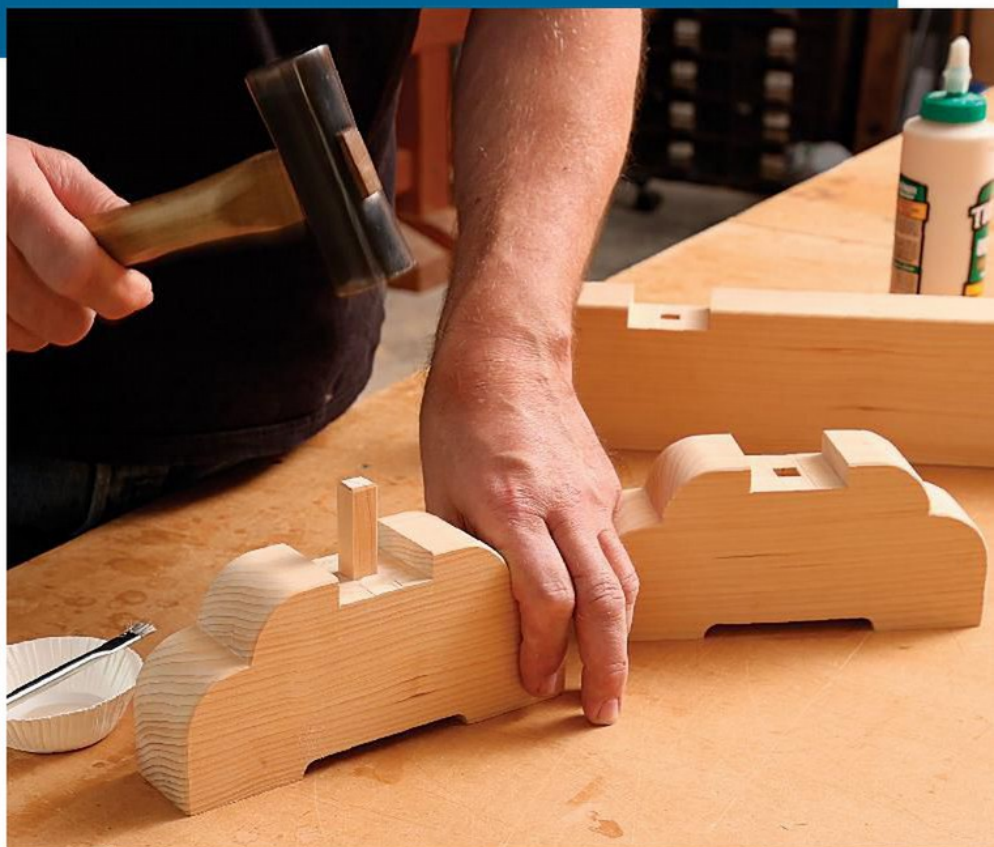
Forming the foot. A piece of card stock makes a good template for laying out the curves of the foot. With the foot blanks clamped together (left), the relief cuts begin with holes drilled at each end. Then it's on to the bandsaw (below), where the cloud-lift curves and the rest of the relief are cut.



BRING IT ALL TOGETHER



Pare the pegs. Using a knife, Cullum chamfers the ends of the floating tenons to be sure they enter their mortises cleanly. He begins the assembly by gluing the pegs into the feet (right).



No clamps. After he drives the joints home with a hammer (left), Cullum will place weights on the beam while the glue sets. To protect the beam—and his workpieces—Cullum adds a sacrificial cap piece to the beam, adhering it with double-sided tape. Here he uses a Japanese chamfer plane to produce just the right finishing touch on the edges (above).



MEDIUM, HIGH, OR LOW?



Standard workbench height is great for most hand- and power-tool tasks, but sometimes it pays to gain a higher stance or to elevate the workpiece.



Work at the Right Height

Optimize the elevation of your bench for the task at hand

BY CHRISTIAN BECKSVOORT

Everybody has an optimum height for their workbench. Standard benches are usually 36 in. tall, but some folks prefer one that's a bit shorter or taller, depending on their own size. The rule of thumb is that the bench should come up to about your wrist. That's great for 90% of all bench work, but it's not perfect for every operation. For example, planing requires more upper body strength, so a lower bench is better. Jobs like carving or sawing dovetails are both easier on your back if the bench is higher.

I have two methods for making my bench higher or lower, and as a result more user-friendly. With a little up-front work, both are quick to implement. I have a platform that lives under the bench that I can pull out and stand on in a minute. I also have an auxiliary bench that I keep close at hand; when I want to do some high work I simply lift it up, clamp it in place, and get to it.

Both add-ons to my main bench have made me a more comfortable and efficient woodworker.

Contributing editor Christian Becksvoort is a professional furniture maker in New Gloucester, Maine.



IS YOUR BENCH COMFORTABLY SIZED FOR COMMON TASKS?

If you stand next to your bench with your arms at your sides, the top should be at wrist height. This general rule should see you through most tasks at the bench—chiseling, belt-sanding, planing, layout, marking, drawing, etc. My bench, like its owner, is on the tall side.



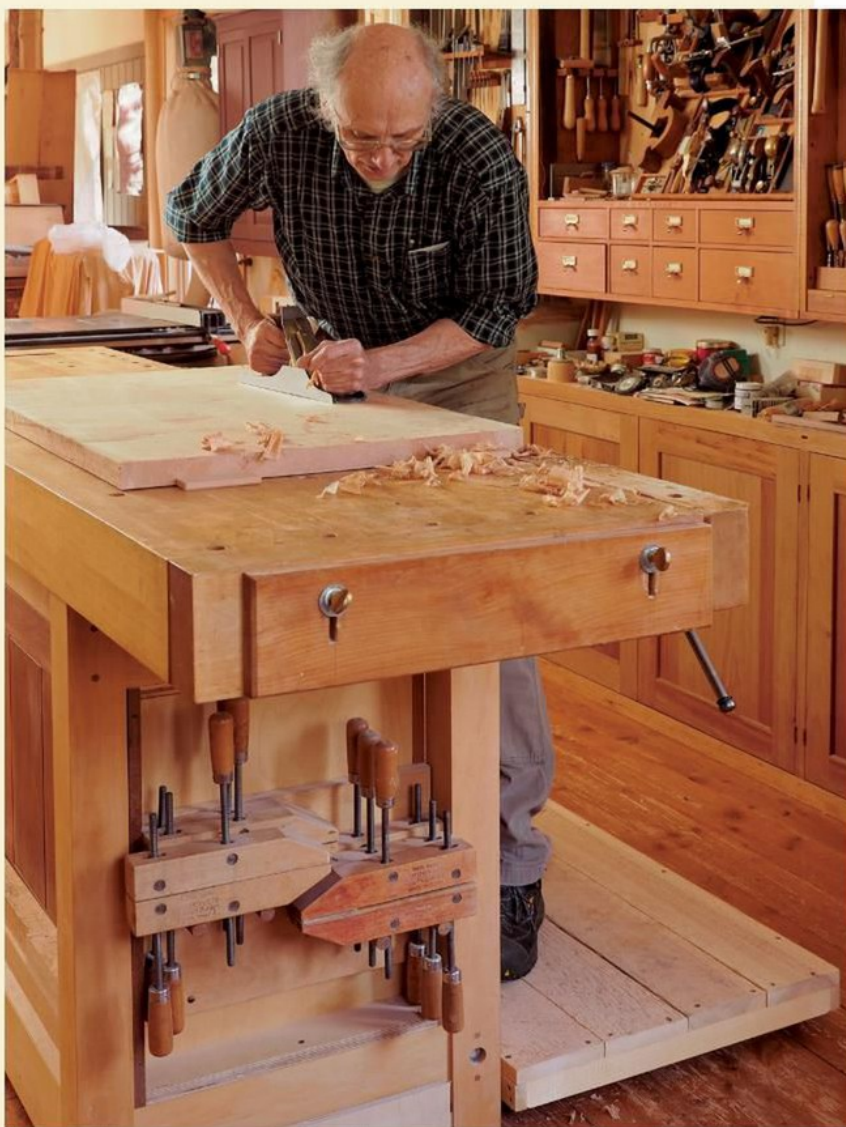


Tucked away until you need it. Becksvoort built a platform to store perfectly between the legs of his bench. Limited by the clearance beneath the bottom rail of the bench, Becksvoort added a lift system under the platform. Once he pulls the platform out, he can add to its height by folding down hinged risers.

LOWER BENCH PUTS YOU ON TOP OF THE WORK

My workbench is 39 in. tall, which is great for the vast majority of my work, even a lot of planing tasks. However, when I need to plane or flatten an entire panel or when I want to sand or plane tabletops or large panels held vertically in the vise, a lower bench surface would really help. Since I can't make my bench lower, I keep a 2¾-in. platform under it, fitted between the legs. I pull it out and stand on it, giving me a work surface that's effectively 36¾ in. high. If that's still too high, the platform has two hinged 3-in.-wide boards underneath that I can brace open with long spinners. Fold them down and the bench is 35 in. high, and I can really get into my work.

When returning it to its home under the bench, I found that the platform tended to bind if not pushed in straight. So I added strips between the legs to assure that the platform slides in straight. If you have a European-style bench with sled feet, the guide strips won't be necessary. If you want a platform the full length of your bench, you'll have to store it elsewhere. The platform can be made out of leftovers or cheap wood and can be built in just over an hour. It's an hour well spent, since it will make your work much easier. I also included a small nylon handle to make the platform easy to pull out.



More height means more power. The platform allows Becksvoort to work at a height that's most effective and ergonomic for planing a wide panel.

A BENCHTOP BENCH PUTS THE WORK WHERE YOU NEED IT

Making a higher work surface can be more complex, but it's worth the effort since it greatly improves the ergonomics of sawing tails and pins for case sides, and of letter carving. Unlike planing, which usually takes 5 to 10 minutes, carving can last for hours. Spending that much time hunched over is tough on your back. The high surface is also useful for fussy jobs such as inlay, where you need to be close to the work.

I have a 12-in.-high auxiliary bench that I clamp to my workbench. Its top surface is 51 in. off the floor, so I can rest my arms comfortably on it, and it is perfect for carving. No more backaches. The front edge has a 24-in. Lie-Nielsen chain-driven vise. That makes it easy to clamp case sides for sawing dovetails. The vise doesn't rack, since both spindles turn at the same consistent rate. The 12-in., 18-in., and 24-in. vise hardware is all priced the same, so go for the big one.

You really don't need an auxiliary bench as complex as mine, and you may not need the full 12-in. height. Use your imagination to come up with a solution that satisfies you. You can buy a variety of vises and carving tops suitable for auxiliary benchtop benches from Lee Valley, Tools for Working Wood, and Lie-Nielsen. Prices range from \$69 to \$890. You also can get some guidance from Steve Latta ("Minibench Works Wonders," *FWW* #244) and Jeff Miller ("A Benchtop Bench," *FWW* #176).



Bring the work up. With the smaller bench clamped to the main bench, Becksvoort can work at a level that will be comfortable for extended periods of time and allow him to use his body position productively.



Same features as the main bench. By adding a vise to the auxiliary bench, Becksvoort keeps his usual methods intact while working at the optimal height.



The Snug, Unplugged Workshop

A woodworker's space evolves along with him

BY DAVID FISHER

The little workshop at the back of our house has changed as much as I have since the day some 20 years ago when I first entered it. Today as I dive ever deeper into working green wood, it serves me perfectly. But its history reflects my own journey through the craft.

In 1996, my wife, Kristin, and I bought a century-old house in our hometown—a house showing its age and in desperate need of renewal. Fortunately, we were naïve about the amount of work that lay ahead; as we stood in the odd little attached garage that served as a vestibule, we focused on the potential and ignored the leaking roof.

From garage to home-improvement central

This quirky L-shaped space was 19 ft. deep and 10½ ft. wide, broadening to 15 ft. wide beyond a bump-out of the house. We agreed that our vehicle would stay outside—it was only a car after all. What few tools I owned were moved into this 250-sq.-ft. space that we were already calling the workshop.

For the first year or so, it remained unchanged but for some crude shelves and a cast-off chest of drawers I used as a workbench. It was the domain of chopsaws, caulking guns, paintbrushes, and utility knives as the infrastructure of the house took first priority. Rooms were transformed, floors were installed, and built-ins were built. As the list dwindled, my mind drifted to furniture and carving. It was time to outfit the shop.

A real workshop

I had worked in my high-school woodshop, in my dad's basement, and in the living room of my first apartment, where I clamped boards to the coffee table to carve them, but this would be my own dedicated workshop. I went

with what I knew: a basic workbench, low cabinets as a perch for benchtop power tools, and lots of pegboard and metal hooks. The workbench and the row of low cabinets still serve me well.

I stumbled into building a workbench that is as solid as the workshop itself. Using dimensional lumber, I constructed the supporting framework and secured it to the wall studs. I bought two sheets of ¾-in. exterior plywood, ripped them lengthwise, and face-glued them into a four-layer sandwich of a benchtop. I drilled some dog holes and added a face vise and got to work.

I filled the shop with a tablesaw, drill press, router, and other power tools. I also added a ventless gas heater and a second-hand bathroom sink, both of which remain valuable assets. Within three years, our family had grown to four and I built furniture to meet our expanding needs: a changing table, toy chests, cabinets, patio furniture, and various other pieces.

With each new piece my skills and my tool arsenal expanded. Although I was doing some hand-work on each project, the tablesaw, router, and orbital sander were still regularly screaming—and spewing a fine layer of dust all over the shop and me time and time again. For that reason and others, I began to consider unplugging my shop.

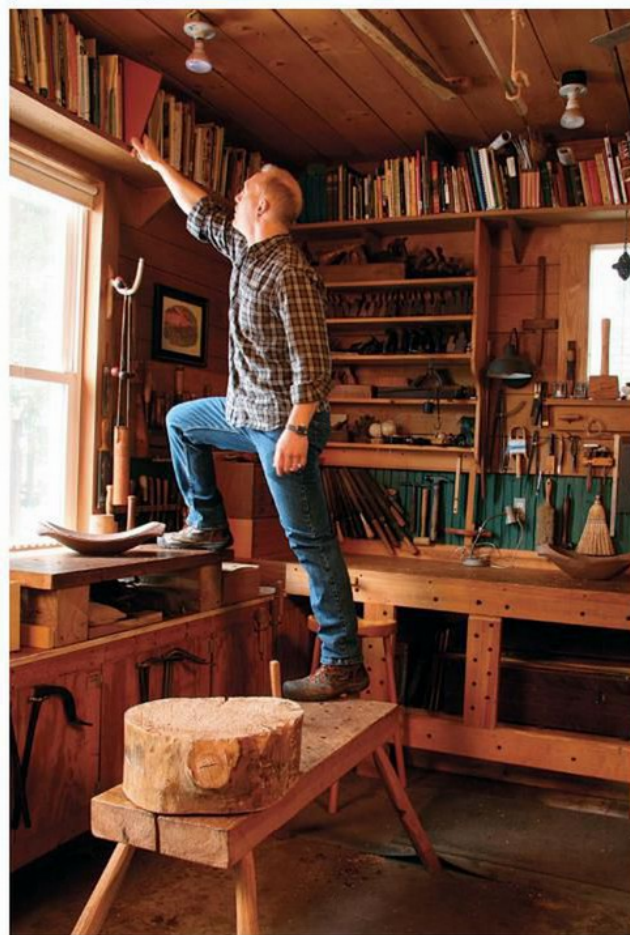
These reasons began to compound. Nap time had become precious, making the idea of a quiet workshop even sweeter. With many of the home requirements met, I was now able to focus on projects I wanted to explore, and I realized that none of them were facilitated much by a space-guzzling tablesaw. The latest gadgets in the tool catalogs had lost their appeal. I had no scorn for power tools; it just became clear that I wanted to move on without them. In a rare moment of decisiveness, I sold or gave them away.







Fine shop furniture. Fisher's canted-leg low bench (below) serves him for chopping, carving, and for reaching his library of woodworking books. His bowl horse (left), made from a stout log, pinions a workpiece from front and back.



I had worked in my high-school woodshop, in my dad's basement, and in my first apartment—where I clamped boards to the coffee table to carve them—but this would be my own dedicated workshop.

From dust to chips

With the money from the sale of the power tools, I bought a slew of old hand tools in need of renewal. I focused more than ever on tuning my tools, and built a dedicated sharpening station. I had already been doing some handwork, but I felt incredibly energized by the new challenge and possibilities.

Work in my shop became even more interesting and fun. The pages of books by Roy Underhill and others were guides to adventure. I also continued to expand and stretch my carving skills with works in relief and in the round, and made furniture for our use in the house and lots of toys for the kids. Regardless of the project there was no dust to settle, only shavings. And it seemed that there was always another exciting road to explore.

One thing I did that smoothed the transition from power to hand tools was to attach an assembly to the front of my existing built-in bench. Constructed from yellow pine dimensional lumber, it has a frame with a sliding deadman, a board hook, and holes for pegs, providing excellent work-holding options.





Rudimentary and rock-solid. Fisher's built-in bench, made years ago from construction lumber and exterior plywood, was upgraded for handwork with the addition of a frame with a sliding deadman.

Going green

A whole new dimension opened in my work and my shop when I discovered the writings of Drew Langsner, Jennie Alexander, Mike Abbott, and Peter Follansbee. These folks were making things from trees! The shop now became a laboratory for a pole lathe, chairs, shrink pots, shaving horses, riven oak boxes, spoons, timber framing, and especially bowls—I fell in love with carving bowls.

My interest in bowls eventually led me to build two features that have now been at the center of my workshop for well over a decade, a low bench and a bowl horse. The low bench is simply a thick, wide oak timber held at top-of-the-knee height by four splayed legs fit into round tapered mortises. It serves as a support for all sorts of operations, from sawing to boring to shaping with an adze. It even supports my portable chopping stump. Like my workbench, it is pierced by $\frac{3}{4}$ -in. holes for pegs, and for those miracles of work holding, holdfasts.

The bowl horse emerged from my desire to work on bowls with a drawknife. The concept was to adapt a traditional shaving horse so that a bowl would be supported by the bed and squeezed end-to-end between the dumbhead and a vertical stop.



Decorative tool storage. To make the shop feel more personal, Fisher purged it of store-bought containers. He uses every inch of wall space for storage and display.





Like a wooden spoon, a workshop can bring joy not only through its performance, but also by its appearance and feel.

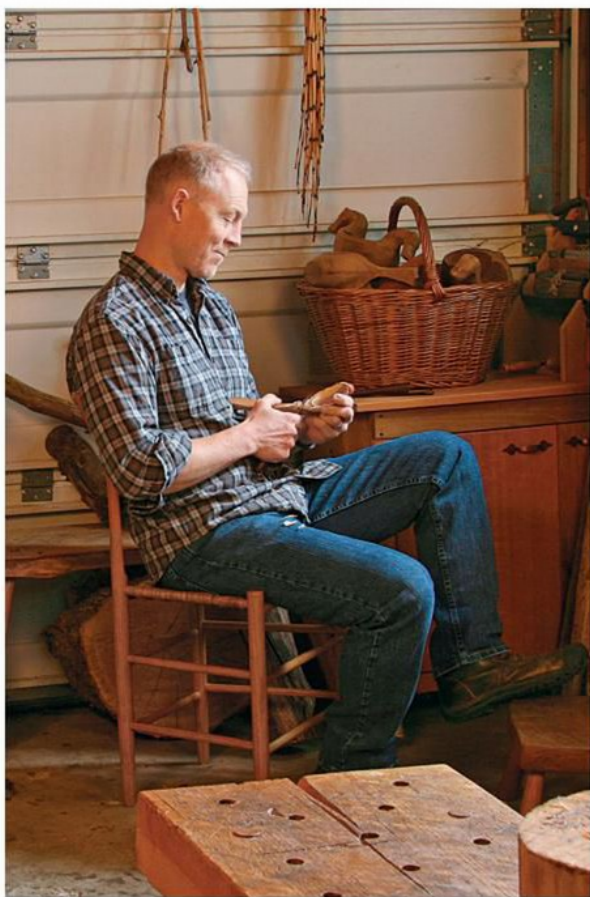


The aesthetic movement

I had also come to the realization that this workshop was more than a place for me to make things. The space served as a foyer into our home, a mudroom, and my peaceful retreat. My children would often pop out to work on projects, and every so often we'd record their heights on the wall. One of the things I enjoyed most about the location of my shop just off the kitchen was this accessibility; I was in the shop and at home all at once. I began to pay more attention to the aesthetics of this room that we all at least passed through many times a day. I didn't want to create a showroom. I just thought that I, and my craftsmanship, might benefit from a reasonably attractive, pleasant, uncluttered space. I was after authentic, practical changes. Like a well-designed wooden spoon, a workshop can bring joy not only through its performance, but also by its appearance and feel.

I got started by closing in the ceiling joists with roughsawn pine boards from a local sawmill and insulating above them, making a ceiling with character that also kept the heating bills down. I got a deal on a big stack of sassafras boards and lined the upper





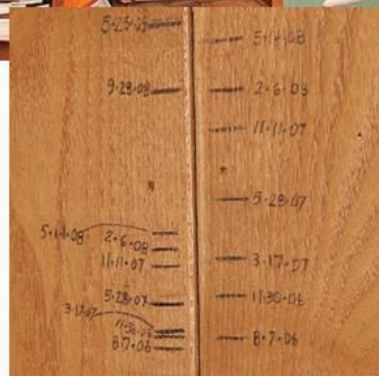
walls with them, adding a high shelf running around the room to hold my ever-growing library of wood-working-related books, making use of what would have otherwise been wasted space. I decorated the walls with things I found meaningful and beautiful.

I got rid of plastic storage bins and containers, replacing them with wooden boxes and small chests that are more pleasing to the eye and just as effective at keeping clutter under control. Some I made and some I picked up at garage sales and auctions. Tools that didn't go in boxes I kept within easy reach on shelves or hung from the walls. Carved branch crooks serve as hangers for everything from tools to hats. And a couple of vintage file cabinets provide storage for paper, art supplies, records, and various odds and ends.

Change and continuity

Like us, the workshop has seen many changes over these two decades. It's still a humble little shop that has its limits, but limits often encourage resourcefulness and creativity. It has all I need to make what I want. I'm sure the metamorphosis will continue over the years as I continue to explore. Yet much of the character and the story will remain, like the growth chart scratched onto the wall. □

David Fisher works green wood in Greenville, Pa.



Home shop. Fisher's shop is also the main entrance to the house, and his family's coats and hats share space on the walls with his tools, his children's artwork, and a penciled record of their growth.



gallery

Inspiration for our readers, from our readers



DAVE NELSON

Miami, Fla.

After admiring chisel cabinets he saw online and in magazines, Nelson decided to take his cabinet a step further and make it with a curved door and abalone inlay. "I really got motivated by Garrett Hack's article ("Coopering a Door") in *FWW* #126."

SAPELE, BIRD'S-EYE MAPLE, AND PADAUK,
5½D X 15W X 15H

ARNOLD BANDSTRA

Ottawa, Ill.

These two hammers have very different purposes. The smaller is used to adjust wooden planes. The head was made from a steel rod that Bandstra turned on his wood lathe; the handle is curved to fit the hand comfortably. The longer cross-peen hammer (top) is used to nail small moldings. "It can nicely set a small brad held between thumb and finger, sliding between without hitting my thumb."

CROSS-PEEN HAMMER: WHITE OAK, 4¾W X 13L

PLANE-ADJUSTING HAMMER: CHERRY, 2½W X 7¼L

Bandstra made the drawknife to hollow wooden beer steins he was making. He worked on the curved blade with a friend who does blacksmithing, shaping it from an old leaf spring. The handles are attached with through-tines peened over washers in the ends.

CHERRY, 9½L WITH 1½-IN. RADIUS CURVED BLADE



TOM CROSS

Murfreesboro, Tenn.

A retired machine designer, Cross made the bevel gauge (top) simply because he needed one. The blade is stainless steel and the fasteners and tightening knobs are brass. "The clamping action is accomplished using two cam plates that slide against each other within the little pocket of the body."

PURPLEHEART, 1SQ X 5L (BODY), 10 $\frac{1}{4}$ L (OVERALL)

This marking gauge is the second Cross has built, and he says if he makes a third, it will have a wider fence. He used a square lathe tool bit for the spur; all the other components are brass. A brass strip is inlaid in the stem to prevent wear from the tightening knob.

CHERRY AND MAPLE, 2 $\frac{1}{4}$ SQ X 1W (STOCK); $\frac{5}{8}$ SQ X 10L (STEM)



Shopmade floats. Mannall makes a variety of planemaker's floats when building his wooden planes. Made from O1 tool steel or by reworking files, they are tapered and angled in different ways so he can access the various recesses and mortises of the molding planes.

CHRIS MANNALL

Nanaimo, B.C., Canada

Mannall is an antique handplane enthusiast who realized that if he wanted to add some of the more obscure old-time planes to his collection, he'd have to make them. This is a Scottish-style four-blade sash plane, also known as a "hedgehog." The profile it creates is an astragal and hollow. "What further complicates this plane is that the blades lean out toward the sides—front blades at 7.5° from the vertical and rear blades at 3°."

EUROPEAN BEECH,
1 $\frac{3}{4}$ W X 9 $\frac{1}{2}$ L X 3H





CHARLES MAK

Calgary, Alta., Canada

Mak had two aims when he made his wooden router plane: He wanted a precision tool for hinges and inlay and thought it would be good to make his own; and he didn't like the plain, utilitarian look he'd seen in other shopmade router planes. "I designed mine for use with a high-quality commercial cutter from Lee Valley, and came up with a more stylish design that also offers good control of the tool."

MAPLE, 3½D X 9½W X 1½H

ALLEN NEFF

Brunner, Ont., Canada

Neff made this scratch stock large because he likes large tools, but the cutters are fine. "The beam is a standard dowel so I can make additional ones easily. A large brass plug in the fence distributes clamping pressure. There are two brass wear plates set into the fence and two crown nuts mounted on studs on the opposite side for curved work."

WALNUT, CHERRY, AND MAPLE, 2¹³/₁₆W X 7⁵/₈L X 2¹⁵/₁₆H



DAVID B. FOWLER

Wichita, Kan.

This miniature woodworker's bench was inspired and built for a Christmas toy show at Wichita's Historical Museum. The bench is a replica of an 1890s workbench that Fowler has in his shop, but it's one-third the size.

MAPLE, WALNUT, AND LIGNUM VITAE, 8W X 24L X 11H



GERD FRITSCHÉ

Niederstaufen, Germany

This is the biggest handplane Fritsche has made. Years ago, he had bought a Norris A5 smoother and was a bit disappointed in how it was made. "When I dismantled it, I said to myself, 'I can do it better.'" This one has 19 double splayed dovetails on each side.

WALNUT, STEEL, AND BRASS, 2¾W X 28L



JOHN WALKOWIAK

Minneapolis, Minn.

These gauges (left) are replicas of antiques. Walkowiak uses them in his shop. The larger one with the handle is a slitting gauge that was used to score thin panels such as drawer bottoms so they could be snapped in half, "like cutting a piece of glass." The thinner one is a trammel, or beam compass, for marking circles.

CHERRY AND EBONY, BOTH 24L

The bowsaw, also known as a turning saw (above), is made of curly maple and ebony. Walkowiak dyed the curly maple using a two-step water-based aniline dye and finished it with shellac. The handles, stretcher, and turnbuckle are Gabon ebony.

CURLY MAPLE AND EBONY, 23L X 13H





STEVEN T. BUNN

Bowdoinham, Maine

Bunn based the design of this Shaker workbench on a larger bench he'd built years earlier, with an eye toward the bench at Hancock Shaker Village in Massachusetts. He says he admires the large top and plentiful storage the Shakers built into their design. He modified the frame after a typical New England timber-framed barn, and built the tail vise and wooden bench screw himself.

MAPLE, 32W X 80L X 33H



LOU YELGIN

Merrimack, N.H.

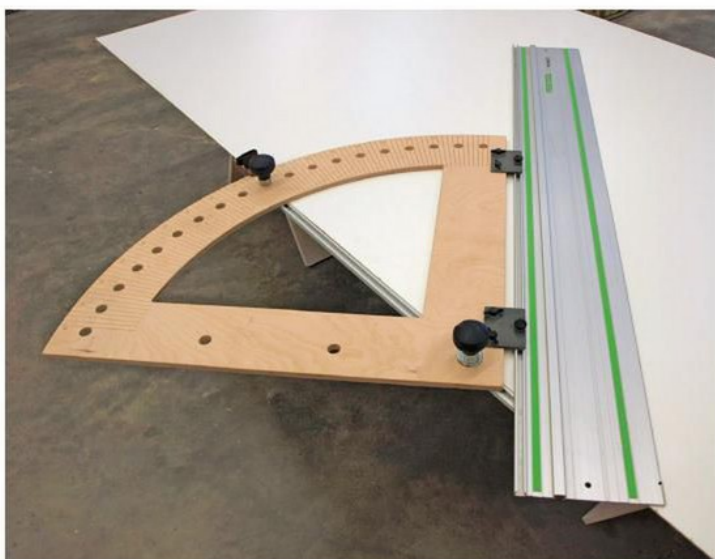
Yelgin's coffin-sided plane (above) has a lignum vitae sole and a vintage laminated blade modified to fit the mouth. The blade bed angle is 50°, also known as a York pitch. Yelgin got his inspiration from James Krenov and from David Finck's "Wood Planes Made Easy" in *FWW* #196.

CHERRY, LIGNUM VITAE, ROSEWOOD, 2 $\frac{3}{8}$ W X 11L X 3H

Yelgin made this spokeshave (above left) and chair devil (left) for a Windsor rocking chair class he took with Vermont chairmaker David Sawyer.

WALNUT, EBONY, MAPLE, LIGNUM VITAE, 1 $\frac{1}{4}$ W X 11 $\frac{1}{4}$ L X $\frac{7}{8}$ H (SPOKESHAVE), 1 $\frac{1}{4}$ W X 11 $\frac{1}{2}$ L X 1 $\frac{1}{4}$ H (CHAIR DEVIL)





GERRY BROWN

Gratum, Alta., Canada

Brown made this protractor because he needed a tool that would make it easier to crosscut 4x8 sheets of plywood square or at any angle with his track saw. He uses it for cabinet parts and general millwork.

BALTIC BIRCH AND WHITE OAK,
½D X 28½W X 28½L

Photo: Bev Brown

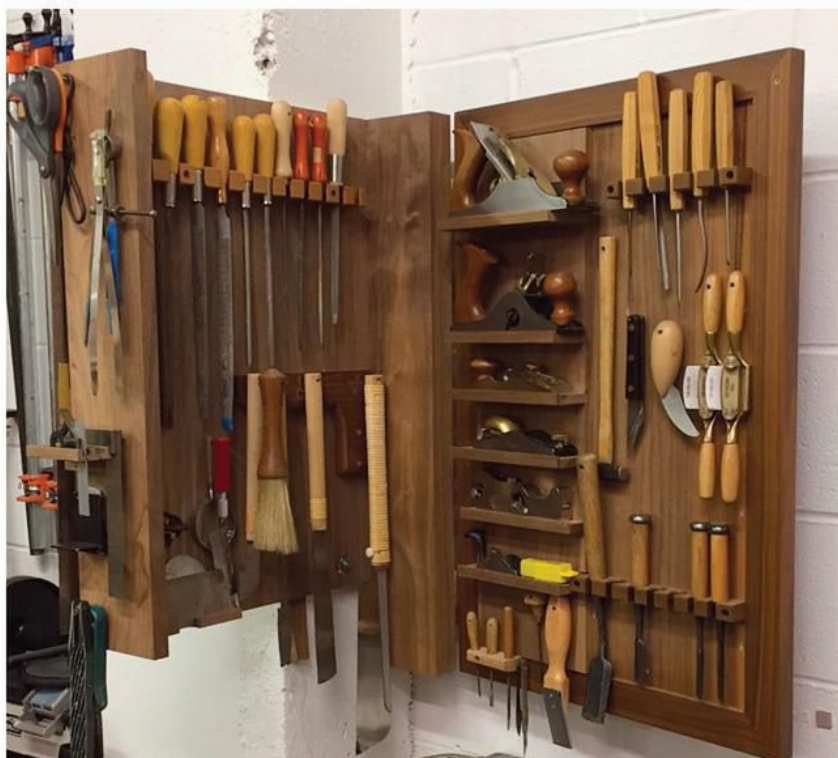
CRAIG THIBODEAU

San Diego, Calif.

This simple tool cabinet was designed without a bottom, so sawblades and knives can hang below the door.

Thibodeau said he used a veneered panel for the door because he had it left over, "but that could be simplified to an edged piece of plywood or made more decorative." He sized the cabinet to fit his most-used hand tools. "I don't like having to move things to get to any of the tools, so everything is only one layer deep."

WALNUT AND BALTIC-BIRCH PLYWOOD,
6½D X 21W X 31H



TODD SPENDIFF

Saint Johns, Fla.

After seeing planes made by Bill Carter of Leicester, England, Spendiff sent some questions via email and corresponded with the veteran planemaker before undertaking this miter plane. "I gave it a go. It was much more work than I had anticipated," he said, estimating it took almost 40 hours to complete.

YELLOWHEART, BRASS, AND STEEL
1¾W X 6½L X 3¼H



The physics of machine safety

TO CUT SAFELY, STAY FOCUSED ON THE FORCES EXERTED BY THE SPINNING BLADE OR BIT

BY TODD BRADLEE

It was only after many years of working wood—and one big scare—that I began to think seriously about machine safety and developed a real understanding of the forces at work when a spinning blade or bit cuts a piece of wood. In this article I'll show you how to compensate for those forces and control the workpiece as you work at the tablesaw, bandsaw, jointer, drill press, and router table.

My awakening came 17 years into my career. I began working as a carpenter at 18, and I saw some pretty frightening things on job sites. Carpenters seem fond of running

Tablesaw

The tablesaw presents the most complex challenge to maintaining control. You must keep the workpiece moving forward, flat on the table, and pressed against the fence. Failing to do any one of these three things can result in serious injury. Fortunately, a pair of hands and a push stick are all you need to combat those forces and stay in control. Past the blade, the workpiece engages the splitter, which helps keep the board against the fence.

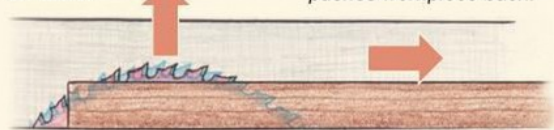


Two-handed technique. Your left hand, anchored near the edge of the table, applies downward pressure and keeps the workpiece against the fence. Push the workpiece through the blade with your right hand (above). To keep your right hand well clear of the blade, start using a push stick when your hand reaches the table (left).

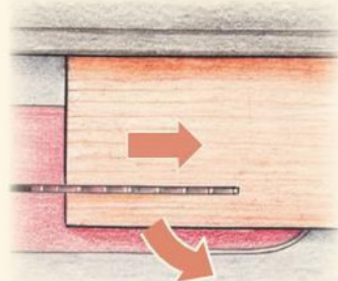
Cutting forces

Back side of blade lifts workpiece off table.

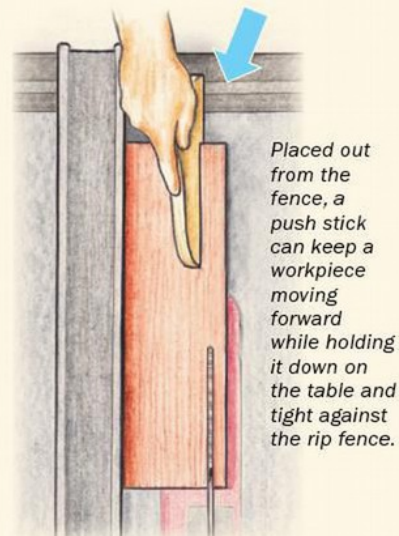
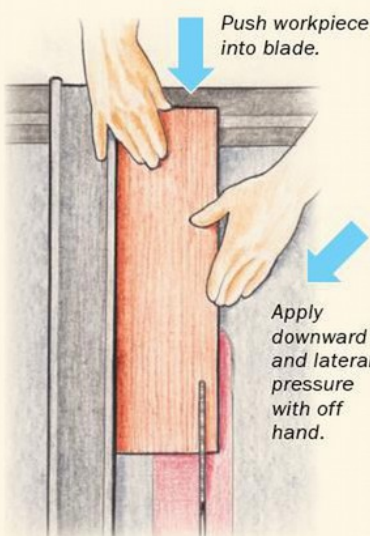
Rotation of blade pushes workpiece back.



If the feed pressure is not in line with the force exerted by the blade, another force comes into play, causing the workpiece to pivot away from the fence.



HOW TO CONTROL THEM



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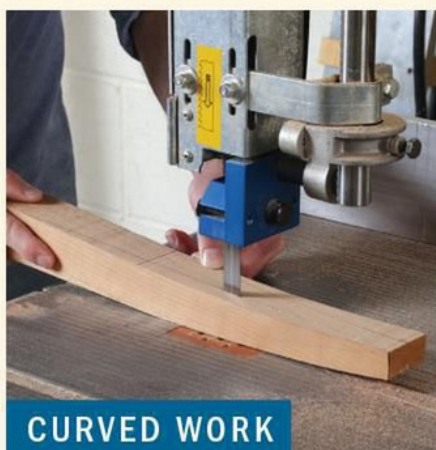
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Bandsaw

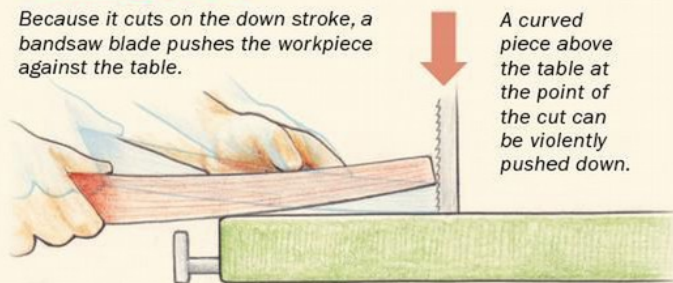
As it cuts, a bandsaw blade exerts downward force that pushes the workpiece onto the table. This is fine as long as the part you are cutting is flat. Things get a bit tricky when the workpiece is curved and only contacts the table at one point. If you keep that point of contact right in front of the blade, you'll be OK. When cutting thin slices from a board, use a push stick to protect your hand in case the blade wanders from the cut and out of the board.



Exploit blade's motion to improve control. The blade forces the workpiece onto the table. Keep the point of contact right in front of the blade, and the downward force will help steady the workpiece.

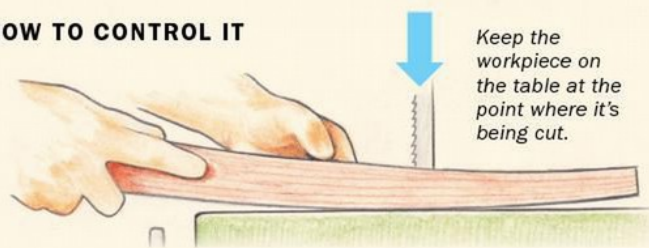
Cutting force

Because it cuts on the down stroke, a bandsaw blade pushes the workpiece against the table.



A curved piece above the table at the point of the cut can be violently pushed down.

HOW TO CONTROL IT

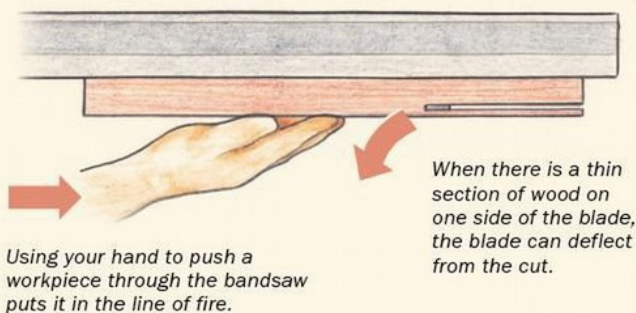


Keep the workpiece on the table at the point where it's being cut.



Beware of wandering blade. When ripping or resawing, a blade cutting near the surface of a workpiece can quickly veer off course and out of the wood, so use a push stick.

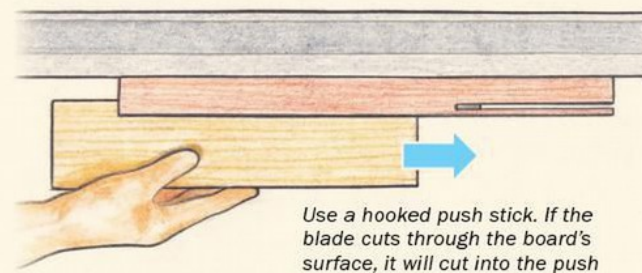
Cutting tendency



When there is a thin section of wood on one side of the blade, the blade can deflect from the cut.

Using your hand to push a workpiece through the bandsaw puts it in the line of fire.

HOW TO COPE WITH IT



Use a hooked push stick. If the blade cuts through the board's surface, it will cut into the push stick rather than your hand.

blades within an inch or two of their fingers. After 14 years in the building trades, I was burned out but unscathed.

Having found inspiration in some custom furniture I had seen, I began to design and build furniture. Three years later, at age 35, my right hand was pulled into a tablesaw blade by a kickback. The blade nicked the tip of one finger, but otherwise I was unhurt. I was very fortunate, but luck doesn't last, so I began to study the machines I used daily. I wanted to understand how they cut, so I could use them more safely.

Todd Bradlee, who began using power tools at age 12, is a professional furniture maker in Bishop, Calif.

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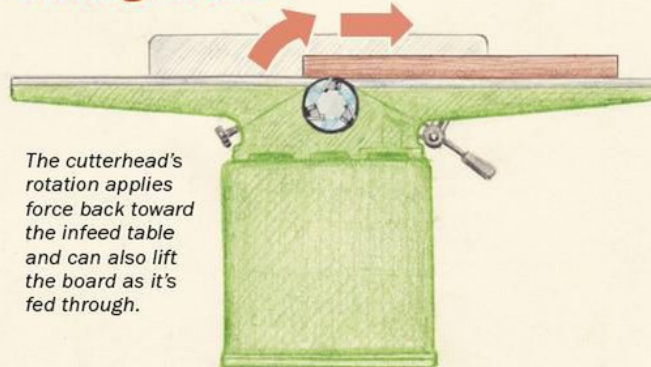
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Jointer

As it spins toward the infeed table, a jointer's cutterhead pushes the workpiece back toward you as you feed it across the knives. At the same time, the cutterhead exerts upward pressure on the workpiece. That's two forces you must counteract to maintain control. Press down with your left hand while using your right hand, with the help of a push stick, to push the workpiece forward.

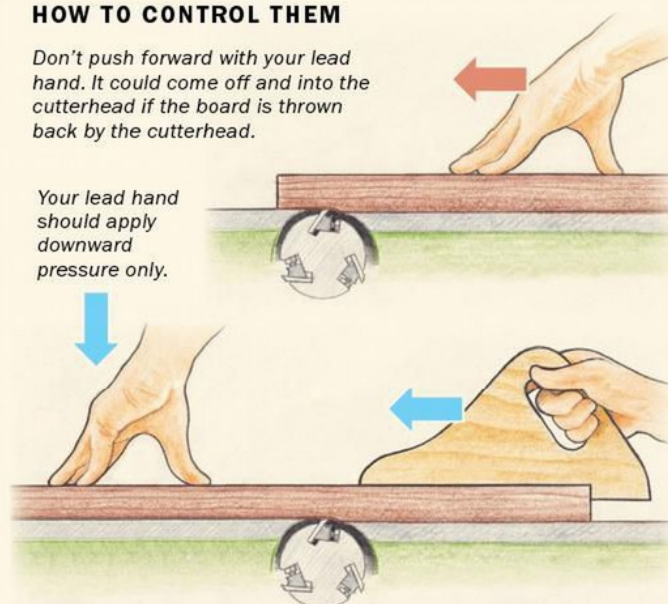
Cutting forces



HOW TO CONTROL THEM

Don't push forward with your lead hand. It could come off and into the cutterhead if the board is thrown back by the cutterhead.

Your lead hand should apply downward pressure only.



Keep pressure near the cutterhead. After the board is 6 in. to 12 in. past the cutterhead, let it pass under your left hand, but continue to apply downward pressure.

Press down and push. Use your left hand to keep the board flat on the jointer's table while pushing it forward with your right hand.

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INDEX TO ADVERTISERS

ADVERTISER	WEB ADDRESS	PAGE	ADVERTISER	WEB ADDRESS	PAGE
Anderson Ranch	www.andersonranch.org	p. 21	Leigh Industries	www.leighjig.com	p. 29
Berkshire Products	berkshireproducts.com	p. 21	Leigh Industries	www.leighjig.com	p. 85
Bessey	www.besseytools.com	p. 19	Lignomat	www.lignomat.com	p. 15
M. Bohlke Corp.	www.mibveneer.com	p. 17	Oneida Air Systems	www.oneida-air.com	p. 21
Center for Furniture Craftsmanship	www.woodschool.org	p. 15	Oneida Air Systems	www.oneida-air.com	p. 91
ChipsFly.com	chipsfly.com	p. 23	PantoRouter	www.pantorouterusa.com	p. 19
Connecticut Valley School of Woodworking	www.schoolofwoodworking.com	p. 11	Philadelphia Furn. Workshop	philadelphiafurniture workshop.com	p. 87
Cook Woods	cookwoods.com	p. 87	Pygmy Boats	www.pygmyboats.com	p. 87
Custom Branding Irons	www.branding-irons.biz	p. 15	Quality Vacuum Products	www.qualityvak.com	p. 11
Dowelmax	dowelmax.com	p. 17	Quickscrews	www.quickscrews.com	p. 2
E-Heat	www.eheat.com	p. 85	Rikon Power Tools	www.rikontools.com	p. 13
Epilog Laser	www.epiloglaser.com/fw	p. 85	Robert Larson	www.twocherriesusa.com	p. 19
Felder Group, USA	www.feldergroupusa.com	p. 9	SCM Group, USA	www.scmgroup.com	p. 29
Festool	festoolusa.com	p. 5	Shaper Tools	www.shapertools.com	p. 23
Forrest Manufacturing	www.forrestblades.com	p. 17	Sorbothane	sorbothane.com	p. 87
The Furniture Institute of Massachusetts	furnituremakingclasses.com	p. 87	SuperMax Tools	supermaxtools.com	p. 15
Goby Walnut	www.gobywalnut.com	p. 87	Titebond	titebond.com	p. 7
Grex Power Tools	www.grexusa.com	p. 23	Vacuum Laminating Technology	www.vacuum-press.com	p. 15
Grngate	www.grngate.com	p. 15	Vacuum Pressing System	www.vacupress.com	p. 87
Groff & Groff Lumber	www.groffslumber.com	p. 87	Wagner Meters	www.wagnermeters.com	p. 29
Hearne Hardwoods	www.hearnehardwoods.com	p. 7	Windsor Chair Workshops	www.jimrendi.com	p. 87
Highland Woodworking	highlandwoodworking.com	p. 21	Woodcraft	woodcraft.com	p. 11
Infinity	www.infinitytools.com	p. 19	Woodworkers Source	www.101woods.com	p. 87
Inside Passage School of Fine Cabinetmaking	insidepassage.ca	p. 19			
Keller Dovetail Systems	bestdovetails.com	p. 87			
Knew Concepts	www.knewconcepts.com	p. 87			
Lee Valley Tools	leevalley.com	p. 92			

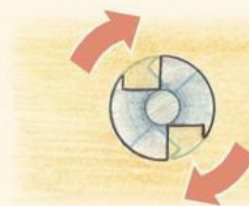
Drill press

Not as obviously dangerous as a tablesaw or bandsaw, the drill press can still ruin an otherwise fine day. When the spinning bit punches through the bottom of a workpiece, it can rip that workpiece from your hand, driving it into the column, or worse, your hand or body. Clamp the workpiece to the table or hold it against a fence to prevent the bit's rotational force from spinning it out of control.

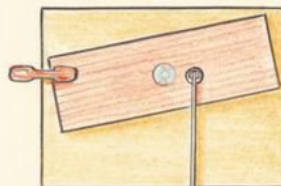


Cutting force

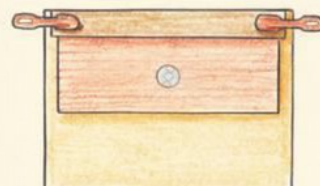
At the drill press, all of the force is rotational, and the bit can spin the workpiece.



HOW TO CONTROL IT



Clamp the workpiece to the table. This also prevents it from lifting when the bit backs out.



A fence attached to the table stops rotation, too.



Two ways to prevent spinning work. A clamp with a deep throat applies stabilizing pressure right next to the bit (left), and keeps the workpiece from spinning or lifting from the table as you back out the bit. A fence clamped to the drill-press table prevents it from spinning as well (above).

Router table

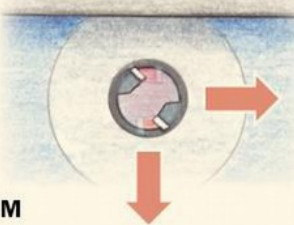
Always feed the workpiece against the bit's rotation. At the router table, this means it travels from the right to the left across the table. This counteracts the bit's rotational force, allowing you to keep the workpiece under control. Because the bit also exerts force toward the back of the table, you should use a fence. The bit will push the workpiece against the fence, helping you to stabilize it during the cut.



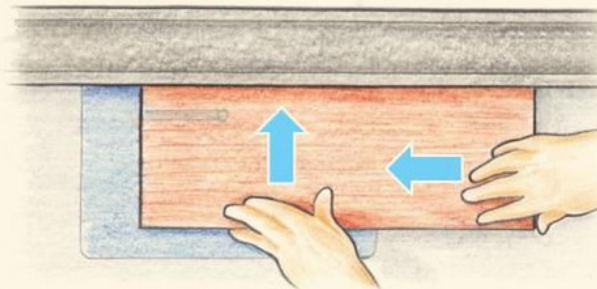
Two hands, one fence, plenty of control. No downward pressure is needed, but use your left hand to press the workpiece against the fence. Once again, your right hand feeds it through the cut, counteracting the force of the bit.

Cutting forces

If fed from left to right, a board is pushed away from the fence and pulled away from you.



HOW TO CONTROL THEM



Instead, always feed from right to left, using your left hand like a featherboard, holding the workpiece against the fence in front of the bit, while pushing it through with your right hand. For narrow pieces, use a push stick or a push pad.

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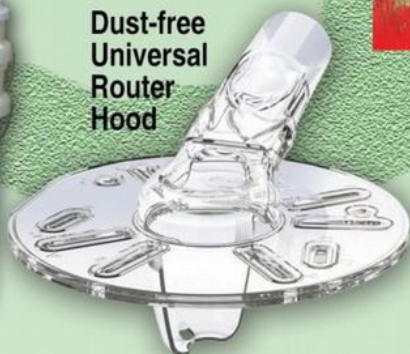
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Configure the plane for left- or right-hand use or to accommodate grain direction.



Accessories

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Box for
combination plane



Blade box

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