

Fine
WoodWorking

Dedicated workshop
for a lifelong hobby, p. 30



Tools & Shops

ANNUAL ISSUE

**Elegant wall cabinet
for hand tools**

2 workbenches:
One in a weekend,
the other for
power tools

**A revolution
in dust collection**

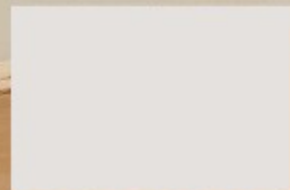
**Smart cart for
plywood, lumber**

TOOL TEST

Shop vacuums

**New cutterheads
stay sharp
20 times longer**

Winter 2011/12 No. 223



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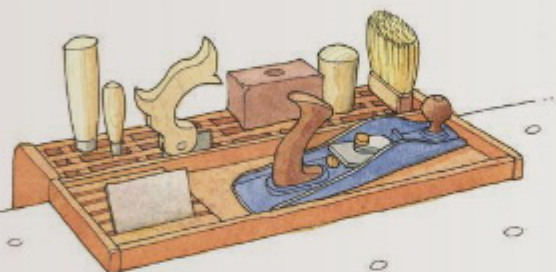
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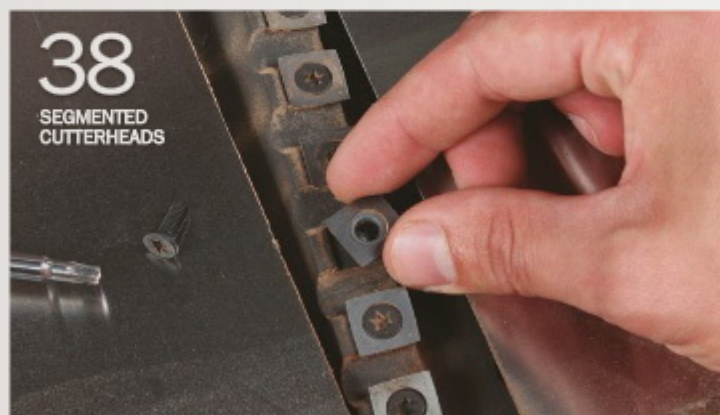
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A workshop with no walls



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on the web

THIS MONTH ON **FineWoodworking.com/extras**

Visit our website to access free web tie-ins, available October 27. While you're there, don't miss our collection of totally free content, including tool reviews, an extensive project gallery, and must-read blogs.

VIDEO:

Can Your Workbench Carry a Current?

Traditional workbenches were never designed with power tools in mind. This one was—from the ground up. Add this mobile workstation (pp. 62-69) to your shop and enjoy onboard power and dust collection, plus a low-profile clamping system and a clever valet for hoses and cords.



Free eLetter

Sign up for our FREE eLetter at FineWoodworking.com/newsletter to receive plans, videos, and articles by email.



Creative Cabinet Storage

Deck out your tool cabinet (pp. 44-51) to the nines with custom storage tips from Chris Gochnour.

VIDEO:

Cabinet Hardware Time Machine

Learn how to transform boring home-center hinges into antiqued treasures with a time-worn patina worthy of your finest cabinets.

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VIDEO WORKSHOP

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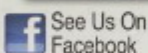
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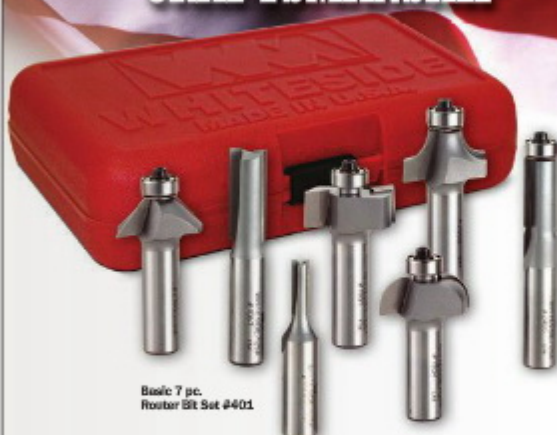
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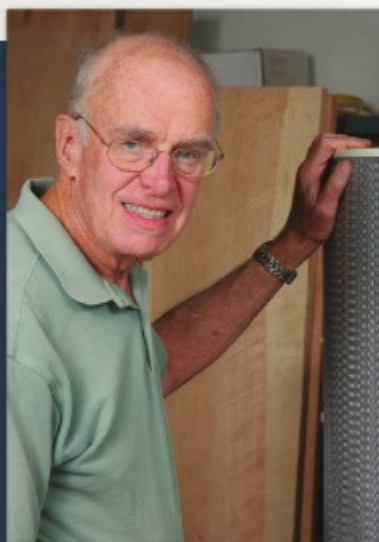
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contributors

Not many woodworking magazines can boast having a rocket scientist on staff, but at *FWW*, we have **Bill Peck**. As shop manager, Peck maintains the machines, manages the inventory for tool tests, and helps editors with anything shop-related. He did much of the testing for two articles in this issue ("Tool Test: Shop Vacuums" and "A Revolution In Dust Collection"). Peck has always loved woodworking, and took it up in earnest when he retired from his first career in the defense industry, where he was part of a team that designed and built ballistic missiles. His engineering acumen has been invaluable in our shop. Bill recently made a big, traditional workbench for his shop. Check out his blog about it at FineWoodworking.com/extras.



Philip Houck ("Ultimate One-Man Shop") has been making things all his life. He built his first piece of furniture at age 10, which he says was "not yesterday." Now retired from the life insurance business, he's happy to answer the phone when it rings. In addition to carling for his arboretum, he can't spend enough time in his dream shop near the New England shore, where he builds reproductions of the finest pieces he can find.

Favorite style of furniture? "Queen Anne and Chippendale."



Chris Gochnour ("House Your Tools In High Style") rolled into woodworking when he was 17, building skateboards in his garage, and it's been a sweet ride ever since. He prefers the quiet precision of hand tools, but being a professional furniture maker has forced him to balance his love for handwork with the need for power to get jobs done. After 23 years he's become an accomplished choreographer, building about 12 commissioned pieces a year and teaching woodworking across the country.

How many planes do you own? "Over 100, but don't tell my wife."

Michael Puryear ("Pivoting Sheet-Goods Cart") became a studio furniture maker by chance and necessity. He arrived in New York in the early 1970s working as a freelance photographer. To augment his income, he took on a job remodeling a kitchen, which led to a business renovating brownstones in Brooklyn. Later, he opened a cabinet shop, always gravitating toward creative and expressive work and honing his skills through reading and experimentation.

Something I love about my shop: "Its organization and versatility."



For more information on our contributors, go to FineWoodworking.com/authors.

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Spotlight

GET MORE FROM YOUR DISK SANDER

Disk sanders have a big advantage over belt sanders—one that Roland Johnson doesn't mention in his recent article ("Why You Need a Benchtop Sander," *FWW* #221). The sanding disk is firmly attached to a flat machined plate, while a sanding belt moves past a fixed platen and can flex as it moves. For this reason, a disk sander is more accurate at sanding to a fine line, matching a handplane, in fact. And here's a tip for straight-line sanding, such as fine-tuning a crosscut: Walk the part gently along the side where the disk is turning downward. Do not push it hard against the disk in one spot.

—EARL LARSON, Hamtramck, Mich.

Johnson makes a good point about the pressure-sensitive adhesive (PSA) used to attach sanding disks to benchtop sanders. It makes the worn disks a big hassle to remove. The answer is a water-based glue used in the sheep-shearing industry to attach sanding disks to sharpening machines. Here in Australia it is



Sticky situation. Worn disks can be very difficult to remove from benchtop sanders. But you can make your own using a softer glue that peels away easily.

called Heiniger shearers adhesive and sold in 250-ml bottles. It lets you peel off worn disks much easier, and any residual glue on the metal plate just rolls off under your thumb. What's more, this glue lets you use standard sandpaper sheets on your disk sander. I take the metal disk off my machine, wipe glue on it, and press it down onto the back of the paper. Then I give it a half-hour to dry before running a utility knife around the outside to trim off the excess.

—ROD JONES, Lesmurdie, Western Australia

Editor replies: It is available at HeinigerUSA.com for \$6.75/ bottle (SKU 719-013). Click on "Grinder & Accessories" to find it. We'll give it a try here at *FWW*. If readers know of any other products that will do a similar job, e-mail us at fw@taunton.com.



Aerosols hurt the environment

I love your magazine but I was surprised that you included an article that promotes the use of aerosols (*FWW* #221). I understand that they are not banned, but aerosol spray cans are known producers of greenhouse gas and their use should be reduced, not presented as a good alternative.

—JULIEN HUARD, Perth, Ont., Canada

Do trim routers take guide bushings?

The review of trim routers (*FWW* #220) had a lot of good information. I do quite a bit of pattern work and a smaller router would be very convenient. But the author didn't explain which of these routers accept guide bushings, and if so, what size.

—FRANK CHEVALIER, Stony Plain, Alta., Canada

Editor replies: Sorry we missed that point. Luckily, all the routers are still in our shop. Those from DeWalt, Festool, Makita, and Porter-Cable take standard-size, Porter-Cable-style bushings. The trim routers from Grizzly and Makita are supplied with a single bushing. The Trend also comes with one bushing, but others are available as accessories. The Bosch Colt does not come ready for bushings, but you can buy an accessory base that accepts them. Finally, neither the Ridgid nor the Ryobi routers work with bushings.

Clarification:

Current sources for Lawson charts

Our recent article on drawing furniture using Lawson perspective charts cited Amazon.com as a source for the six-chart sets. As of press time, they were sold out there but available at PrintsAsia.com and Lulu.com.

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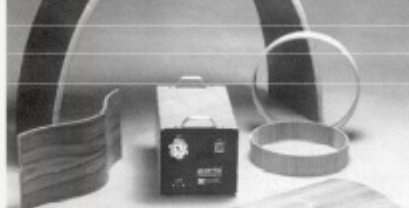
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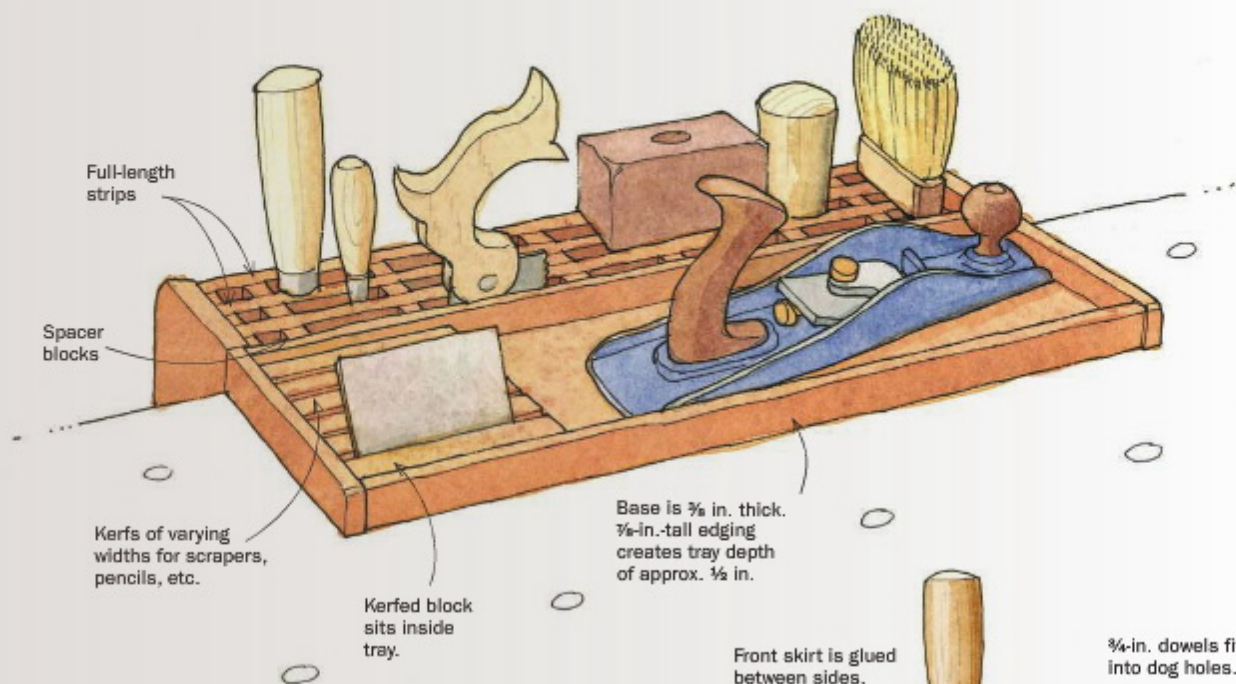
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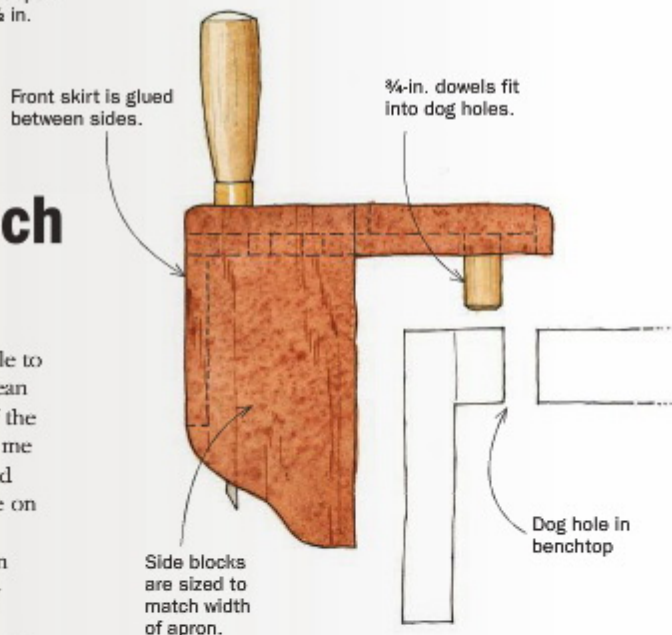
Greg Brunk has worked as a technical designer most of his career. After becoming a member of the Society of American Period Furniture Makers 11 years ago, he has been building traditional furniture. To see more of his work, visit the SAPFM gallery at sapfm.org/gallery.

When I built my workbench, I wanted to be able to work on any side. Adding a tool well would mean losing usable work space on one whole side of the top. Instead, I designed a tool caddy that helps me beat benchtop clutter, keeps tools organized and within easy reach, and can be moved anywhere on the benchtop.

The design is easy to customize for your own group of often-used tools. On mine, the caddy features a shallow tray for larger tools like handplanes, a kerfed block to hold a selection of scrapers, and custom-fitted slots to hang tools like chisels, mallets, and handsaws.

Dowels glued into through-holes in the tray's bottom fit into a pair of dog holes in the benchtop, holding the caddy in place. Because I drilled dog holes along every edge of my bench, I can locate the caddy for easy access regardless of my task.

—GREG BRUNK, Cuyahoga Falls, Ohio



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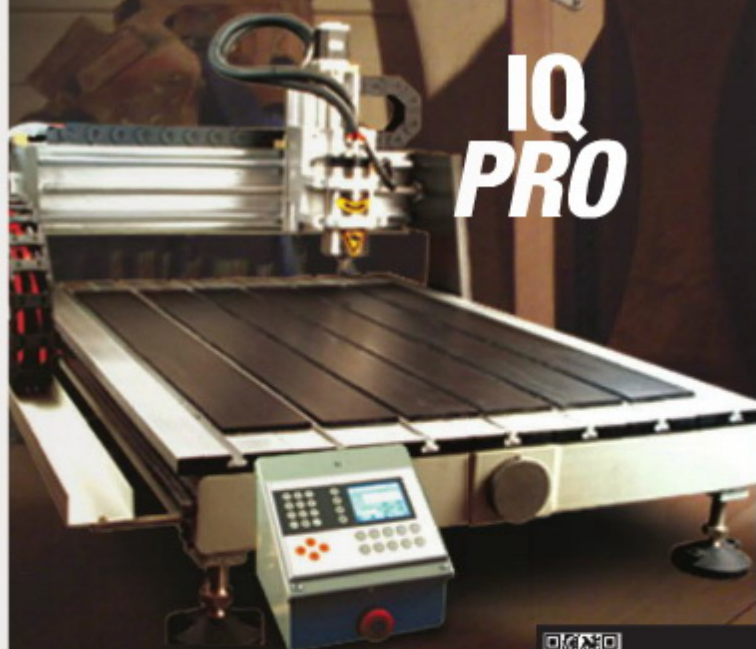
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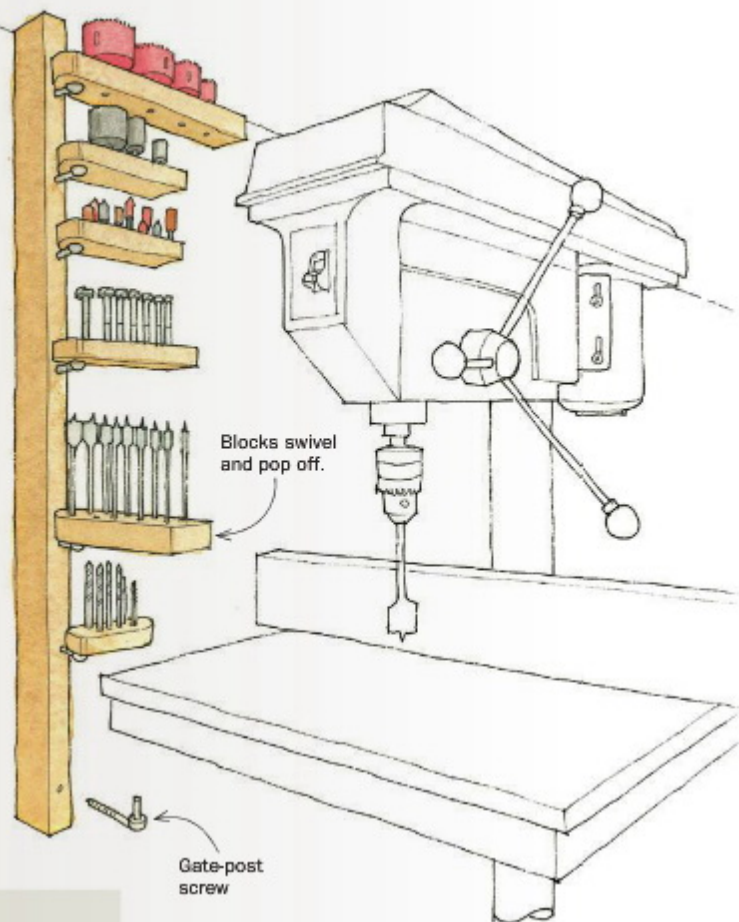
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Swiveling bit-storage shelves

Like most longtime woodworkers, I've accumulated a large and diverse collection of bits, sanding drums, rotary rasps, and other odds and ends. I'm most likely to use these at the drill press, so that's where they're stored. I want them organized by type and close at hand. I also want them to fit in the least possible amount of wall space. But since I also use these bits elsewhere—at the bench, at the lathe, or outside of the shop—I want to be able to take the whole set of whatever I'm using with me.

My system is to store each set of bits in a wooden block that has a hole bored at one end to fit the pin of a gate-post screw hook—the piece of hardware that serves as a pivot for a gate hinge. These sell for \$1 apiece at your local farm or hardware store. I have a row of blocks mounted this way running up the wall by the drill press, so I can swing out a block to grab the bit I want, then swing it back to nest between the blocks above and below. If I want to use spade bits at the lathe or brad-points at the bench, I slip the block off the pivot and take it along.

—BOB MITCHELL, Madison, Wis.



Quick Tip

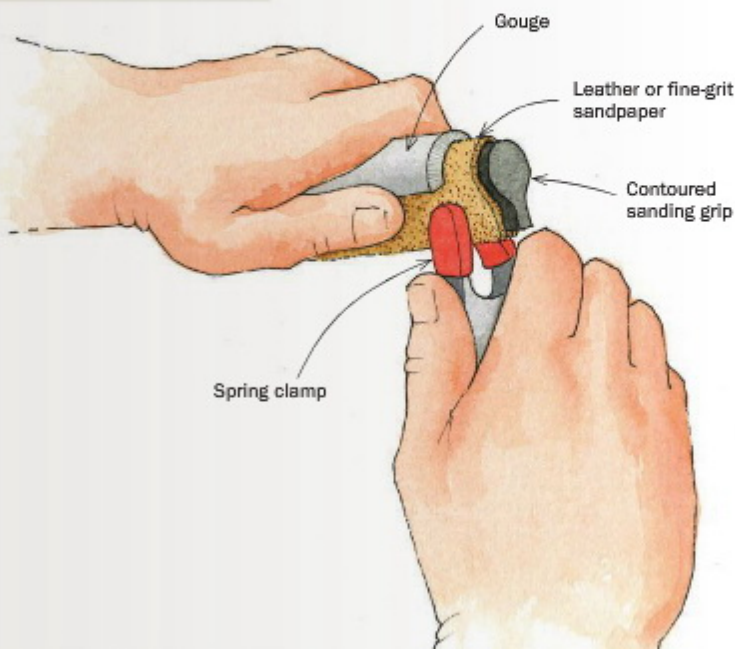
To start each project with a perfectly clean benchtop, I use a roll of kraft paper, a knife, and a stapler. Roll out and cut the paper so that it overhangs the bench on all sides by 3 to 6 in. (for a wider bench, join two overlapping sheets with masking tape). To fasten the paper, fold the corners into triangles on the ends, like wrapping a present, and staple the folds in place. A side benefit is that you can write notes and measurements on your benchtop.

—MIKE WITTENSTEIN, Marietta, Ga.

Honing the inside bevel of a gouge

Here's a simple way to sharpen or hone the inner flute of a carving or turning gouge. Start by ordering a set of contoured profile sanding grips (available from Rockler and other suppliers). These inexpensive rubber sanding profiles come in a set of several convex and concave sizes. Pick the radius that matches your gouge and wrap the sanding grip with a fine grit of wet-or-dry abrasive paper to push back the burr. To hone the flute, replace the abrasive paper with a piece of leather loaded with polishing compound.

—MICKEY CALLAHAN, Bellingham, Mass.



Versatile featherboard clamp

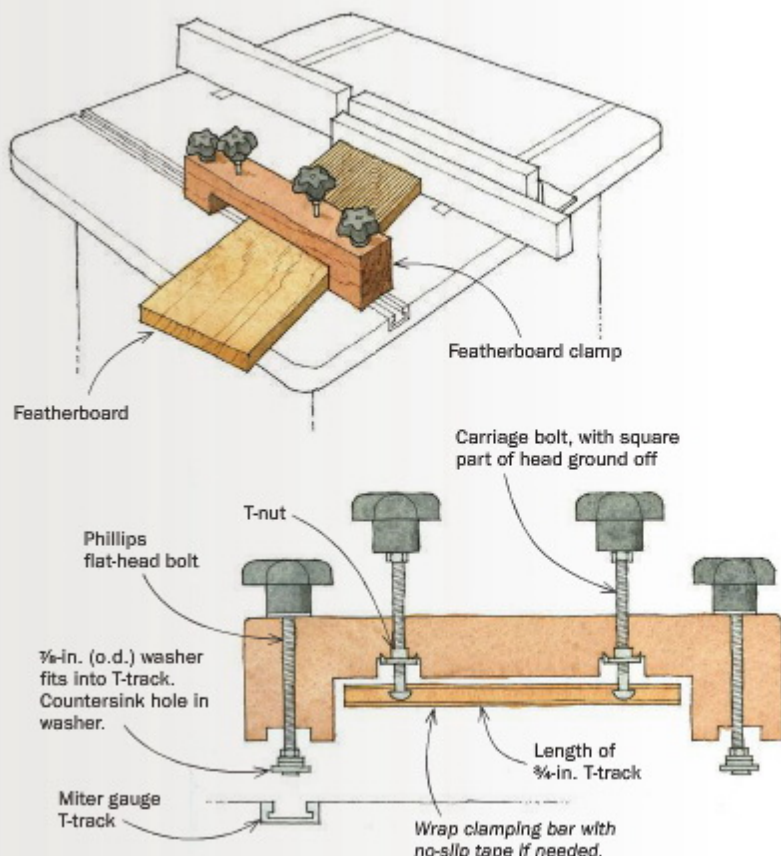
I like using a shopmade featherboard to hold work securely against a machine fence, but clamping the board to the tabletop can be a challenge. The clamps don't always reach deeply or hold securely enough.

To get a good grip on the featherboard, and to position it easily at any working angle, I made this clamping bridge. The device mounts to the miter-gauge 'T-track' on router tables, auxiliary handsaw tables, and newer tablesaws, and can accommodate a featherboard of any length.

I made the clamp body from a block of white oak, but any durable hardwood will work. The ends of the block are secured to the T-track with a pair of long Phillips flat-head bolts threaded into star knobs and set in drilled holes. Three stacked washers on the end of each screw ride in the T-track.

The other two knobs apply pressure to an aluminum clamping bar. Run the featherboard under the clamping bridge, position it against the workpiece, and then turn the two center knobs on the bridge to push the clamping bar down, securing the featherboard.

—DENNY KING, Beverly Hills, Fla.



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Quick Tip

An electrical wire nut makes a great replacement for a damaged or lost round glue-bottle cap. They are available in many colorful sizes at any hardware store.

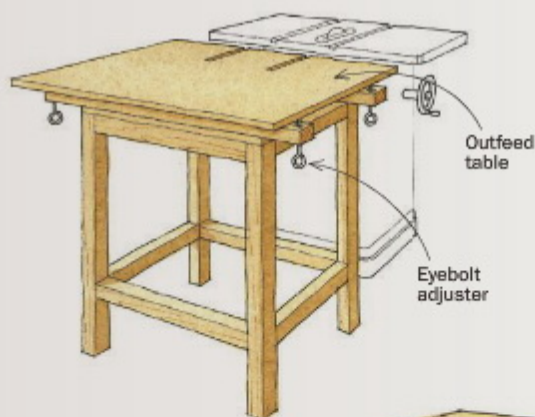
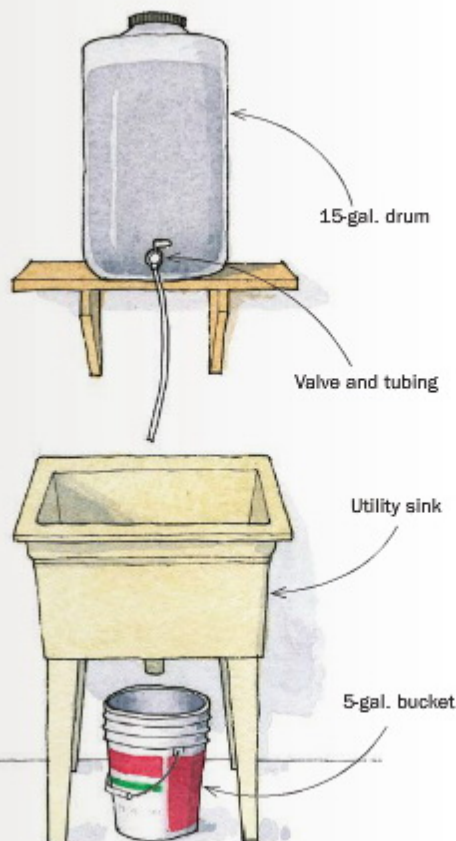
—ROGER S. APTED,
Milton, Wis.

A water supply in the shop

I needed a water supply in my shop but found it wasn't practical or cost-effective to extend the household plumbing. Instead, I installed a plastic 15-gallon drum on a very sturdy shelf in the shop. Beneath that I placed a cheap utility sink with a 5-gallon bucket under the sink's drain.

I fill the drum with a garden hose and then when I need water I open a valve at the base of the drum. Waste water spills into the bucket below. I can hear when the bucket is in need of dumping, which is not too often. This setup, which provides plenty of water for sharpening, hand washing and more, doesn't take up a lot of room or cost a lot of money.

—MICHAEL PURYEAR, Shokan, N.Y.



Adjustable tablesaw outfeed table

My shop is small, and I often have to move my tablesaw to make room for the project I'm working on. Because the floor isn't level throughout, my separate outfeed table gets out of alignment with the saw's top.

My solution was to build an adjustable top for the outfeed table that lets me quickly re-level the surface to match the saw's height.

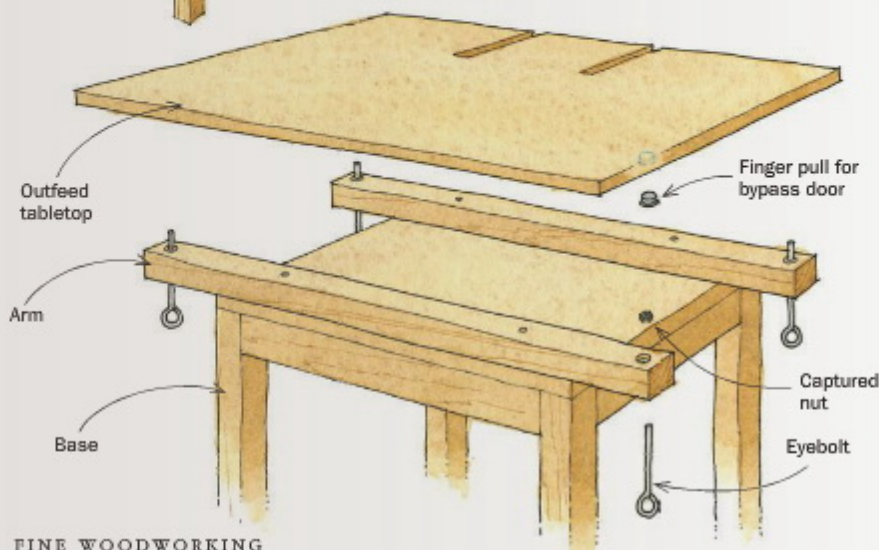
Two arms screwed on the top of the table's base are equipped with four eyebolt height adjusters—one for each corner. From underneath,

I thread the eyebolts through captured nuts set in the top of the arms. The table's top rests on

the tops of the four bolts, which fit into metal-capped recesses in the top's underside. I installed brass finger pulls for bypass doors (prime-line-products.com, No. 161910) into the recesses to provide a bearing point for the end of the eyebolts.

With the base shimmed to prevent rocking, adjust the outfeed table by setting a long straightedge across the saw table that extends out the back. You can raise or lower each corner of the outfeed table without tools simply by turning the eyebolts.

—PAUL DUX, Purcellville, Va.



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■ POWER TOOLS

A compact drill with unmatched versatility



Small drill, big power. The CXS can drill deep holes in hardwood without bogging down.



Stub chuck. The CXS has a short built-in hex chuck that increases precision for screwing in hardware. The short length also comes in handy for working in tight spaces.



Quick-change chucks. Festool's FastFix system lets users change out chucks in seconds, without tools.

WITH ADVANCES IN LITHIUM-ION BATTERY and motor technology, drill manufacturers have been able to make smaller drills with big-drill power. These compact drills are perfect for furniture making, offering enough power to bore holes in hardwood and enough precision to drive brass screws without twisting their little heads off. And they are small enough to fit easily inside cases, say for installing drawer runners.

There have been a number of entries in the little-but-large category, and now Festool has joined the fray with its new lightweight CXS 10.8-volt, variable-speed drill (1.3 amp-hour battery). It did not disappoint.

First off, this baby has guts. I drilled a bunch of 5/16-in.-dia. holes 2 in. deep into white oak and could bore down with significant speed without stalling the motor—impressive for a drill that weighs less than 2 lb.

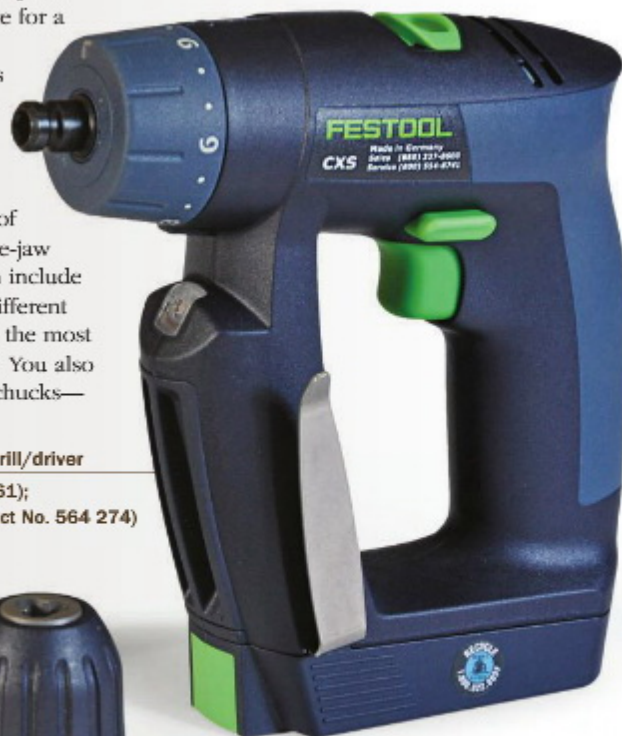
Along with ample power, the CXS is loaded with convenient features, one of which is Festool's FastFix chuck system. A basic kit (\$225) includes a quick-release 3/4-in. hex chuck, designed to be used with Festool's line of Centrotec drill accessories, and a three-jaw keyless chuck. For \$50 more, you can include a right-angle chuck that locks in 16 different positions, making it easy to deal with the most awkward of drilling or driving angles. You also can use the drill without the add-on chucks—

it has a built-in hex chuck for times when you need a shorter driver to fit into a tight spot. Because of its short length, the built-in chuck also offers more precision when driving screws in cabinet hardware.

The drill is very comfortable to hold and has a bright and well-aimed LED light on the front of the D-handle. A convenient, large belt hook can be mounted on either side of the drill.

Overall, the light weight, power, and versatility of the Festool CXS make this compact drill hard to beat. The basic kit includes the two chucks, two batteries, a charger, and a Systainer storage box. Both kits have a full three-year warranty. For more information, go to festoolusa.com.

—Roland Johnson is a contributing editor.



Festool CXS 10.8-volt compact cordless drill/driver

\$225 (basic set, Festool product No. 564 261);

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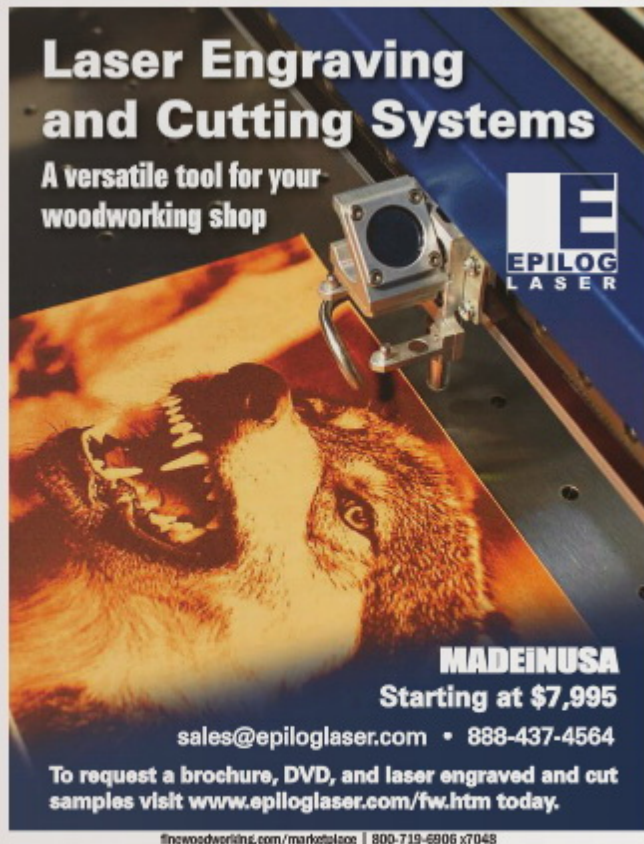
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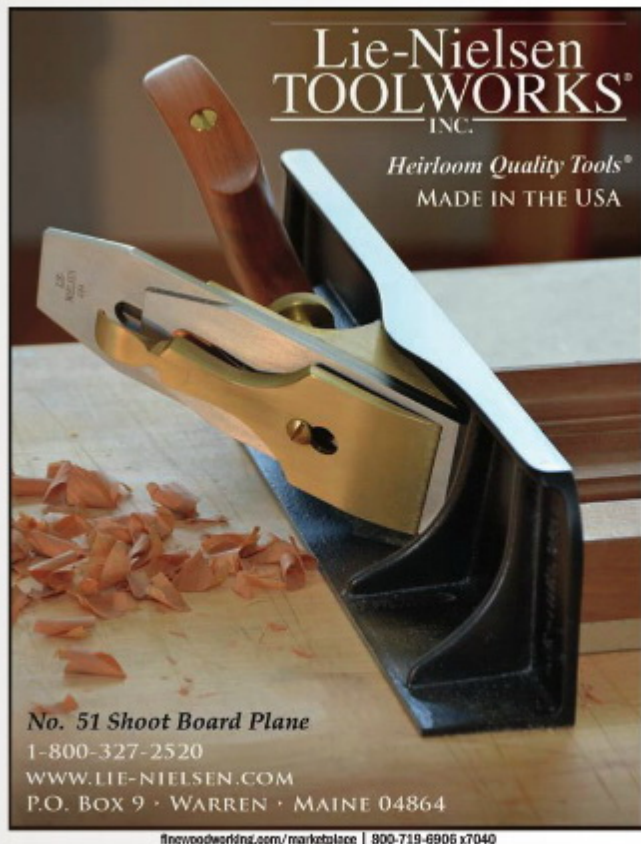
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■ SHARPENING

A better way to flatten stones

WHEN A SHARPENING STONE GETS DISHED OUT FROM USE, it won't let you flatten the back of a blade effectively and will cause you to inadvertently round the blade as you hone the bevel—two big obstacles to a sharp tool. The new Dia-Flat diamond-coated lapping plate from DMT does a great job of flattening waterstones between uses. It's extremely flat (less than 0.0005 in. of variance), and the manufacturer claims its extra-extra coarse, 120-micron diamond coating is more durable than other diamond plates. I've been using one for a couple of months, trying it on waterstones, oilstones, and ceramic stones, with excellent results. The 4-in. by 10-in. Dia-Flat is more expensive than similar-size diamond plates, but if it holds up as well as it has so far, it will be a bargain.

—Michael Pekovich is FWW's art director.

DMT Dia-Flat
diamond-coated
lapping plate

\$180
highlandwood
working.com



Rub-a-dub, two stones in a tub. Flattening a waterstone under running water sends debris right down the drain.

■ POWER TOOLS

Budget router worthy of a serious workshop

Skil Combination
Router Kit

Model 1830

\$112

Amazon.com

acts as an alert that the router is powered up, prior to changing or adjusting bits.

The router has a 1/2-in. collet and a 1/4-in. adapter sleeve. Bit changes are easily done with one wrench and a spindle lock lever. However, the spindle lever has to be retracted whenever you remove and install the motor in the bases—a minor inconvenience.

Both plunge and fixed bases have a micro-adjust mechanism to fine-tune the bit height, and all scales are pretty easy to read. The plunge mecha-

nism held its height when locked and released easily.

I used the router to cut large round-overs, complex edge profiles, dadoes, grooves, and even mortises in tough white oak. It performed well. Although I'd worry about the plastic parts being able to stand up to the rigors of a pro's shop, I think the new Skil 1830 combo kit is an ideal entry-level router or a good second router for a serious hobbyist.

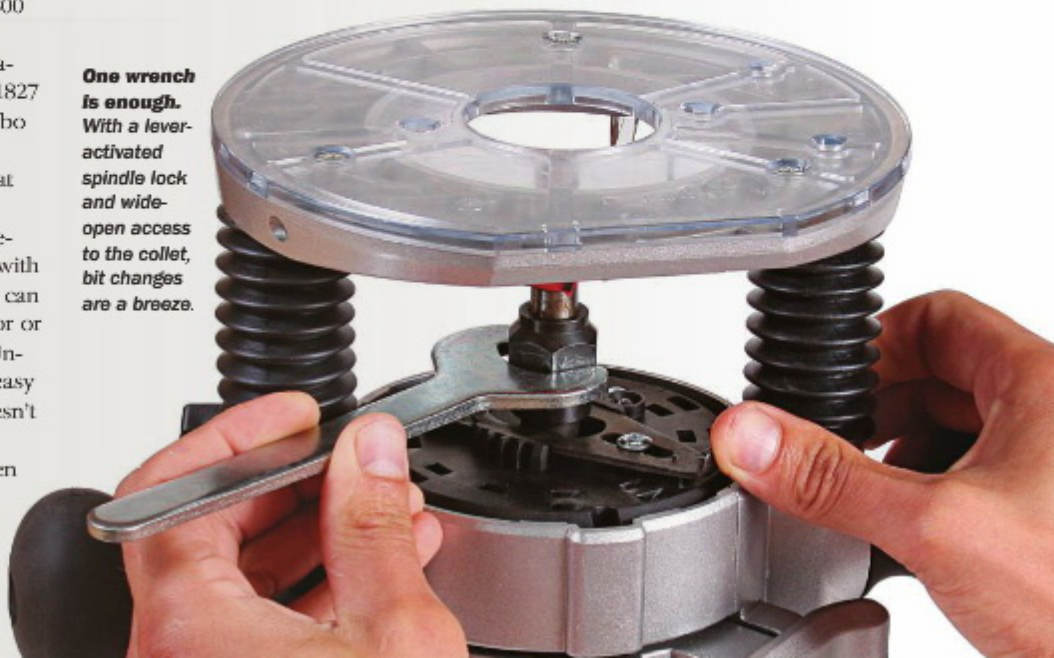
—Gregory Paolini boards routers in his shop near Asheville, N.C.

SKIL'S NEW LINE OF ROUTERS, the 1800 Series, offers pro features with an affordable price. There are three variations: the 1817 fixed base (\$82), the 1827 plunge base (\$95), and the 1830 combo kit. Because the combo kit offers the most versatility for a router, I took that one for a spin around my shop.

The 1830 features a 2 1/4 hp, variable-speed motor (10,500 to 25,000 rpm) with a soft-start feature. The on-off switch can be accessed from the top of the motor or through the base with your thumb. Unfortunately, the thumb switch is not easy to slide up and down, because it doesn't protrude from the base.

The motor's LED light turns on when the router is plugged in. It not only illuminates the work area but also

One wrench is enough. With a lever-activated spindle lock and wide-open access to the collet, bit changes are a breeze.



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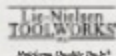
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■ TURNING

Smart system for hollow vessels

THE NEW HOLLOW ROLLER from Carter Products gives you everything you need to hollow a vessel of any size or shape. Made to fit most lathes, from minis up to floor-standing models, the system uses two auxiliary tool rests to support the boring bar. One rest mounts in the lathe bed close to the work, while the other, called the Torque Arrestor, mounts to the banjo of the lathe's existing tool rest; but you'll need to purchase the appropriate stud adapter (sold separately, \$20) for your tool rest.

The 3/4-in.-dia. boring bar has a 3/16-in.-dia. high-speed-steel cutter (included) on the end that can be adjusted to any angle. (Carbide replacement bits are available too.) The bar is held in the Torque Arrestor by two rollers that trap it but allow it to advance or retract and move freely from side to side. A flat on the bottom of the bar prevents it from rolling.

The quick-lock tool handle, made from extruded aluminum, is hollow on the end, so you can pour in some lead shot to give it more heft—which adds stabil-

The Torque Arrestor grips the boring bar between two rollers while allowing it to move without twisting.

Hollow Roller by Carter Products
\$360
woodcraft.com

The adjustable high-speed-steel cutter does the work inside the vessel.

The auxiliary tool rest supports the boring bar close to the work.

ity when you're hollowing a large vessel and need to extend the tool farther.

Carter is known for its bandsaw accessories, but I am very impressed with this foray into turning. The generous diameter of the bar combined

with the support just in front of the work makes for a very stable system. For more information, go to carterproducts.com.

—Ernie Conover is a woodworker and lathe expert in Parkman, Ohio.

Veritas Precision Square
Metric or Imperial
\$24.50
leevalley.com

Double-duty tool. The Veritas square is ideal for setting bit and blade heights. It's also an accurate way to check that a blade is square because the long leg extends far onto the table.

■ MEASURING & MARKING

Square rule is great for machine setups

THE L-SHAPE OF THIS NEW RULE from Veritas makes it great for setting bit/blade heights and the distance between the bit/blade and the fence. It's also useful for checking whether components are square. Available in both imperial and metric sizes, the Veritas Precision Square has clearly marked increments that are easy to read. It's also small and light enough to hold in the chest pocket of a shop apron, so it's always at the ready. Because the leg of the rule often gets in the way while laying out workpieces, I don't use it for that. But it's my new go-to tool for bit and blade setups at the router table and the tablesaw. It makes my cuts dead-on accurate.

—Matt Kenney is a senior editor.

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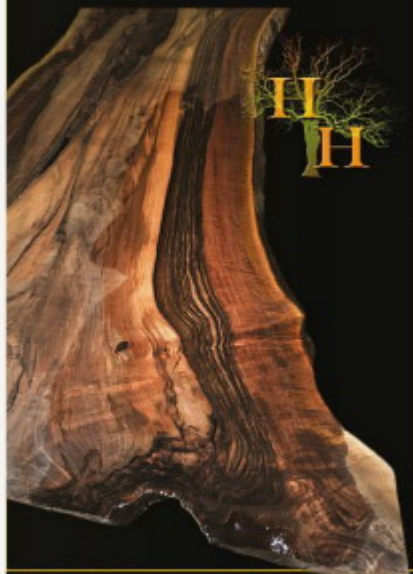
The simpler the tool, the more you can do with it. Away with fingers and guide bushes, laser beams and digital readouts: put in a little ingenuity, and you get mortises and tenons, sliding dovetails, dado and finger joints and dovetails of all kinds, in fact any joint in the book. All without compromising the quality of your work.

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Build your first workbench

BY BOB VAN DYKE

A workbench with an end vise and front vise is easily the most important tool in your shop, one that you use on every project. If you don't already have one, or if yours is old and rickety, it's time to upgrade.

You could just buy a bench—there are some good ones out there—but you could easily spend \$1,000 and not improve on the bench I'll show you how to build in this article for around \$300.

This bench is everything a good workbench should be: It is heavy and strong, so it won't skate or wobble. It has a flat surface big enough to support a medium case side or tabletop. And it's capable of holding your work securely, with an end vise that can be used with benchdogs to hold work flat or like a front vise to clamp work upright. Best



of all, you can make this bench in a weekend, to your own dimensions, and you don't need a ton of tools.

If you're wondering whether a bench like this can really do the job, I have more than 25 of these benches in my school and they are still going strong after 11 years and 3,500 students.

Simple joinery and fasteners make a sturdy base

I like to make the base from ash, maple, poplar, or oak. The base consists of two

end assemblies, each built from a pair of crosspieces dadoed into the legs. These end assemblies are connected by two long stretchers bolted in place on each side. The top long stretchers are rabbeted into the tops of the legs.

All of this joinery is best cut on the tablesaw with a dado set but it's also possible, if more tedious, to do the work with a standard blade and a miter gauge. Either way, a single fence setting and a spacer block is used to cut each corresponding joint exactly the same

Easy dados on the tablesaw

You don't need a dado set to cut the joints on this bench. Here's how to do it with your standard blade and miter gauge.



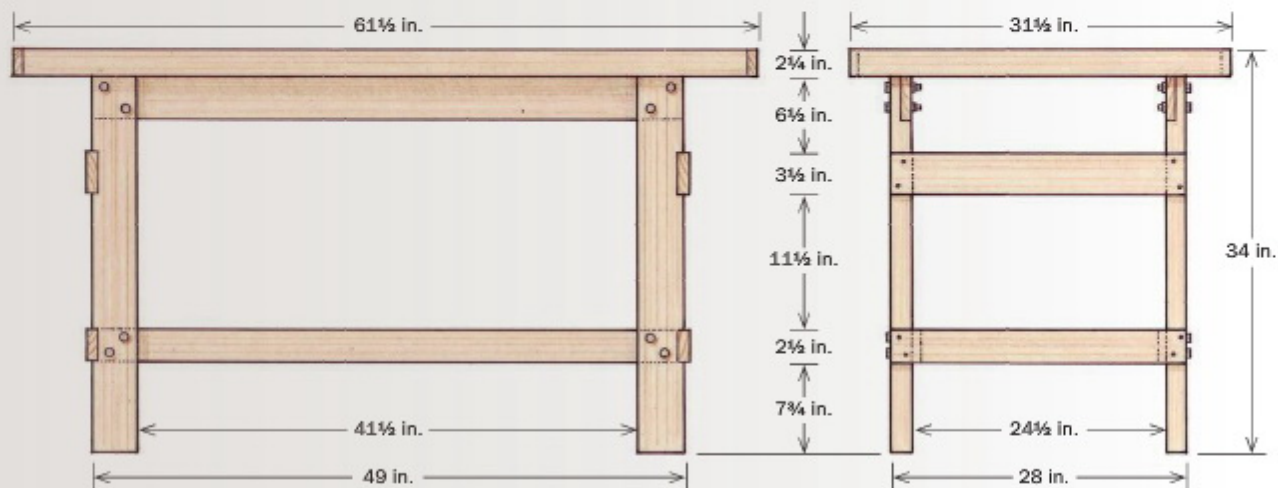
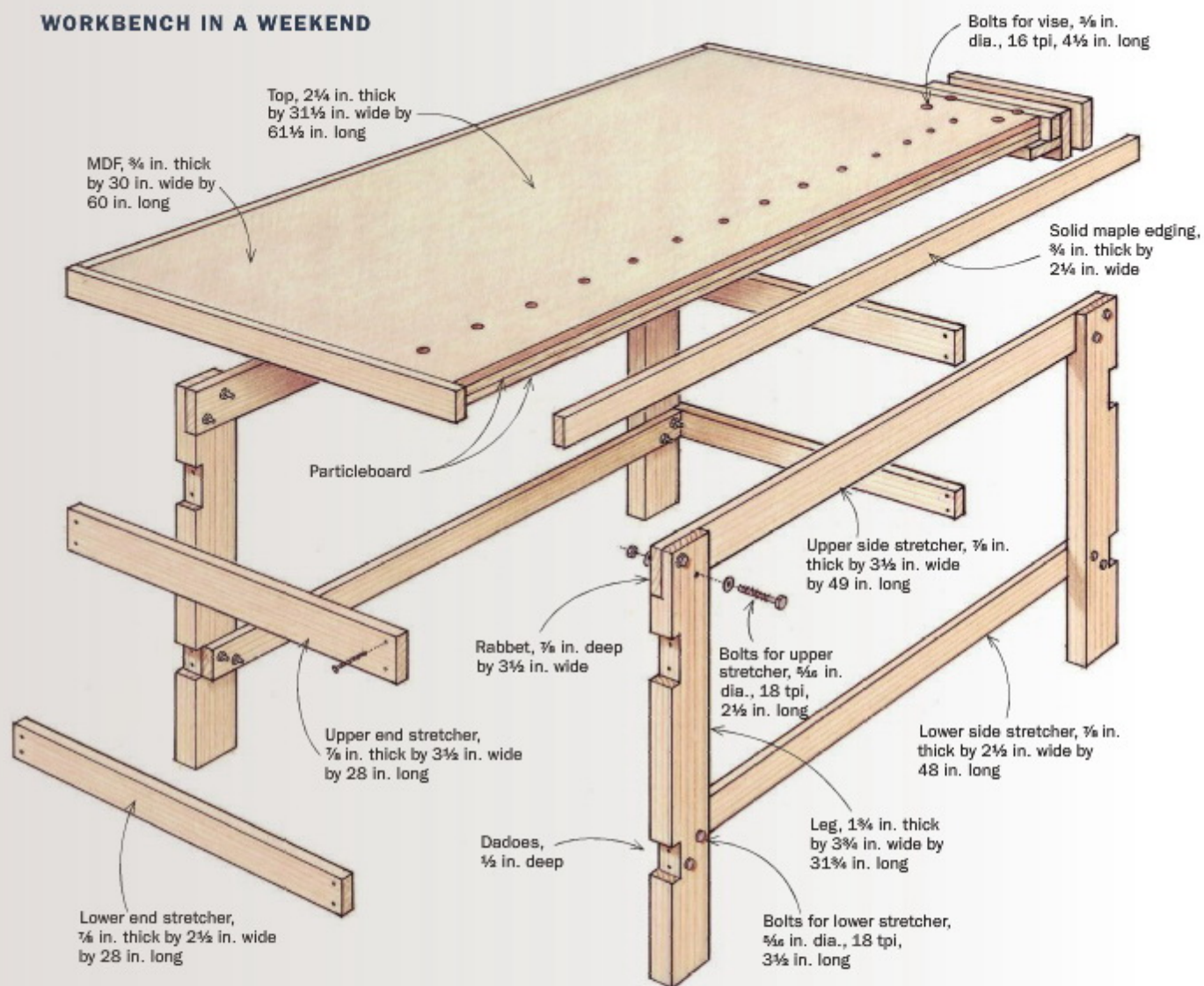
First the fence gets set. The rip fence will be your stop. Lay out one of the legs and set the fence so the blade lines up with one end of the dado.



Then the fence stays put. Use a spacer block (left) to reposition the leg for cutting the dado's opposite end. Cut each wall cleanly, supporting the leg with the miter gauge, and then make passes to remove the material between them (right).



WORKBENCH IN A WEEKEND



Build the base first

Glue and screw the end assemblies. Drill pilot holes and countersink for the screws while the assembly is dry-fit (right). Clamp the side stretchers in place when drilling their bolt holes (below).



width and in exactly the same place on each leg. If you leave the crosspieces and stretchers a bit wide, you can edge-plane them in the thickness planer for a precise fit in the dados and rabbets.

With the joinery cut, begin construction of the base with the two end assemblies. Before starting, break all the edges with a chamfer or roundover. Check for square during glue-up by measuring diagonally across the assembly in each direction. Adjust at the corners if needed until the measurements match.

The rest of the assembly consists of

connecting the two ends by attaching the long stretchers. Set the base upside down on a level work surface and clamp the stretchers in place while drilling the bolt holes. With the base assembled, you can turn it over and use it to build the top.

The top: A triple-decker sandwich

Cutting 4x8 sheets of medium-density fiberboard (MDF) and particleboard by yourself is no picnic. Buy one sheet of each and have your supplier rough them down so each piece is 1 in. bigger than final size in each direction. You can use

the particleboard offcuts to piece together the top's middle layer. If you plan your cuts carefully, the middle layer will consist of two pieces with only one seam.

Before assembly, use a tablesaw or a router and straightedge to cut the top layer accurately to final size. Cut the other layers about 1/4 in. to 3/8 in. bigger than this layer.

Start the glue-up with the top layer facedown on the base. Roll yellow glue onto the surface, then place the pieces of the middle layer on the waiting piece. Make sure the middle layer extends beyond the top on all sides, then screw them together. Make sure you don't drive any screws where you plan to drill dog holes. Afterward, use a router and a flush-trimming bit to bring the middle layer flush with the top. Finish the glue-up by repeating the entire process to attach the bottom layer.

Cut the stock for the solid-wood edging no more than 1/8 in. wider than the thickness of the top, with each piece about 1 in. longer than its finished length. When gluing the edging to the sides, use thick clamping cauls to distribute the pressure evenly. After gluing the edging in place (long sides first) and trimming the ends, use a router to flush-trim the protruding edging to the core—top and bottom. Then switch bits and round over all the edges. Now is also a good time to sand the benchtop.

A single vise does double duty

This bench has one vise, which acts as both a front vise and an end vise. You can use it to hold your work vertically for any sawing or chiseling task or you can use it in conjunction with benchdogs to easily hold a board flat on the benchtop.

Before installing the vise, I use an inexpensive 3/4-in. spade bit to drill a row of holes in the top for the benchdogs. I start the row 5 in. from the vise end of the bench and space them about 4 in. apart, but the spacing can vary according to your needs. What is important is that the holes line up with the dog in the vise.

To mount the vise, first make a spacer to fit between the vise and the bottom of the benchtop. It should be slightly longer and wider than the vise's footprint, and

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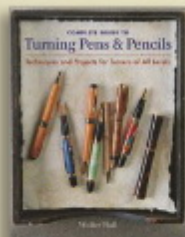
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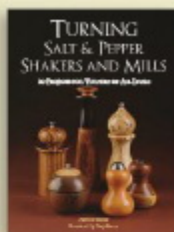


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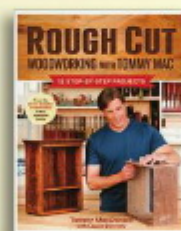


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thick enough to drop the cast-iron jaws about 1/2 in. below the top. Hardwood jaw pads go on before installation, then get planed flush with the benchtop.

Glue and screw the block to the underside of the bench and then clamp the vise in its final position. Mark the location of the vise bolt holes on the bottom of the bench, then use an adjustable square to transfer the locations to the top.

Drilling from the top, start with a Forstner bit to counterbore each hole deep enough to fully recess the bolt head and washer. Use the center dimple left by the bit to drill the through-holes, and bolt the vise in place.

The top goes together in layers



1. TRIM, THEN TRIM AGAIN



Assemble the top. Start with one layer cut to exact size, then use a router and flush-trimming bit to trim the adjacent layers.

2. ADD THE EDGING

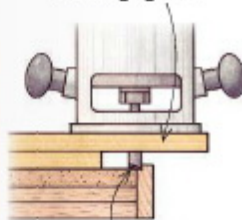


Biscuits align it. Van Dyke uses a shim to offset the biscuit joiner when cutting the slots in the top's edge. This ensures the edging will stand proud of the top for trimming flush.



Trim the edging with a router. This simple base allows a straight cutting bit to trim the edging flush with the surface of the top.

Overhanging base



Straight bit

The last thing to do is attach the top to the base. I use six small angle irons available from any hardware store and screw them in (turn the bench upside down).

For a tough, water-resistant finish, I use four coats of Minwax High Gloss Polyurethane on the top and bottom. The finish is exceptionally durable, and can be renewed easily by scuff-sanding with 220-grit sandpaper and brushing on a new coat. □

Bob Van Dyke is the founder and director of the Connecticut Valley School of Woodworking in Manchester, Conn.

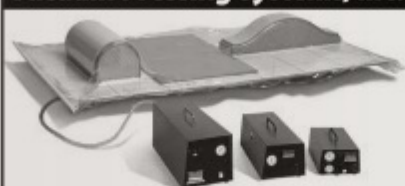
3. OUTFIT WITH DOG HOLES AND A VISE



Install the vise. Sighting along an upright square (above) helps in drilling a straight dog hole. When you attach the vise (right), add a spacer block to keep the jaws even with the tabletop.



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Look what blooms in a woodworker's garden. Houck felt guilty about abandoning his basement shop every spring to enjoy the sunshine and blossoms of his home near the seashore. His new shop is located perfectly to solve that dilemma.

Light and space. With 13 windows and a full array of fluorescent fixtures, Houck's roomy shop is bathed in light from every direction. Extra-strength ceiling joists and under-floor dust collection allow an open floor plan with no support columns or hoses in the way.

Ultimate

A woodworker's new space is a



One-Man Shop

year-round haven for his favorite hobby

BY PHILIP HOUCK



For several decades, from the time I started as a woodworker until very recently, I did almost all of my work in underground shops. My first workspace was in the basement of my parents' home. I was 9, and I made toys and useful objects for my family.

As a newlywed, my shop consisted of a vise mounted to the end of a 2x8, which I clamped to a rude table that doubled as

my desk. Over the years, the shops grew in size and equipment, but as a gardener and lover of the outdoors, I found that even a great basement shop could seem dismal on a beautiful day.

Every so often I tried open-air woodworking, setting up shop on my deck during the warm weather (I live near the ocean, in New England). That was better, but far from ideal. For one

thing, I found myself constantly in need of yet another tool, and I spent much of the day traipsing up and down the cellar stairs.

A few years ago, when I finally had enough saved to build the shop of my dreams, I was able to stop being a seasonal, subterranean woodworker. I wanted a year-round shop: cozy in the flying snow but not claustrophobic when the azaleas bloom. I wanted plenty of light, room, and storage. For a year, I researched and mulled over the design, and then I spent the next seven years building and fitting it out. I think my approach could help some of you, even if you already have a shop and are just making upgrades.

Let there be heat

Ensuring that the shop was usable year-round meant making it affordable to heat through a New England winter. But I also wanted large windows—and plenty of them—to let in natural light and the view of the trees and two ponds.

To combat the cold, I supplemented the cellulose wall insulation with two layers of rigid foam and a ¾-in. barrier of trapped air behind the drywall. The ceiling over the second floor has 16 in. of cellulose and the roof has another 8 in. of insulation between the rafters. The framing contractor thought I was going overboard, but he wasn't going to pay the heating bills. The extra care paid

ALL THINGS CONSIDERED

Philip Houck spent a year designing a shop that is easy to heat, with plenty of light and an open floor plan. Beefed-up framing, extra insulation, and an under-floor dust collection system helped him achieve that goal.

High windows on the north side make room for the wall-mounted lumber rack. Underneath, an array of upright boxes holds cutoffs of varying lengths.

Whole-shop dust collection

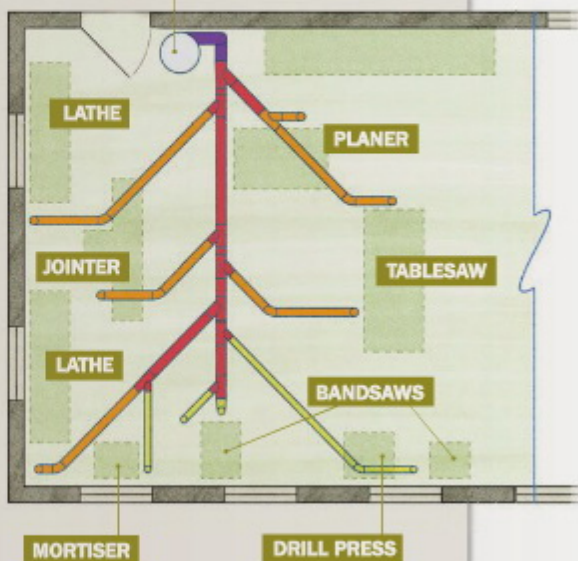
Smart use of crawl space. A network of rigid ducts mounted under the floor carries dust from each machine to a cyclone collector.



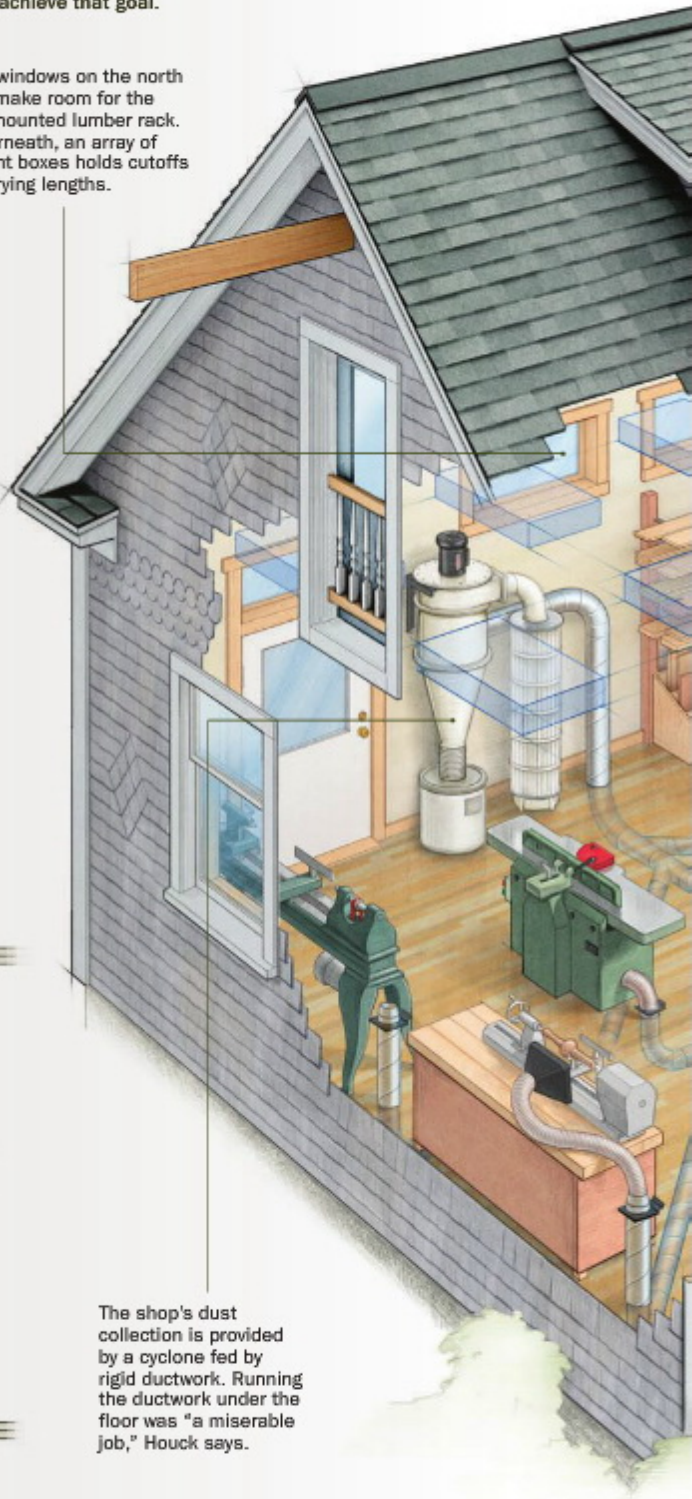
DUST COLLECTOR

By going under the floor, Houck was able to keep his duct runs as short as possible for efficient airflow. For even more efficiency, each branch feeds into a larger main trunk.

- 7 IN. DIA.
- 6 IN. DIA.
- 5 IN. DIA.
- 4 IN. DIA.



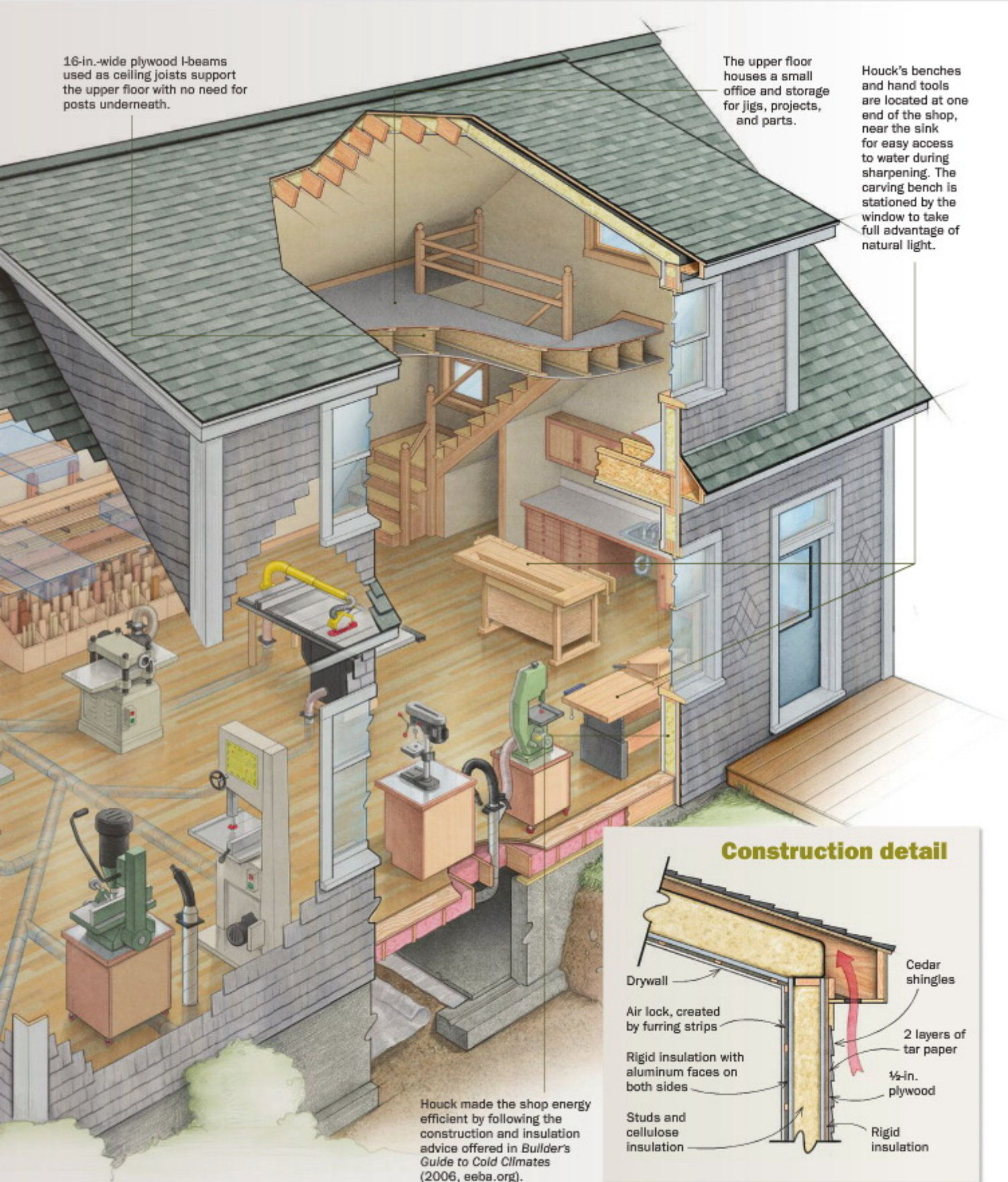
The shop's dust collection is provided by a cyclone fed by rigid ductwork. Running the ductwork under the floor was "a miserable job," Houck says.



16-in.-wide plywood I-beams used as ceiling joists support the upper floor with no need for posts underneath.

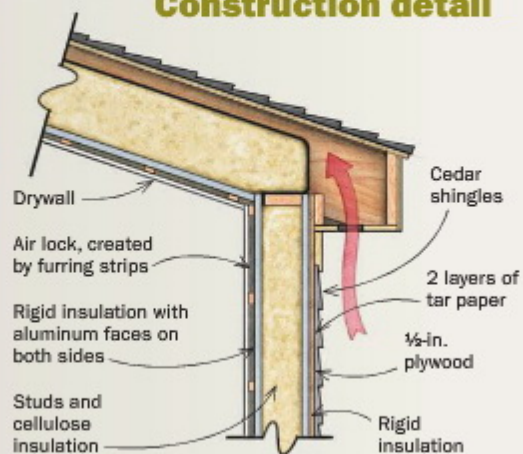
The upper floor houses a small office and storage for jigs, projects, and parts.

Houck's benches and hand tools are located at one end of the shop, near the sink for easy access to water during sharpening. The carving bench is stationed by the window to take full advantage of natural light.



Houck made the shop energy efficient by following the construction and insulation advice offered in *Builder's Guide to Cold Climates* (2006, eeba.org).

Construction detail



Benches

For handwork, plenty of elbow room. The bench area, opposite the machines, includes two benches and lots of open countertops, with a sharpening station and sink. There is ample space to move around the main bench from all sides.



The second bench is adjustable. Houck varies the height of his Noden Adjust-a-Bench to accommodate a range of tasks including handplaning, routing dovetails (far left), and carving (left).

off. The propane used to heat the 960-sq.-ft. shop has averaged about \$180 per winter.

The floor is open

The shop building is 24 ft. by 40 ft., large enough for three cars (or two and a boat) if a future owner ever wants to convert it. The first floor is supported by 2x10 pine joists.

The dimensions are generous for a one-man shop. To make the most of that space, I wanted an open floor for flexibility of layout and for elbow room. The design for the shop's ceiling called for joists made of 16-in.-wide plywood I-beams. Their rigidity allowed me to dispense with support posts, despite the large floor area.

Wall storage



Walls do more than keep out the cold. Wall-mounted cabinets throughout the shop keep hand tools and hardware within easy reach. This large cabinet's hinged interior panels maximize storage capacity.

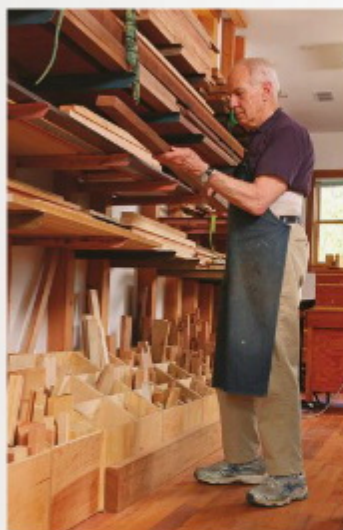
Another decision that helped free up space was to hang all of the dust ducts in the crawl space under the floor joists. This gave me greater freedom to move around, but it also tied down my big machines permanently. Think carefully before trying this approach.

The result is ample room for a full complement of large machines: a cabinet saw, a 20-in. bandsaw, a 12-in. jointer, and a 20-in. planer. All are positioned to handle stock at least 8 ft. long. There is also room for a pair of benches: a traditional European-style bench for joinery and an adjustable-height bench for carving. The two lathes are isolated at the far end of the room because they are seldom used in conjunction with other tools and are usually used for extended periods. The small tools used most frequently, a smaller bandsaw (on casters) and drill press, are closest to my workbenches. The mortiser is off in a corner, also on casters so I can move it out to accommodate long stock.

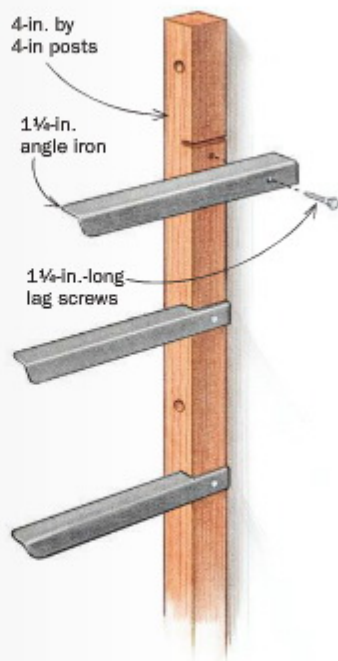
Two "invisible" time savers are my scrollsaw and spindle sander, which live beneath one lathe and the small bandsaw, respectively. When I need one of them, I set it on a stock cart and wheel it wherever I choose.

A place for everything...

Near my main bench, I built and installed a series of storage cabinets that house 67 drawers filled with supplies and tools,



Lumber storage. Houck's wall-mounted lumber rack uses space efficiently because the angle-iron requires no bracing. A graduated set of boxes underneath keeps scrap organized and accessible.



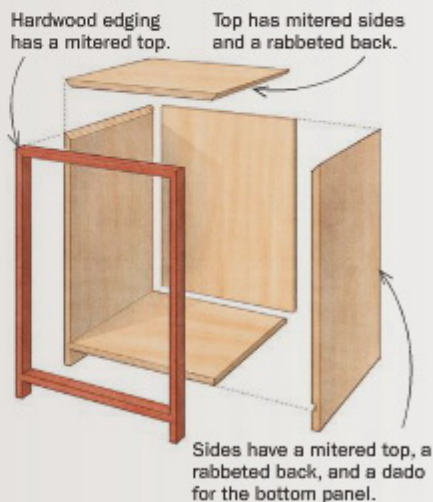
Cabinets



Clutter under control. A bank of under-counter storage lines the wall behind Houck's bench. For these and other cabinets throughout the shop, Houck built a total of 67 drawers.

MITERED CASEWORK

On the storage cabinets, Houck used the method of mitered carcass construction detailed by Steve Latta in *FWW* #129. In plywood, the miters provide a surprising amount of long-grain glue surface, making for a strong and attractive joint. The miters are cut on the tablesaw.



Satellite storage. Similar cabinets are located throughout the shop. Drawers of varying heights accommodate a variety of tools and supplies. The system of numbered drawers and lettered cabinets helps Houck return tools to their proper places.



Cabinets on wheels. The mortiser and drill press sit atop rolling cabinets with plenty of drawer storage for bits, accessories, and other tools.

Tools to go. Shallow boxes, packed with everything needed for a particular task (sandpaper and sanding blocks, for instance), can be easily lifted out or replaced as needed.



Behind the doors, more drawers. Shallow trays on heavy-duty drawer slides provide easy access to handheld power tools and other bulky items.

each having its own, dedicated space. I made the cabinets using Steve Latta's method of mitering the plywood tops and sides ("Strong, No Clamp-up Corner Joints," *FWW* #129). I could not foresee just how and where I would want every tool, so I built the first few cabinets with drawers of varying heights and started organizing. Later editions became more specific to my needs as I added dadoes to the drawer sides to house dividers.

Much of what doesn't fit in the drawers has a place on the walls. Behind the main bench is a wall cabinet (courtesy of Jan Zoltowski's "Quick-to-Make Tool Cabinet," *FWW* #188) that is a marvel of simplicity and efficiency. Since so much fits in the drawers below, I use this cabinet strictly for tools that can be hung. As a result, the internal doors almost double its storage area. On the wall next to the cabinet are shelves holding an array of small drawers for nails, screws, and other fasteners.

Rather than rummage through boxes of drill and router bits, I built a separate wall cabinet to hold all of my power bits except for the boxes of twist drills, which are in drawers beneath the press. On the door to the cabinet are charts giving the decimal size of "number" twist drills and which sizes to use for threading metal and wood.

Unlike some woodworkers, I cannot hold a pencil behind either ear, and no matter how many I put in my pocket, they all vanish. My solution was to mount a pencil block to every window casing. The problem is not limited to pencils: I seem to lose calipers and squares with the same frequency, so I have additional blocks to hold them in several places as well.

The wood rack is the brainchild of my friend Don Regier, a Maryland woodworker. It's a model of efficiency and it is cheap! The lumber rests on angle-iron bars (salvaged from bed frames at the local dump) set into kerfs in a series of 4x4 posts. The design requires no space-robbing braces, and it can hold a lot of lumber. □

Phillip Houck makes furniture and enjoys the sunshine in his shop near the New England coast.



A gem of a detail. Houck cut and installed shaped shingles for decorative touches like this diamond pattern near the shop's main entrance.

Custom touches, inside and out

The shop is just steps away from my house, so I wanted it to look good. The siding is cedar shingles, of which 1,100 are decorative semi-circular or diamond patterns that I cut myself using shopmade jigs. Mounting the diamond shingles was too fussy for the siding contractor, so I wound up installing them. It was a chore, but the work was truly satisfying.

Inside the shop, my wife asked if I planned to ornament the face stringer on the stairs, and I told her: "It's just a shop."

"No," she replied. "It is *your* shop!"

I was easily persuaded. Just cutting the blocks and fairing them took all day, but I appreciate them every time I see them.

—P.H.



Taking stairs to a new level. The decorative stringer faces, bandsawn to shape, lend a personal touch.

Segmented Cutterheads

Plane hundreds of feet of lumber with no tearout and no knife changes

BY ROLAND JOHNSON

Installing fresh knives in jointer or planer cutterheads is tedious and time-consuming, requiring dial indicators, magnetic knife holders, and a bit of voodoo to get all three knives set to exactly the same height. And right after you get a sharp set installed, it takes only a stray grain of sand or a small, hard knot to take a tiny nick out of those fresh edges and start leaving tracks on every board. But if you delay and don't change your knives when they need it, you'll be frustrated by tearout and bad results.

Segmented cutterheads are one of the few truly new developments in woodworking. The multi-sided, (usually) carbide teeth hold an edge many times longer than traditional steel knives, and pivot quickly and accurately when they finally do need a fresh edge. Users also report much less tearout than they get with straight knives.

Today's higher-end machines come equipped with a wide variety of these innovative cutterheads, and there are at least two that can be retrofit into your old jointer or planer. But there is a lot of debate about

Big benefits

One project's worth of rough lumber is enough to nick and dull the straight, steel knives on your jointer and planer. Not so for segmented cutterheads, spelling the end of tedious blade changes.

CLEANER CUTS

The perfectly indexed, long-lasting carbide teeth leave fewer ridges and less tearout in all types of woods.

Change the Game

which types leave the cleanest surfaces, those with forward-facing teeth (a bit less expensive to manufacture) or those with angled, shear-cutting teeth.

To find out if all the claims about segmented cutterheads are true, and see if any of the types have an edge on the competition, we ran hundreds of feet of lumber through most of the models on the market. As we were going to press we realized that we missed two, available as an option on some machines from General and General International. We'll test those in the future.

An explanation of the new cutterhead

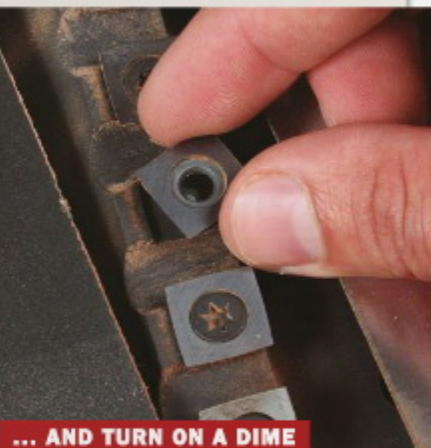
Microprocessors make super-accurate CNC machining possible, and this, in turn, makes insert-cutter technology not only possible but affordable for the average woodworker. The cutterheads have pockets machined in them that accept precisely ground cutters held in place by a screw. The typical cutter has four sharp edges (one type has two), and all can easily be rotated to a fresh cutting edge when one becomes dull or damaged. The CNC accuracy creates very accurate knife projection so all the knives

cut uniformly in all four positions, leaving a planed surface nearly free of knife marks. All of the heads left very shallow tracks or scallops in the wood, but none were deeper than normal milling marks, easily removed with one pass of a sander or handplane.

Aside from the milling marks, many users claim that the cutting action of a small insert cutter creates less tearout than a full-width, straight knife.

The mechanical differences

There are obvious differences between the various cutterheads, such as tooth count



... AND TURN ON A DIME

When you do finally need a fresh edge, the teeth are simple to loosen and turn, and they go right back into perfect position. Say goodbye to tedious knife changes.



TEETH LAST 20 TIMES LONGER ...

The typical insert cutter has four sharp edges vs. one or two on high-speed-steel knives, and is made of carbide, making each edge much more durable.

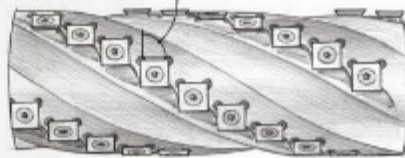


Two types battle it out

New segmented cutterheads are emerging all the time, but they shake out into two main approaches, each with its own passionate advocates.

STRAIGHT STYLE IS LESS EXPENSIVE

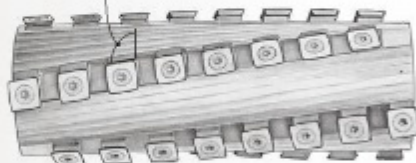
Teeth are set along a spiral, but each is straight and faces forward.



Teeth are straight on all four sides.

SHEAR CUT IS MORE COMPLEX

The teeth are not only arrayed in a spiral, but their edges follow the spiral too.



Teeth are set at an angle and slightly curved on the edges to create a shearing cut.

Head to head

We tested five types of segmented cutterheads both as standard equipment in new machines and retrofit into DeWalt DW735 12-in. benchtop planers. Our control group was another DW735 and a Jet JJP-12 Jointer/Planer, each outfitted with the straight knives. We ran MDF through each machine to accelerate wear, and then closely examined cut quality on a wide variety of woods, from tiger maple and exotic woods to common domestic hardwoods and soft white pine. We think that straight knives will fare a bit worse in the real world than they did in our tests because people tend to avoid changing straight knives, keeping them in place long after they are dull and causing serious tearout. Also, our MDF wear cycle only simulated 200-or-so feet of lumber passing by the blades. We would have listed prices in the chart, but there are too many factors (machine type, bearings, cutterhead dia.) to lock down specific ranges. In general, Accu-Head is the least expensive and shear-cutting heads cost the most.

CUTTERHEAD

Straight knives

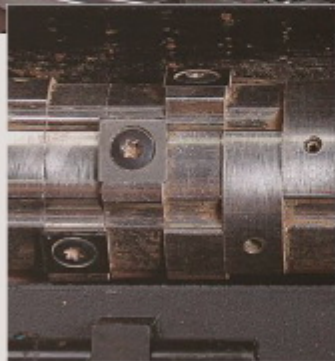
Accu-Head

Byrd Shellix

Grizzly spiral cutterhead

Laguna ShearTec II

Powermatic/Jet helical cutterhead



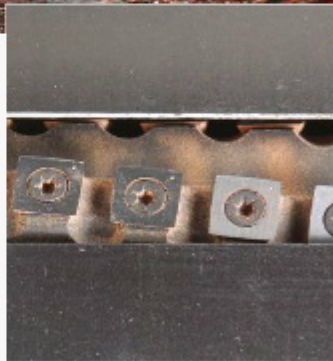
Accu-Head



Byrd Shellix



Grizzly spiral cutterhead



Laguna ShearTec II

AVAILABLE ON	TOOTH ORIENTATION	TEETH PER INCH	PERFORMANCE		
			HARDWOODS	SOFTWOODS	DIFFICULT HARDWOODS
All machines	Straight	n/a	Good	Very good	Good
General International's 13-in planer*, many of Steel City's jointers and planers, and as retrofits for dozens of other machines (check Accu-Head.com)	Straight	2¼*	Good	Good	Good
Available on some new machines (check with the manufacturers), and as retrofits for many more (check byrdtool.com)	Shear	5	Excellent	Good	Excellent
Grizzly planers, jointers, and planer/jointers	Straight	5	Very good	Good	Very good
Laguna planers, jointers, and planer/jointers	Shear	6¼	Excellent	Very good	Very good
Jet planers, jointers, and planer/jointers, and a few Powermatic jointers	Shear	4¼	Excellent	Very good	Excellent

*Accu-Head teeth are high-speed steel and have two sharp edges. All others are carbide, with four sharp edges.



and tooth positioning on the cutterhead. For example, the teeth on the Accu-Head face forward, and are arranged in a steep spiral with the teeth staggered for overlapped cutting. The teeth are high-speed steel (HSS) with two sharp edges. Grizzly's cutters also face forward, but they are arranged in spiral rows. Also, each tooth is carbide and has four sharp edges. The other main types we tested have carbide, shear-cutting teeth, positioned and ground so the edges align in a spiral.

Apples to apples

A head-to-head comparison of the technologies is a bit difficult because the machines they are installed in play a role in

cut quality. So we tried them in a wide array of machine types and sizes.

But we did manage a limited head-to-head test, using the two cutterheads that can be retrofitted, the Accu-Head and the Byrd Shelix, putting each into a DeWalt DW735 benchtop planer, with a third DW735 tested with its original straight knives.

That allowed us to measure amperage draw and decibel levels on a level playing field, to get some ideas about power demands and noise levels. Surprisingly, the straight knives consumed the lowest power, the 26-cutter Accu-Head was next in line, and the Shelix required considerably more power. My assumption had been that



Powermatic/Jet helical cutterhead

How we crunched the numbers

We rated the surface quality on dozens of sample boards on a 1-to-10 scale. No single board was worse than a 5, and no overall average was lower than 6. We called an average rating between 8.5 and 10 "excellent," 7.5 to 8.5 "very good," 6.5 to 7.5 "good," and 5 to 6.5 "fair." When all the samples were averaged, no cutterheads got a rating below "good."



Upgrade the machine you have

BY BILL PECK

For both retrofittable cutterheads, the Accu-Head and Byrd Shellix, installation in the DeWalt DW 735 planer is straightforward, if you follow the detailed instructions provided with both. This is not a job for the mechanically challenged, but some patience and attention to detail will make the installation go smoothly. You'll need a good set of internal and external snap-ring pliers, some other standard tools, and about two hours to do it.

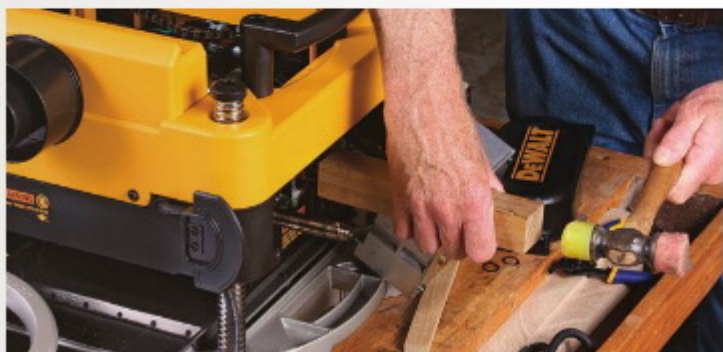
When reassembling the Shellix unit, I found the key slot in the cutterhead shaft was slightly undersize and would not accept the DeWalt key. Byrd quickly provided a new key, which solved the problem.

At right are a few highlights of the job, with tips for success.

START BY REMOVING THE OLD CUTTERHEAD

Tip for removing the belt. Neither set of instructions tells you to remove the idler pulley from the feed roll chain, but doing so eases the removal of the drive belt, and it's easy to do.

Knock out the original head. Heavy taps with a dead-blow hammer and a block of hardwood unseats the bearing, and then it slides out easily. Fasten the planer securely when removing the old cutterhead and reinstalling the new one.



with insert cutters the power needed to make a cut would be lower simply because the cutters are narrow, compared to a full-width blade, and take a smaller bite.

I believe that the reason for the higher power demand is that the cutters are constantly in contact with the wood. With three or four straight knives, the motor has a chance to regain a bit of lost inertia between bites. Don't worry, the constant power demand won't wear out your motor any faster, but the additional amp draw could trip the breaker on an undersize circuit.

The big test

For the ultimate test—surface quality in real-world situations—we started all of our machines and cutterheads with several passes on cherry and oak boards, taking $\frac{1}{16}$ in. per pass. Then we put 120 linear feet of 12-in.-wide MDF (very unkind to cutting edges) through each one to put some additional wear on the edges. And then we ran three types of woods through all of them. We ran cherry, oak, and maple as examples of domestic hardwoods; and then cumaru, jatoba, hickory, and tiger maple to test the cutter-

heads on the toughest interlocked and alternating grain. Last we ran some white pine, since softwoods present their own challenges.

Most of the planers we tested have two feed speeds. We used the lower speed, which is generally considered the finish-cut speed. On the jointers, we pushed the wood through at a slow, steady rate.

Overall, we were pleasantly surprised at how well all these cutterheads performed. The straight knives survived the MDF better than we had anticipated. If we had unlimited time and manpower, we would have run a lot more of it through. The HSS segmented cutterheads followed suit with very little discernible difference between brand new and slightly abused, and the carbide cutters all breezed through the test regimen with little difference in cut quality before and after the MDF. It is logical, however, that the gap will widen as the cutters become more worn.

Overall, our testing proved that insert cutters do a better job of dealing with difficult wood than straight cutters, and that there are subtle differences be-

Do the math: You'll save in the long run

Comparing the costs of this technology isn't a straightforward matter. You should consider the number of sides the segmented cutters have because it adds longevity to the cutterhead. You have to think about the cost of replacement blades and sharpening costs for straight knives. Go to FineWoodworking.com/extras to read Roland Johnson's detailed breakdown and formula for figuring out total costs and values involved with the different cutterhead scenarios you may come across.





Cutters off, cutterhead in. Accu-Head tells you to remove the teeth (left) before sliding the cutterhead through the bearing housing (above). Byrd provides a plastic wrapper to protect its carbide cutters, but we recommend removing its cutters, too. It takes a little longer but you are assured not to damage the brittle carbide edges or score the bearing housing. After the head is in place, Peck says it's easy to re-install the teeth (right).



tween the technologies with regard to quality of cut.

Using a raking light, we analyzed both grain tearout and surface quality (lines, ridges, or troughs). The milling marks were all about the same, all shallow enough that normal surface prep (a light pass with either a smoothing plane or a random-orbit sander with 150-grit sandpaper) will remove them. Tearout was also a non-issue on most boards, whether the cutterheads were straight or segmented, but certain species and individual boards caused problems, just like they do in the real world.

The shear-cutting heads were the top performers in the group, planing domestic or exotic wood with virtually no tearout and minimal ridges. The front-facing teeth on the Grizzly head came in just behind, showing slightly more tearout on the worst boards, and the Accu-Head didn't fare any better than the straight knives on the toughest boards.

By the way, unlike the straight knives, all of the segmented cutterheads worked almost as well no matter which direction we sent a board through.

Bottom line: These cutterheads are worth the added cost

I can unequivocally say that insert-cutter technology for jointers and planers is worth every penny. The fact that each carbide edge will last 10 times longer than a steel one, conservatively, and that most teeth have four sharp edges, not one or two, is enough to repay your investment. Add to that the time you will save on knife changes. Now consider the lack of tearout and the resulting savings in lumber and time, and you can see how quickly one of these cutterheads will pay for itself, whether in a brand-new machine or as a retrofit for a good machine you already own.

But most valuable of all will be the reduction in stress. There are few things more frustrating than having the perfect board become firewood from massive and unexpected tearout. With a segmented cutterhead, on the other hand, you'll have sharp teeth on your jointer or planer and tearout-free cuts almost all the time.

When the teeth do become dull, rotating them is simple compared to the dreaded knife change. The accuracy of CNC machining means the teeth will always be

positioned accurately. That alone will result in better cuts and longer tooth life (all of them share the load). And if just a few teeth are damaged by a nail or grit, only those teeth need to be rotated. By the way, replacement teeth cost \$40-\$60 for a 10-pack.

So here's my bottom line. If you are on a budget and work with mostly straight-grained domestic hardwoods and softwoods, any of the carbide-tooth cutterheads will revolutionize your ability to create straight, flat surfaces with minimal or no tearout. If you have slightly deeper pockets or work a lot of difficult wood, then the shear-cut technology is the ticket. □

Roland Johnson is a contributing editor.

House Your Tools

Plywood cabinet and simple joinery speed construction time

BY CHRIS GOCHNOUR

A tool cabinet is a great shop helper. It keeps hand tools and small power tools well organized and off the bench but within reach. And perhaps more importantly, it saves valuable floor space. But a tool cabinet doesn't have to have the cold feel and look of MDF, or the piecemeal appearance of a cabinet made entirely from scraps. Rather, it can have the look of fine furniture, giving tools an attractive home and your shop an aesthetic boost.

I collaborated with the editors at *Fine Woodworking* to design a useful, attractive tool cabinet. It can be built with the most basic shop tools in a short amount of time, and it will beautify your shop as it has mine.

The carcase, made of $\frac{3}{4}$ -in. walnut plywood, is built with simple dado joinery cut with a tablesaw. The six interior drawers employ a similar setup. The attractive doors couldn't be easier to make. They feature stub-tenon and groove joints for the frame, a veneered plywood panel glued in place, and divided glass panes that can be done in no time at all. Construction starts with the case.

Case is a lesson in tablesaw joinery

All of the main components of the case (including the adjustable shelves) can be built from one sheet of $\frac{3}{4}$ -in.-thick walnut plywood. The back is $\frac{1}{2}$ -in.-thick walnut plywood. Some suppliers may be reluctant to sell a partial sheet of hardwood



in High Style



plywood. If your supplier won't, and you don't think you'll use the cutoff in the future (or make two cabinets!), you can make a solid-wood back (see "A Back for Every Cabinet," *FWW* #192).

Begin with the case sides. Cut them to length but leave them $\frac{1}{4}$ in. extrawide. Glue $\frac{1}{8}$ -in.-thick solid walnut caps to the bottom edges and trim them flush. After that, rip the sides to their final width. The fixed shelf also is edged with solid walnut that's trimmed flush prior to cutting the joinery.

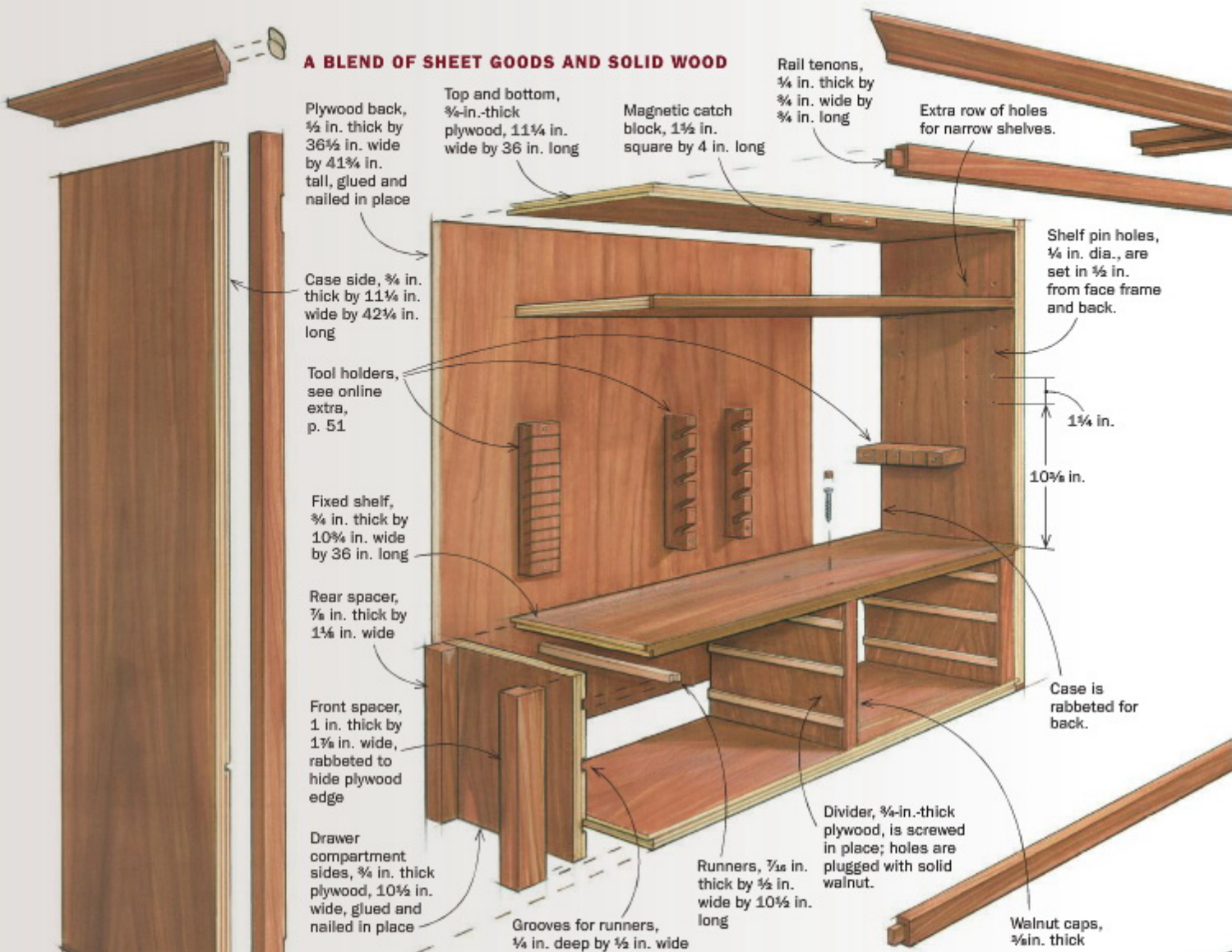
The case dado joints are cut on the table-saw with a $\frac{1}{4}$ -in.-wide dado blade. Adjust the blade for a $\frac{1}{4}$ -in.-deep cut and make the dados in the sides for the top, the bottom, and the fixed shelf. Then, without changing the height or width, cut the $\frac{1}{4}$ -in. tongues on the top, the bottom, and the fixed shelf. Now cut the rabbets that will house the cabinet back. I do this on a router table using a straight bit and a fence to guide the cut. The rabbets on the case sides are stopped, while those on the top and bottom run all the way through.

With all the joints cut, you can dry-fit and then glue up the assembly. Gluing in the plywood back as you assemble the carcass will help keep things square. Reinforce the assembly with brad nails.

Face frame and crown are solid walnut

I make the face-frame parts a hair oversize in width so they overhang the case by about

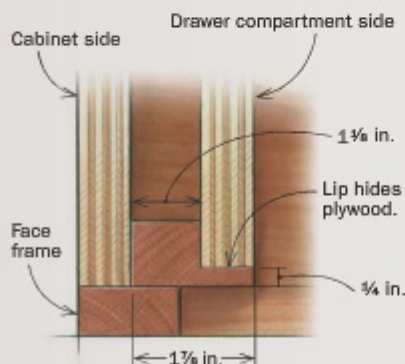
A BLEND OF SHEET GOODS AND SOLID WOOD



Walnut cap, $\frac{3}{4}$ in. thick

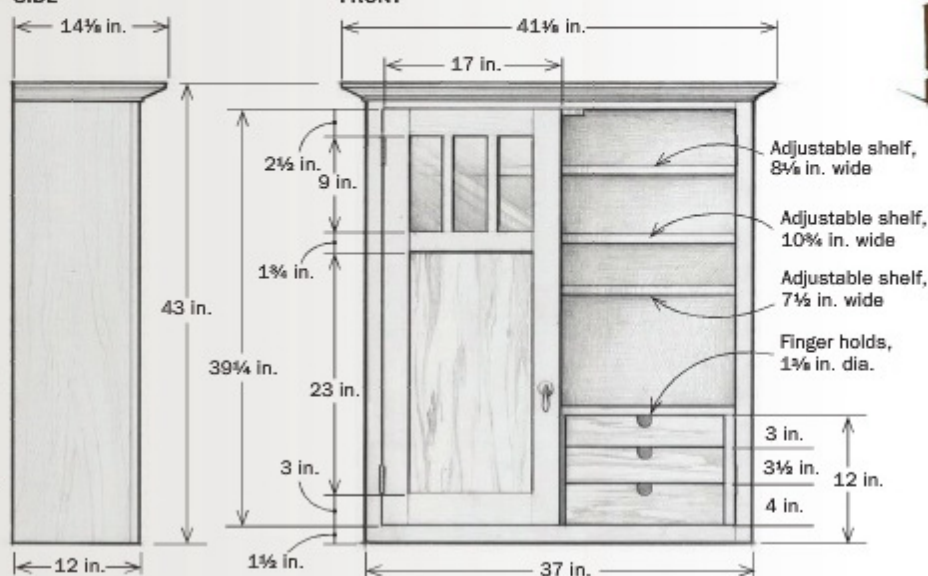
FRONT SPACER DETAIL

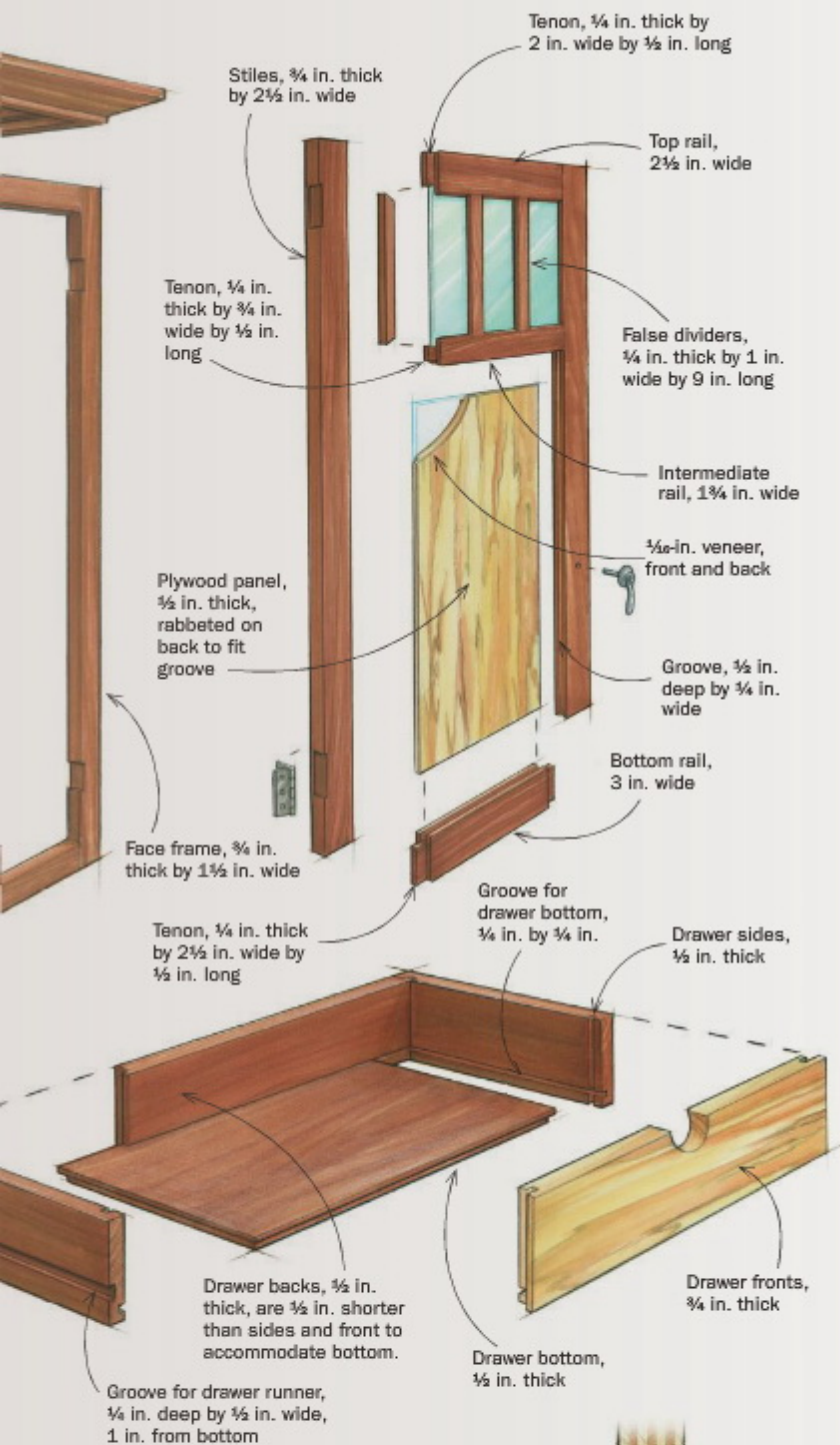
Spacers move compartment sides in so that drawers can clear the face frame in front.



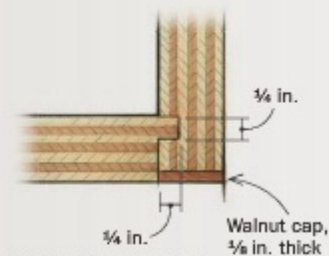
SIDE

FRONT



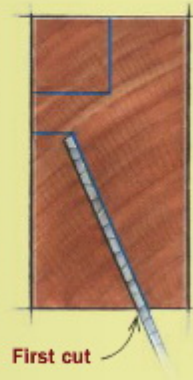
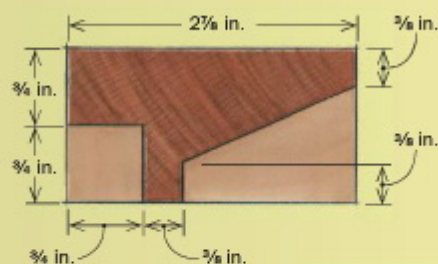


To purchase digital plans and a complete cutlist for this cabinet and other projects, go to FineWoodworking.com/PlanStore.



CASE JOINERY DETAIL

CROWN MOLDING IN FOUR CUTS



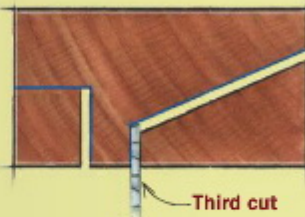
First cut

The first cut is the deepest. Make the bevel cut first. Use a featherboard to keep the piece tight against the fence.

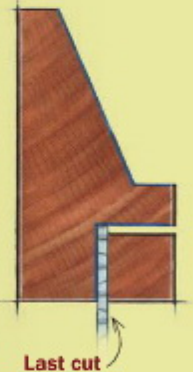
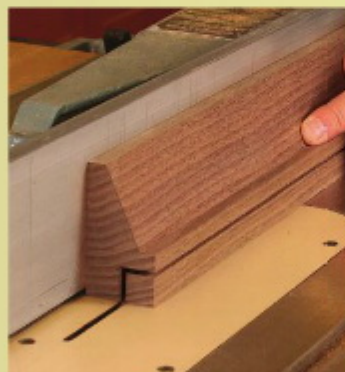


Second cut

Lay it flat. The second cut starts the rabbet. The third cut (shown) frees the bevel waste.



Third cut



Last cut

Stand it up. The fourth cut finishes the rabbet and lets the waste fall away safely.

SIMPLE JOINERY IS SOLID AND SPEEDY

No help needed. The case is fairly large, but with carefully fitted joints, the glue-up shouldn't require more than two hands.



$\frac{1}{32}$ in. all the way around. This makes it a bit easier to get the frame aligned and squared perfectly. The stiles and rails are joined using mortise-and-tenons. I remove the bulk of the mortise waste at the drill press and finish with chisels. The tenons are cut on the tablesaw using a dado blade.

Glue up the frame and then glue it to the case. Once the frame is aligned the way I want, I drive four brads, one in each corner, to ensure that the frame doesn't shift as I clamp it. After the glue has set, flush-trim the frame to the case.

The crown molding is very easy to make and apply. It is made using four different tablesaw setups (see p. 47). Make the profile and clean up the cuts with scrapers and sandpaper, then cut the miters and fit the molding. I reinforce the miters with #10 biscuits, and then glue and nail the mold-



Face frame is last. After gluing and nailing in the back, attach the face frame to the front (left). Trim it flush with a router (above) after the glue dries.



Build the drawer compartment. Install the spacers and compartment sides after cutting the dados for the drawer runners. The center divider is screwed in from above and below. Temporary plywood spacers on each side (top and bottom) keep the divider aligned vertically.

ing to the case. The adjustable shelves are plywood with solid walnut edging. I made two of the shelves shallower to make it easier to access tools without banging a shelf edge.

Dirt-simple glass doors

The frame-and-panel doors have three divided lights in the upper section, but their construction isn't complicated: It's all tongue-and-groove joinery, with the plywood panel glued in place for strength.

After milling the frame material, cut the panel grooves on all the inside door parts. The grooves also receive the rail stub tenons, which are cut using a dado blade on the tablesaw.

The 1/2-in.-thick plywood panel on my cabinet doors is covered with spalted syc-

BUILD STRONG DOORS ON THE TABLESAW



Center the grooves. The door frames are grooved for the glass and the wooden panel. To make sure the groove is centered, cut it in two passes with a dado blade, flipping each workpiece end for end after the first pass.



Don't change the blade. Reset the height of the dado blade to cut the stub tenons. Dial in the tenon with a test piece, then crank out the tenons on all the parts.



Spacers help the glue-up. Because the glass is installed later, the intermediate rail is hard to align and keep square. Gochmour uses spacers to align the piece before clamping it (above). The panel is glued all around, adding strength to the door (left). To avoid squeeze-out, brush glue into the grooves but not on the panel.

amore veneer. But you can substitute a nice hardwood plywood. Cut the panel to size and rabbet the back on the tablesaw to form a tongue that is captured by the groove of the door frame. Once all the parts are cut and fitted, glue up the doors.

The glass in the top of each door is an eye-catching detail, and my method of installing the single pane of glass is easy. First, rout a rabbet for the glass using a bearing-guided rabbeting bit and square the corners using a chisel. The false dividers are butt-joined to the frame rails. Cut them to width, and then carefully fit them lengthwise. The butt joint is rein-



Scraper trick gets the reveal just right. Before tightening down the clamps, use a card scraper as a lever to adjust the reveal all around the rabbet on the back of the door panel.

GLASS ADDS CLASS

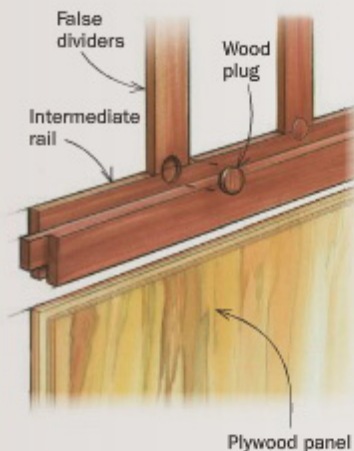


Glass sits in a rabbet. With the door facedown, remove the wood behind the groove, using a bearing-guided rabbeting bit riding on the wood in front of the groove. Square up the corners.



Spacers again. The false dividers are cut for a tight fit and butt-joined to the frame. When gluing them in, use spacers to align them correctly.

WOOD PLUGS ADD STRENGTH



Holes for the plugs. Gochnour uses wood plugs to reinforce the small butt joints. Drill $\frac{1}{8}$ -in.-deep mortises for them using a $\frac{1}{2}$ -in.-dia. Forstner bit.



Cut and release. Use a plug-cutter to make a row of $\frac{1}{2}$ -in.-dia. plugs in a walnut blank and then rip off a thin strip on the bandsaw to free them.



Glue them in. Align the plug's grain with that on the dividers and trim the plugs flush after the glue dries. The frame is attached with brads.



Add the glass after finishing. It is held in place with a small bead of adhesive caulk below the glass, and a thin mitered frame (left) attached with brads. Drill pilot holes for the brads, and use a sheet of thin cardboard to protect the glass as you drive them home (above).

add the solid-wood edging to the center divider and trim it flush.

Now you're ready to assemble the drawer compartment. Cut and fit the spacers and glue and nail the pieces to the sides. Next, glue and nail the compartment sides to the spacers. Finally, screw the center divider in place from above and below. The screw holes are countersunk and plugged.

Once the internal case is assembled, make the maple drawer runners and fit them in their dadoes. The runners have some front-to-back play and, when dry-fitted, can slide back and forth. They butt against the back of the drawer fronts and, when glued in place, also serve as the drawer stops.

The drawers use simple dado joinery at the back and front. I made the drawer bottoms from 1/2-in.-thick solid alder, but you could substitute plywood there. The bottom is screwed into the drawer back, with a slot in the bottom to allow for movement.

The drawer pulls need to be flush because of the close proximity of the drawer fronts to the doors. I use a simple 1 3/8-in.-dia. hole drilled into the edge of the drawer front using a Forstner bit.

Once the drawers are complete, make the tool holders and finish the piece (I used a sprayed lacquer). To hang the cabinet, simply screw right through the back, being sure you hit the wall studs. Now if only I could find the time to put away all my tools ...

Chris Gochmour is a busy furniture maker near Salt Lake City, Utah.

SIX DRAWERS IN A DAY

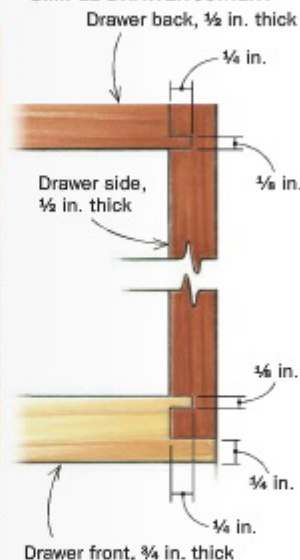


More tablesaw joinery. After cutting the grooves for the side runners, cut the narrow dadoes for all of the drawer backs. Keep the blade at the same height but adjust the fence to cut the dadoes for all of the drawer fronts.

Hold it steady. The tongues on the drawer backs are cut flat on the saw table with a dado blade. To cut the tongue and rabbet joint in front, hold the workpiece up-right as shown, using a featherboard and tall fence to keep the piece from tipping.



SIMPLE DRAWER JOINERY



Bite the tongue. After dialing in the setting, trim the tongues on all the drawer fronts.



No fitting required. The runners have enough play front to back to allow you to adjust the drawers perfectly flush in front. Glue in the runners (above) one pair at a time. Then, before the glue dries, install the drawer and tap it so that the front is perfectly flush (right). Leave it that way until the glue dries.



Online Extra
For information on making the tool holders, go to FineWoodworking.com/extras.

A Revolution

The industry gets serious about the subject, with safer products for every budget

BY ASA CHRISTIANA



SMALL CYCLONES, TINY CYCLONES

One of the breakthroughs in dust collection involves downsizing. There is no doubt that the cyclone is the best way to collect dust. New portable models (above) are a more affordable option for small shops, while even smaller versions work wonders as dust separators for shop vacuums (right) and single-stage dust collectors.



in Dust Collection

In 2002, wood dust went from being a nuisance to an official health risk. That's when the U.S. government put it on their list of "known carcinogens," linking it to a variety of nose, throat, and lung cancers. But it has taken our corner of the woodworking industry a while to catch up with reality.

The best way to manage dust is to collect it at the source, and one of the industry's first important realizations was that the dust ports were sadly lacking on most woodworking tools, and nonexistent on others. That was pretty easy to fix, and the improvements have been steady and significant. So before you spend money on ceiling-hung air filters or expensive respirators, go to the source of the problem. Connect your dust collector and shop vacuum to every possible power tool. If you are buying new tools, look for manufacturers that make dust collection convenient and effective. For your existing tools, take a day in the shop to improve the ports.

Fine Woodworking has done lots of articles on this topic.

The filtration story

Fifteen or twenty years ago, if you collected dust at all, you probably did it with a single-stage collector and a 30-micron polyester bag. Those porous bags act like fine-dust delivery systems, blasting out a cloud of the most dangerous stuff at head height. The irony is that people who didn't bother with dust collection at all, leaving big piles of sawdust under their tablesaws, were probably safer!

The trouble with wood dust is that the most dangerous particles, the very fine ones, are the hardest to collect. Under 10 microns in size, they hang longest in the air, penetrate deepest into the lungs, and are the hardest for the body to eject.

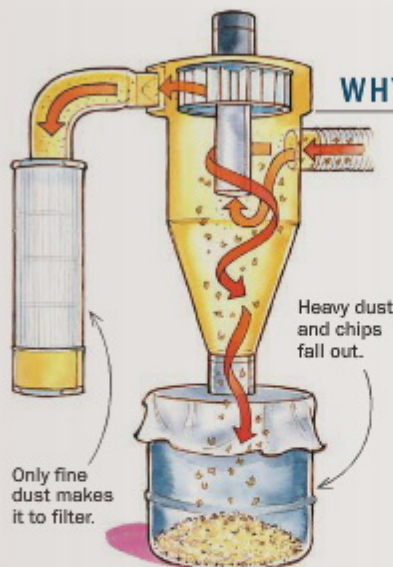
So the tool companies knew they had to get serious about filtration. Felt bags were an early response, borrowed from industry. But the finer the felt, the taller the bag needed to be in order to have enough surface area for good airflow. There's room

for that in a factory but not a small shop. Enter the pleated filter, which packs hundreds of square feet of surface area into a small canister. You see these now on the latest cyclones, single-stage dust collectors, and shop vacuums, and they certainly are a major upgrade from the filters of the past. But for everything but the cyclones, there is a problem: The filters can only get so fine before they start clogging and killing airflow.

Why the cyclone is still best—Filters work best on two-stage collectors (like cyclones). A two-stage system catches most of the dust before it can get to the filter. That means the filter can be much finer.

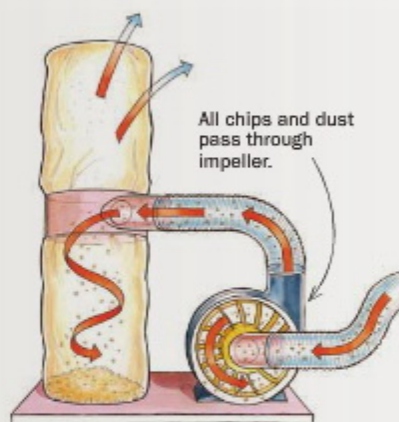
On single-stage dust collectors (and most shop vacs), most of the fine dust reaches the filter, so the very finest pleated filters will quickly pack with dust and start killing suction. At least five manufacturers of single-stage dust collectors told me the same thing: that they had to stop at 2-micron pleated filters when outfitting those machines. On the other hand, cyclone collectors can have state-of-the-art filters that capture particles as small as 0.3 microns.

WHY TWO STAGES ARE BETTER THAN ONE



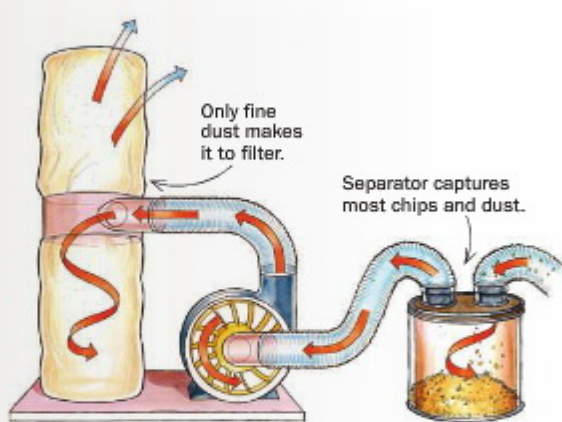
THE CYCLONE IS KING

A cyclone has two stages. Dust is drawn first into the cyclone itself. All but the very finest particles fly to the outside of the cone and spiral down into a collecting bucket, leaving mostly clean air to be drawn up through the center of the funnel cloud and into the filter stage.



MOST COLLECTORS AND VACS ARE SINGLE-STAGE

Single-stage dust collectors (and most shop vacuums) draw air and chips directly into the collection area, where they clog filters, choking airflow and reducing suction.



ADD A SEPARATOR TO CREATE A TWO-STAGE SYSTEM

A dust separator turns a single-stage collector (or vac) into a two-stage system, grabbing the vast majority of the dust before it reaches the filter, keeping it clean and effective.

Testing clears the air



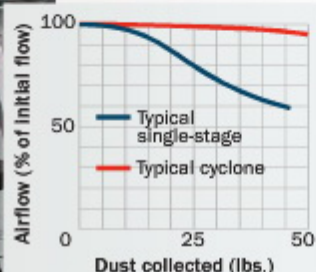
(For the bottom line on filter ratings, see "The truth about filtration," on p. 59.)

So my first piece of advice is to buy a cyclone dust collector if you can. While the first cyclones for small shops were big, expensive, stationary machines, requiring long hose or rigid-duct runs to reach all four corners of a shop, almost every cyclone manufacturer now makes compact, roll-around models, and many are under \$1,000.

Separators for the rest of us

I would love to trade up for a cyclone collector, but I recently exhausted my marital

CYCLONES RULE

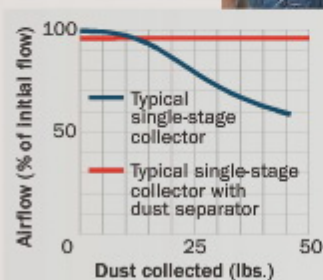
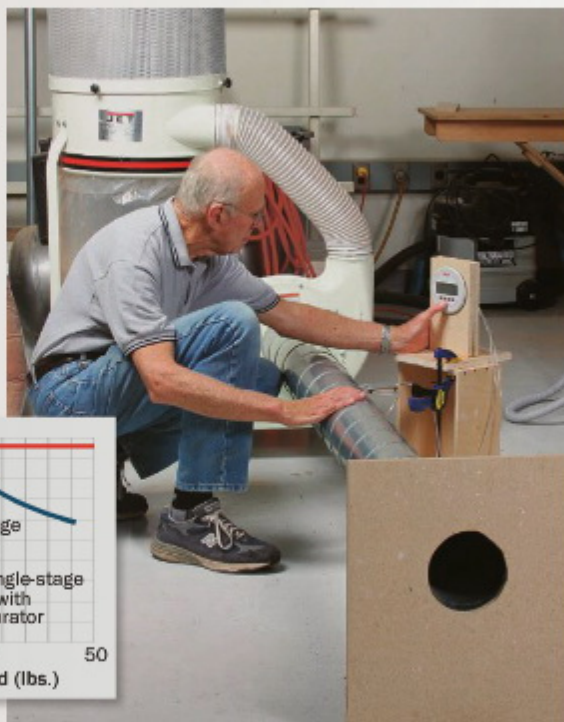


Wonderfully efficient. While the airflow dropped quickly as we sucked dust into the single-stage collectors, it barely budged on the cyclones.

SINGLE-STAGERS NEED HELP

A separator makes a dramatic improvement.

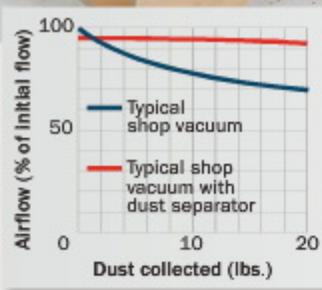
Although it sapped a bit of the initial airflow, the Oneida Super Dust Deputy removed 99% of the dust before it reached the filter of this Jet dust collector, keeping the airflow steady. Frequent filter cleaning was also effective (see p. 57).





SEPARATORS SUPER-CHARGE SHOP VACUUMS

Same cure for shop vacs. We outfitted shop vacuums with HEPA filters, and tested them with and without separators. The difference was undeniable, both in airflow and filter condition. The only vac that maintained its suction without a separator was the Bosch Airsweep (see "Tool Test: Shop Vacuums," p. 70).



capital on a bigger bandsaw and a planer/jointer with a segmented cutterhead. So I have the same setup you probably have: a single-stage collector and a shop vacuum.

I've done my best to upgrade them. I put a "2-micron" cartridge filter on my dust collector and replaced the standard filter on my vac with a HEPA model (the finest filtration available). But the HEPA filter came with a cost: I have to bang it against my trash can regularly to unclog it and restore the vacuum's suction. That's not only a pain, but it also fills my head with the same fine dust I'm trying to avoid. And I've known for some time that the 2-micron filter on my collector was not up to snuff.

The light went on for me when I recently reviewed Oneida's new Dust Deputy

(Tools & Materials, *FWW* #207). It is a small plastic cyclone separator for shop vacuums, and I was astounded at how clean it kept my HEPA filter, and how much more powerful the airflow was as a result.

Dust separators are nothing new, and they are made for both shop vacuums and single-stage dust collectors. The common type is not much more than an inlet and outlet that attach to the top of a barrel. Dust reaches the barrel first, where the larger particles spin around and settle out before the air passes out of the barrel and into the dust collector itself. Oneida's little cyclone is just a new type of separator.

My experience with the Dust Deputy got me thinking: Could I upgrade the cartridge filter on my single-stage dust collector and



WITHOUT SEPARATOR



WITH SEPARATOR

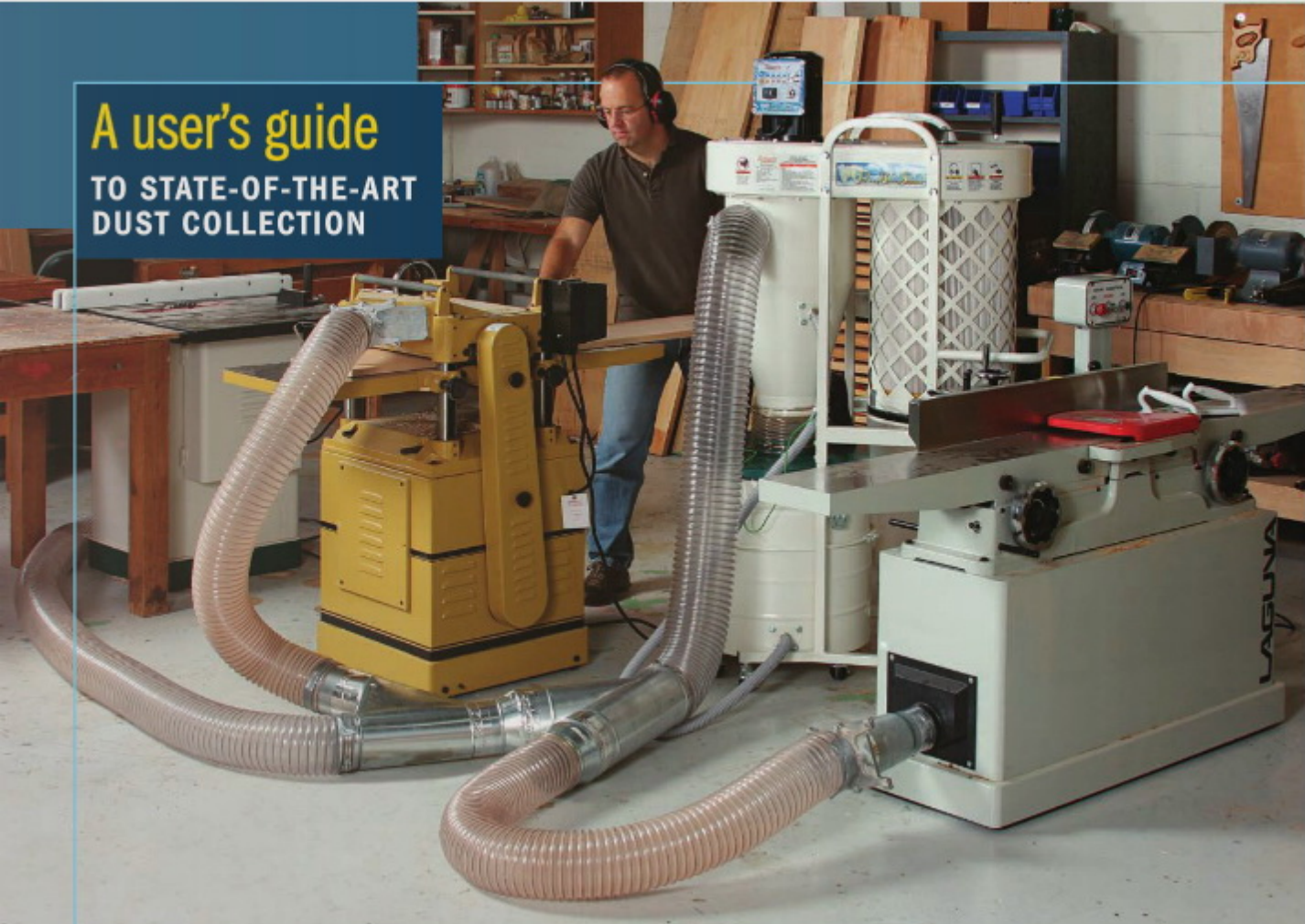
then install a separator to keep that filter from clogging constantly? Or do I have to spring for a cyclone to be truly safe?

Testing, testing

To answer these questions and more, I started researching this article. I spoke with product managers from eight companies; brought in the best cyclones, single-stage collectors, shop vacuums, aftermarket filters, and dust separators for testing; and enlisted the help of *FWW* shop manager Bill Peck, a retired engineer. He dug our pitot tube and digital manometer (devices for measuring airflow) out of storage, and borrowed bags of dust from a local shop.

No surprise: Cyclones rule—First, Peck measured the initial airflow on every dust

A user's guide TO STATE-OF-THE-ART DUST COLLECTION



CYCLONES: GO PORTABLE AND CHOOSE WISELY

Find a cyclone with a fine filter. Grizzly, Oneida, and Penn State (sold out at press time) are three companies whose cyclone filters are rated MERV 15 or higher (see "The truth about filtration," on p. 59). Oneida's HEPA filters are the highest rated.

OR UPGRADE THE CYCLONE YOU HAVE

Grizzly, Oneida, and Penn State also sell their filters as accessories.



collector and vacuum to get a baseline for each with a clean filter. Then he turned them on, and sucked up enough dust to fill each one to capacity, measuring flow the whole time. That told us that the experts are right about cyclones: They work better than any other type of collector. While the airflow/suction on the other dust collectors and vacs dipped up to 40 percent as their filters clogged, the filters on the cyclones stayed clean and the airflow barely wavered.

How to test single-stage?—After seeing what a dust separator did for my shop vacuum, allowing it to have a much finer filter without clogging, I couldn't wait to try out the separators made for single-stage dust collectors. That's when we hit a road-block: No one makes an aftermarket filter for single-stage collectors that's any better than the standard-issue models. (But that's about to change. See "Better filters are on the way," opposite page.)

So we couldn't upgrade the filters on the single-stage collectors, but we could do

SINGLE-STAGERS: CLEAN FREQUENTLY OR ADD A SEPARATOR



Use a dust separator to keep the filter clean. This Veritas Cyclone Lid is an affordable upgrade for any single-stage dust collector. Separators are also easier to empty than bags are.



Or clean the filter yourself—frequently. Spinning the internal flappers or blowing with compressed air will return the airflow to normal, but you must do it after each wood-working session.

AUTHOR'S
BEST OVERALL
CHOICE

SUPER DUST DEPUTY
\$220 (requires container)
Oneida-Air.com
Dust captured: 99%

TRASH CAN CYCLONE LID
\$31.50 (requires container)
Woodcraft.com
Dust captured: 90%

AUTHOR'S
BEST VALUE
CHOICE



BETTER FILTERS ARE ON THE WAY

As a result of this article, both Grizzly and Oneida have agreed to make and sell upgraded filters for single-stage collectors, with the same filter material used in their cyclone filters. The Oneida FXK011820 HEPA (intro price: \$270) is available now, and the Grizzly T23916 (\$300) by Jan. 1.

two things that would get us very close to a definitive answer. First, we could test the effect of a dust separator on a single-stage collector with its standard pleated filter in place. If the separators worked well for those, they should help even finer filters too. Second, we could do the full test on our army of shop vacuums, since there are dust separators *and* upgraded filters available for all of those.

Separators work wonders on single-stage collectors—We started by testing a number of typical single-stage collectors, trying them without a separator in place, and the results were sobering: Airflow dropped by an average of 40% after filling the bags just once. One has to assume that number would be even higher with finer filters. Then we picked a typical performer, the Jet DC1100CK, and tried it with various dust separators. With the best separators, the airflow hardly budged! By the way, Jet makes a "Vortex" version of its

SHOP VACUUMS: TWO AFFORDABLE UPGRADES MAKE A BIG DIFFERENCE



Faithful companion. A dust separator tags along with your shop vacuum, capturing 99% of the dust before it can clog the filter.



Add a HEPA filter. Certified HEPA aftermarket filters are inexpensive and widely available for most shop vacuums. Go to cleanstream.com for more information. However, without a dust separator (left), a HEPA filter will clog more quickly than a standard one, reducing airflow significantly.

single-stage collectors, and the one we tested recently (see "Tools & Materials," *FWW* #222) kept its filter clean without the need for a separator.

We also tested the effectiveness of those internal flappers that manufacturers have included on their cartridge filters. They worked great, too. A few spins of the handles this way and that unpacked the pleats and brought the airflow back to normal. Blowing compressed air through the pleats also worked very well, and won't abrade the filter media the way flappers might. We also found that a full bag drives the dust swirl higher, clogging the filter more quickly, so we recommend emptying the bag when it is half full or so.

Separators are a must-have for shop vacuums. The next test was tougher. We put both standard and HEPA filters onto a number of shop vacuums, sucked up gallons of dust, and measured the flow. Sure enough, the HEPA filters clogged more rapidly than standard models, just



DUST RIGHT VORTEX

\$70

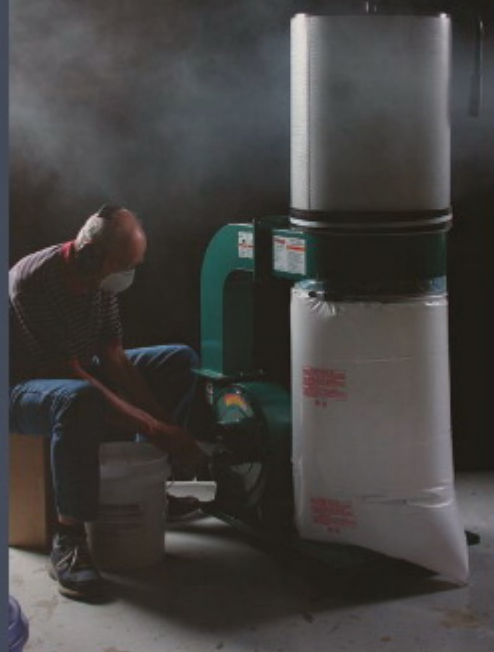
Rockler.com

Dust captured: 99%



We tested three dust separators designed for shop vacuums, and two were extremely efficient. The Oneida Dust Deputy stopped a few more grams of the finest dust before it reached the vacuum filter, but the Rockler Dust Right Vortex has a number of key advantages: Its larger-diameter ports allow larger hoses, which don't steal as much airflow. It's also mobile and has more capacity.

The truth about filtration



"2-micron" doesn't cut it. Here's what happened when we sucked the finest diatomaceous earth (powder used to test filtration) into a typical single-stage dust collector with a typical pleated filter.

as I experienced in my own shop. Then we attached the separators, and they did their magic once again, keeping the filters clean and flowing free.

By the way, our tests showed that adding a separator does steal a small amount of initial airflow, but that loss is vastly outweighed by their advantage once you start pouring dust into the system.

The bottom line for safe woodworking

If you want to be safe from fine wood dust and have a cleaner shop in general, you should focus on two things: Bringing the proper amount of suction to the source, and putting the finest filtration you can buy at the other end.

Choose the right power plant—Your primary source of suction for woodworking machinery should be a dust collector, not a shop vacuum. That's because you need as much as 700 cfm of airflow at the end of the hose for larger machines. But it is possible to overbuild your system. Too

There is a lot of mystery and misinformation surrounding filtration specs, so I took a closer look. Manufacturers tend to give vague ratings like "2 micron." If a filter rating doesn't tell you what percentage of what size particles it can capture, the manufacturer probably doesn't know exactly. Although the science of filter ratings is new to our corner of the woodworking industry, there are plenty of independent companies in Europe and the United States that can test and rate filter media at very low cost, and a few manufacturers have taken advantage of that.

Ratings are standardized. The widely accepted standard in the United States comes from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), and is expressed as a minimum efficiency reporting value (MERV), or as HEPA (high-efficiency particulate air), a rating that exceeds the MERV scale. True HEPA filters capture 99.97% of 0.3-micron particles, which is as small as wood dust gets. For shop-vacuum filters, buy a certified HEPA filter, not "HEPA-type" or anything vague-sounding. For all other dust collectors, look for a filter that is third-party-rated to capture more than 85% of the 0.3-micron to 1.0-micron particles (MERV 15 or higher). We've identified most of them in this article.

—A.C.

Model: RD-1
Test Type: ISO 12224
Test Agency: Oneida

Oneida GE HEPA
Filtration Efficiency
ISO 12224

Velocity (ft/min)	ISO 12224
100	99.97
200	99.97
300	99.97
400	99.97
500	99.97
600	99.97
700	99.97
800	99.97
900	99.97
1000	99.97
1100	99.97
1200	99.97
1300	99.97
1400	99.97
1500	99.97
1600	99.97
1700	99.97
1800	99.97
1900	99.97
2000	99.97

Everything else should be tested and certified.

For cyclone and single-stage dust collectors, look for filters that have been tested by a reputable third party to capture at least 85% of the finest dust particles. Manufacturers can have their filters tested and post the results online. At left is part of Oneida's third-party test report.

much air pressure is actually a bad thing, since it can force dust right through a fine filter. So unless you are installing a full-shop system, with a stationary collector and permanent duct runs to every corner, a 2-hp dust collector (either cyclone or single-stage) with a 12-in. impeller is probably right for a basement or garage shop.

With anything smaller, and even for 2-hp collectors, I recommend keeping the biggest machines as close as possible to each other to keep hose runs shorter (long runs add friction and slow airflow).

Check your filters—If you can afford it, get one of the new compact cyclones, with a filter that has been rated by a reputable third party. We found three manufacturers with certified, state-of-the-art filters—Grizzly, Oneida, and Penn State. And filters from those companies can be purchased as accessories and retrofit onto an existing cyclone. But other manufacturers are upgrading all the time, so check websites for current stats and testing info.

If a single-stage collector is a better fit for your budget, or if you already own one, consider the upgraded filters coming from Grizzly and Oneida. Most collectors have similar dimensions and designs, so there should be an aftermarket filter that will fit yours. After upgrading, consider adding a dust separator to keep the filter clean and the airflow powerful.

Of course, no matter what type of collector you get, you'll need a shop vacuum that can go where its big brother can't. Put a HEPA filter on yours, or buy a new one with HEPA standard. And unless your vac has some kind of self-cleaning feature (a few have built-in filter shakers), add a dust separator to keep that HEPA filter from clogging and killing airflow. By the way, while doing all this testing, we ended up testing the best new vacuums (see "Tool Test: Shop Vacuums," pp. 70-75). □

Asa Christiana is editor of *Fine Woodworking*; shop manager Bill Peck handled the testing.

Divide and Conquer

Easy-to-make drawer dividers keep tools safe and secure

BY MICHAEL PEKOVICH

The set of drawers in my workbench holds the tools I use most often, but until recently it didn't hold them very well.

I've always liked having the tools within reach, but I wasn't fond of the way they rattled and rolled around, threatening to damage one another. And I didn't enjoy having to rummage through a dusty jumble of stuff to find the tool I wanted.

I finally got tired of it and installed dividers. They are easy to cut and install, and they're adjustable. I didn't want to be locked into a layout that I might outgrow, so I used dividers that are dry-fit into dadoed end pieces. They fit securely, but can easily be removed and relocated as needed.

Now, all my tools rest easy—and in plain sight. No more rattling, rolling, or rummaging. □

Michael Pekovich is Fine Woodworking's art director.



BEFORE



AFTER

DADO BLADE IS THE KEY TO QUICK JOINERY

Get your stock ready.

Use a dado set to make 1/4-in.-wide test cuts in a scrap of wood. After thicknessing, rip all of your stock (right) to fit the dados in the scrap piece (far right). As one dado gets worn, move on to a fresh one. Leave the pieces long at this point.



Don't bother with a drawing. For layout, simply arrange the tools in the drawer the way you want them (left). Then fit crosspieces to the drawer and mark them for the dados (right).



Dado both ends at the same time. For the carving-gauge dividers, Pekovich dadoed both crosspieces together to ensure that they would line up.



Finishing touches. A layer of rubber mesh drawer liner cushions the tools and helps keep them from sliding. After marking and cutting the pieces to length (above), profile the dividers as needed for easy access to the tools and slide them into place (right).



The Wired Workbench

Readers
help us design
the perfect
power-tool
workstation

BY JOHN WHITE

In a modern shop, a lot of work gets done with power tools such as routers, biscuit joiners, and random-orbit sanders. But most of us use them on benches designed around handplaning, which means everything from the height to the mass to the vises and benchdogs is geared toward hand-tool use. So the editors at *Fine Woodworking* decided to build a bench designed for power tools. They posted a blog on *FineWoodworking.com*, asking readers what they thought a "wired workbench" should be. A lot of great suggestions came in, and being a veteran of the *FWW* shop and an inveterate inventor (see my "New-Fangled Workbench," *FWW* #139), I was given the task of distilling readers' ideas into a user-friendly whole.

Power tools need electricity to run and they make dust by the fistful. So most people



Collect the dust, forget the fuss

Imagine locking down your workpieces quickly, and using your portable power tools without any dust or distractions.

CLEVER CLAMPING IS BUILT IN



Pipe clamps apply the pressure, and low-profile dogs stay out of the way of your tools.

SMART VALET FOR CORDS AND HOSES



A simple hanger system manages these necessary evils, so they don't drag and disrupt your work.

SHOP VAC AT THE READY



Put a small vacuum in the cabinet and leave it there, ready to work. That way you won't forget to hook it up or be tempted to do without.

HIGHER THAN A HAND-TOOL BENCH



Traditional benches are lower, so you can bear down on your bench planes. But power-tool tasks like routing and sanding are better at belly height.

DUST EMPTIES EASILY

The Dust Deputy grabs 99% of the chips and dust, dropping them into a box that's easy to empty and keeping the vacuum filter clean.



ONBOARD POWER

Plug your power tools into an automated vacuum switch that turns on the vacuum when you turn on the tool. It also runs the vacuum for a few seconds after the tool powers off.



Build the base first

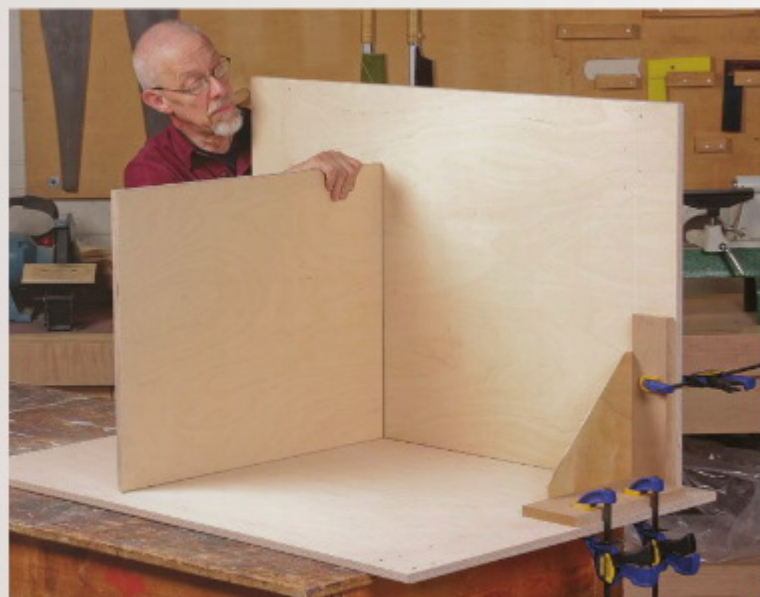
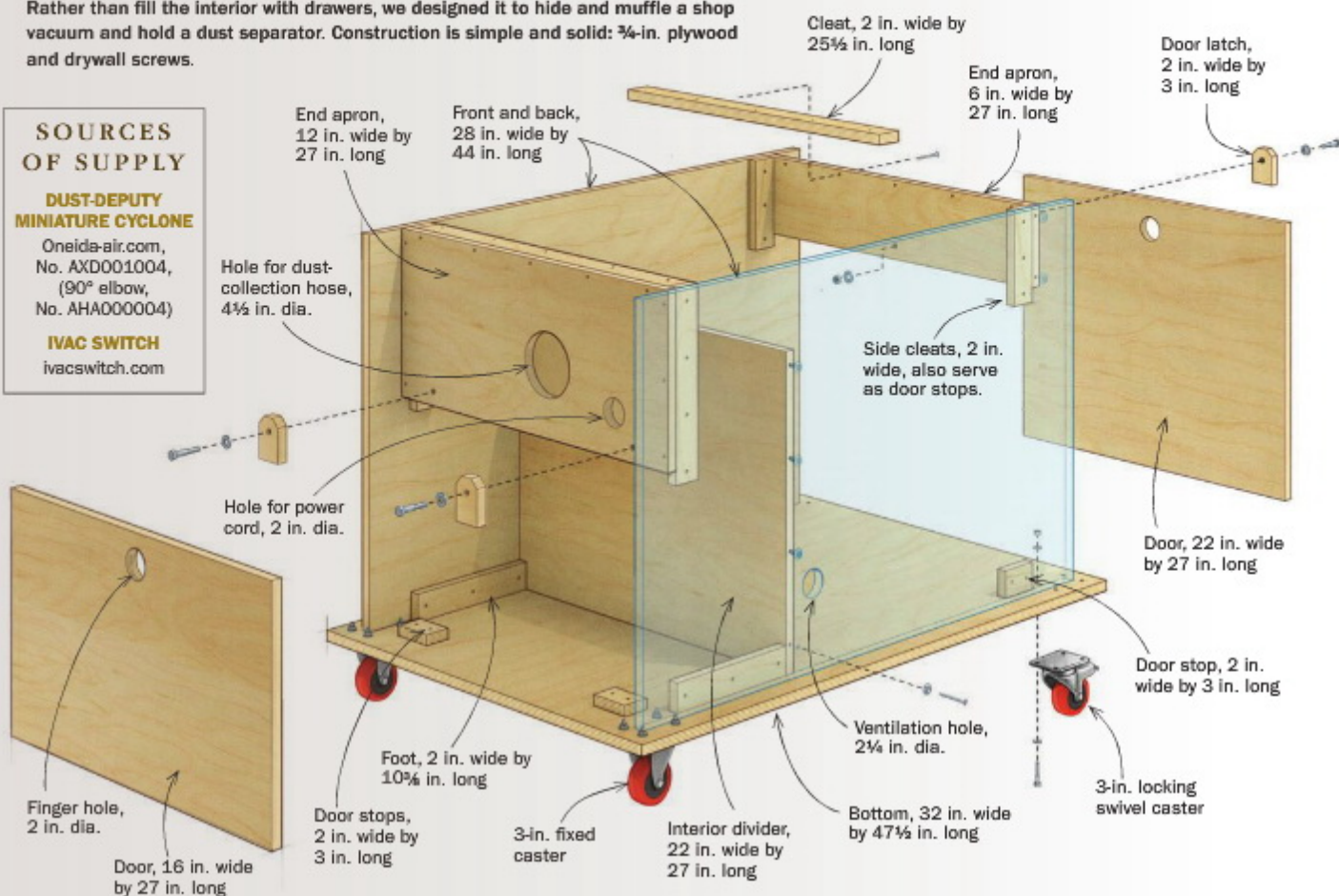
Rather than fill the interior with drawers, we designed it to hide and muffle a shop vacuum and hold a dust separator. Construction is simple and solid: $\frac{3}{4}$ -in. plywood and drywall screws.

SOURCES OF SUPPLY

DUST-DEPUTY MINIATURE CYCLONE

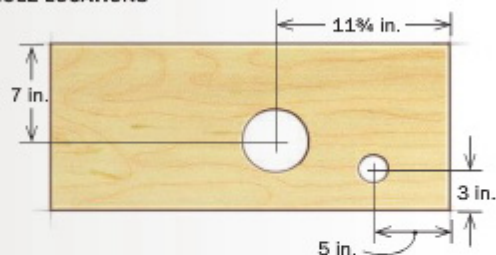
Oneida-air.com,
No. AXD001004,
(90° elbow,
No. AHA000004)

IVAC SWITCH
ivacswitch.com



Get a third hand for assembly. White used a simple plywood corner block to hold parts still and square to one another while he drove in screws.

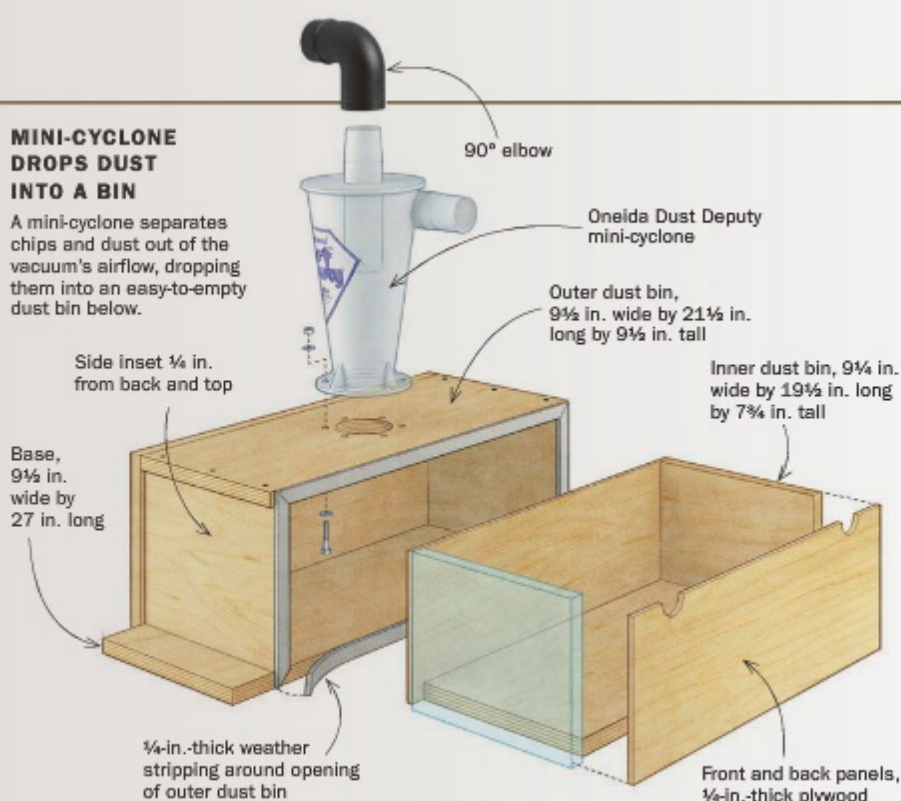
END APRON HOLE LOCATIONS



Add aprons for stiffness. Screw through the face into the cleats. On the cyclone end, pre-drill holes for the vacuum hose and power cords with a circle cutter.

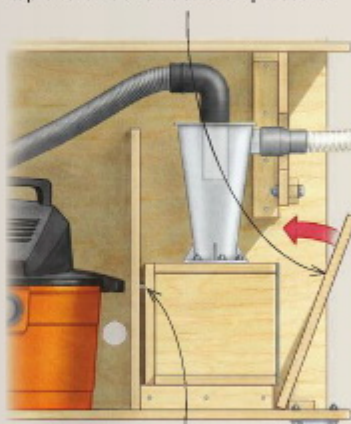
MINI-CYCLONE DROPS DUST INTO A BIN

A mini-cyclone separates chips and dust out of the vacuum's airflow, dropping them into an easy-to-empty dust bin below.



FINE-TUNE THE AIR SEAL

A door on the cabinet presses tightly against weather stripping on the dust bin, so the inner bin can be loose. Stops at the bottom and latches at the top of the door create even pressure.



Use drywall screws on the back of the dust bin to push it back and forth to fine-tune how much the weather stripping is compressed by the door.

agreed that the first thing this bench needed was a built-in source of electricity and dust collection. I kept things simple by attaching a commercially available automated vacuum outlet, the iVAC switch box, that turns on the dust collection when you power up the tool. And I made room in the base for both a shop vacuum and an Oneida Dust Deputy, a miniature cyclone that has proven its value (see "A Revolution in Dust Collection," p. 52-59) trapping the fine dust (and all of the chips) before it gets to the vacuum and clogs the filter.

This wired workbench also is taller (38 in. total) than traditional benches, moving the tool and the workpiece up to a height where you have better vision and control. It's wider, too, but not as long. I got rid of the traditional front and tail vises, opting for a simple but effective clamping system made from two pipe clamps. The benchdogs have soft heads that hold workpieces firmly, but won't dent or mar them. And there are locking casters underneath to make the bench mobile.

Finally, the wired workbench is much easier to make than a big, heavy traditional bench. Because it won't take the forces a hand-tool bench does, the entire bench is made from plywood. And there is no complicated joinery, just butt joints held



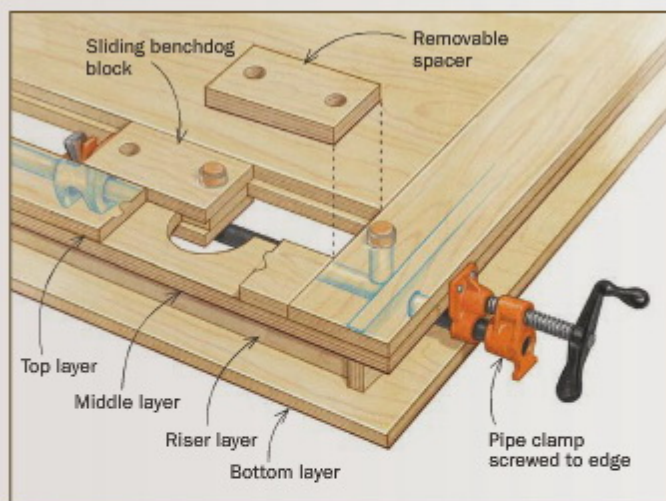
Weather stripping makes an airtight seal. Miter the corners with a chisel after you apply the stripping, and glue the corners together with cyanoacrylate glue.



Put the Deputy on the case. To create an airtight seal, apply a bead of acrylic caulk to the mini-cyclone's flange before putting it on the bin.

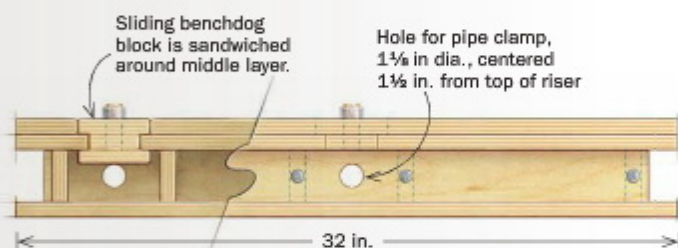


Connect the vacuum to the mini-cyclone. A 90° elbow makes the tight turn under the bench's top without restricting airflow like a crimped hose would.

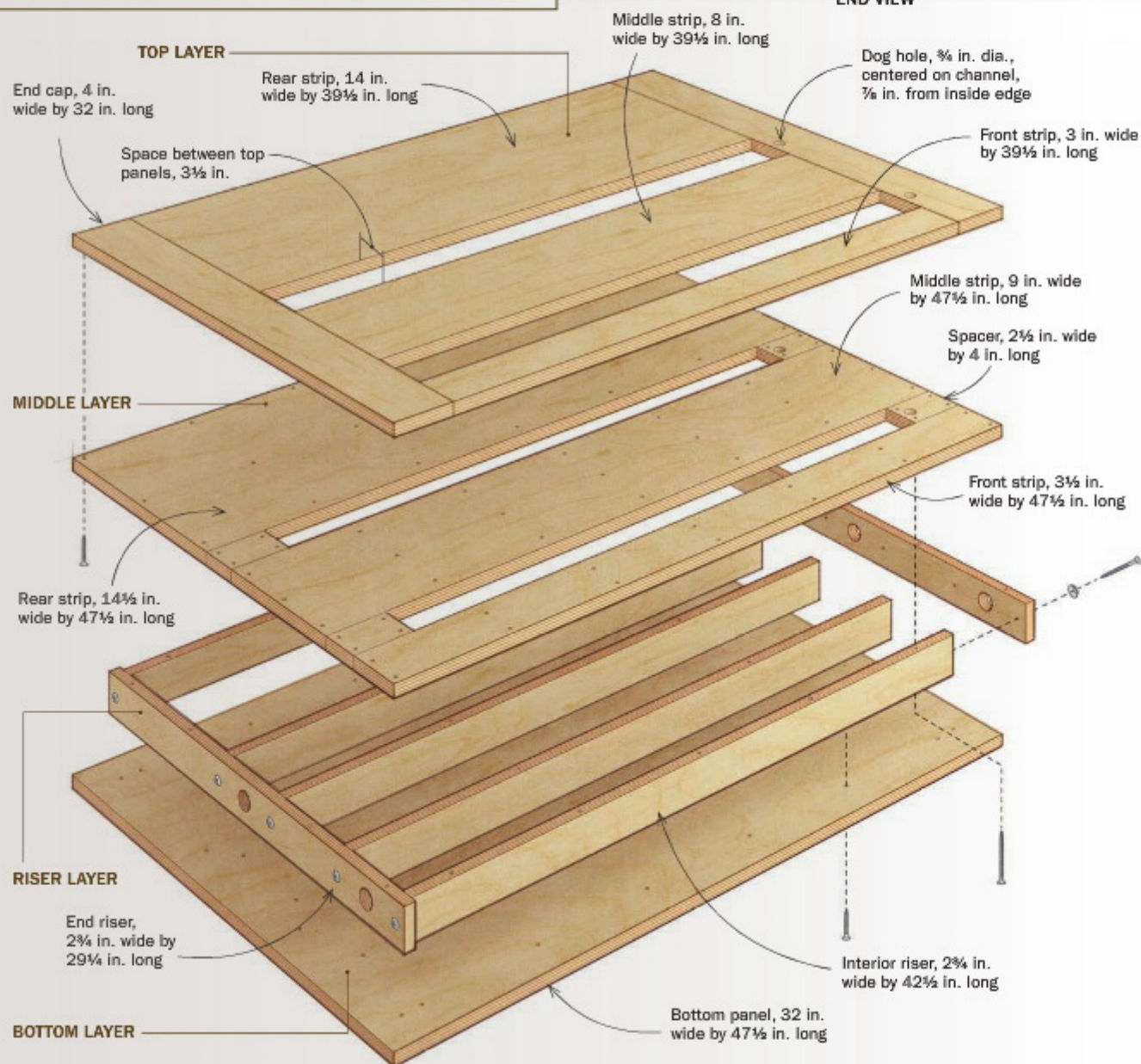


Layered top has room for clamps

This plywood top assembly has a clamping system built into it. The layered construction makes it easy to create tongued channels for the sliding benchdog blocks and a cavity for the pipe clamps.



END VIEW



BUILD THE TOP TWO LAYERS FIRST



Connect the top and middle layers. Pre-drill and countersink for the screws and use an outcut from the plywood to keep the edges aligned as you drive the screws.



Use spacers to locate slots for clamps. Make sure they're dimensioned and placed accurately, because they determine where you drill holes for the stationary benchdogs.



Drill for the stationary benchdogs. Leave the spacers attached and drill through both pieces at once. Use scraps to support the far end of the assembly.

together by screws. Where they show, I've used stainless-steel deck screws and finish washers for a clean, modern look.

If you already have a heavy hand-tool workbench, this one will make a great, mobile, secondary workstation. And if you rely mostly on power tools, this might be the only bench you need.

The base is a dust collector

It's not too difficult to cut accurate parts from plywood. (For a few tips, see one of my recent articles: "Best-Ever Outfeed Table," *FWW* #202). I'll skip over that process now and just explain how the parts go together.

I put the vacuum and the mini-cyclone in the base for two reasons: First, enclosing the vacuum muffles it. Second, it makes the bench a self-contained unit. There's no vacuum trailing behind it like a baby elephant behind its mother.

Start assembling the base with the bottom panel, pre-drilling holes for the casters. Then attach the front panel to the bottom. Screw the interior divider to the base and then to the front panel. Next, attach the back panel to the base and divider, but before you do, drill the ventilation hole (the power cord for the iVac switch also passes through this hole).

An apron runs across the top of the door opening at both ends of the base. Each apron is screwed to plywood cleats. The top cleat attaches the top assembly. The side cleats serve as door stops. After assembling the aprons and cleats, screw them between the front and back panels.

Then turn over the base and bolt the casters to it. Flip the cabinet back over and

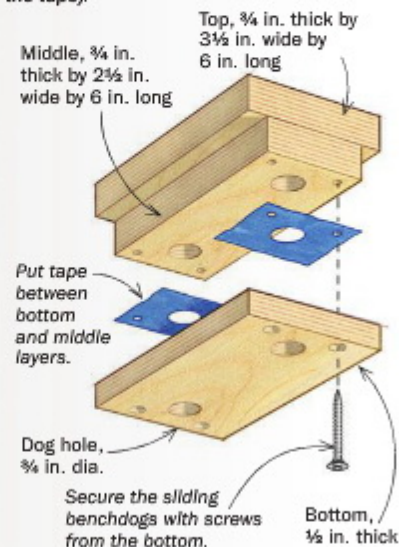


ADD THE RISER FRAME AND SLIDING DOGS

Long screws. Screw down through the frame pieces and into the top.



Make the sliding benchdog blocks. After drilling dog holes through the assembled blocks, take off the bottom layer and put the blocks in place. Three stacked pieces of blue tape, added after the dog holes are drilled, create enough play for the block to slide easily (use a knife to cut openings in the tape).



Install the low-cost clamping system

Whether you're sanding or routing, the workpiece needs to be held still. White's ingenious "vise" is nothing more than $\frac{3}{4}$ -in. pipe clamps and a clever system of sliding blocks and dogs, but it gets the job done and applies pressure close to the bench's surface—without sticking up and getting in the way.



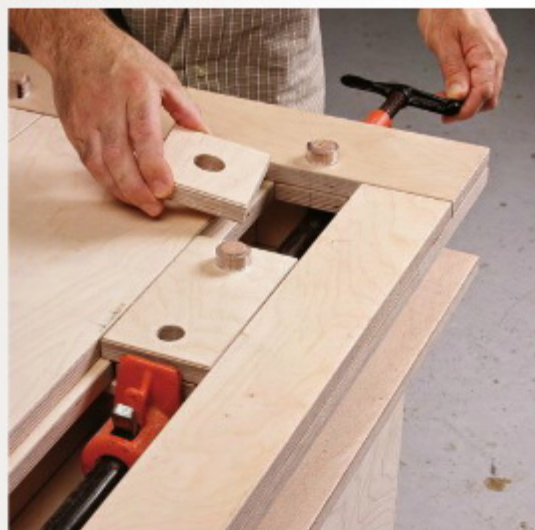
Put the top on the base. It's heavier than it looks, but one person can do it. Screw through the cleats in the base, into the top.



Install the pipe clamps. Put the bare end in and through the adjustable clamp head. Tighten it completely, and mark it where it's flush with the top's edge. Take it out, cut it to length, and put it back. Screw the fixed head to the bench through pre-drilled holes (inset), so you can open and close it without holding the head.



Low-tech benchdogs. A sharp knife is all you need to cut the plastic tubing that fits over the dowels (above) so they won't mar or dent workpieces. Use filler blocks to cover the slot (right). You need several of different lengths for complete coverage no matter where the benchdog block and clamp head are.



install the doors. Attach the lower door stops to the sides of the cabinet and to the bottom panel. Then screw the pivoting door "locks" to the apron.

Collect the dust in an airtight box—The Dust Deputy is a plastic cyclone typically attached to the lid of a 5-gallon bucket, which collects the chips and dust when they fall out of the cyclone. But such an assembly is too tall to fit inside the base cabinet, so I came up with another way to collect the debris. Of course, that meant overcoming a big challenge, because for

the cyclone to work properly, the box needs to be airtight. Fortunately, I found an easy way to do that, because—and this is the cool part—you don't need any special tools or materials to make it.

The cyclone sits on top of a box, and inside the box is a removable drawer that catches the dust and chips. When it is full, you just open the box, pull out the drawer, dump it in a trash can, and put it back in.

The butt joints in the box are tight enough to prevent airflow and the door

can be used to create a tight seal around the opening. Just apply foam gasket—the kind used for weather stripping on entry doors—around the opening for the door, mitering the corners and gluing them together using cyanoacrylate glue. When the door closes against the gasket, it creates an airtight seal.

To fine-tune how much the door compresses the gasket, I drove two drywall screws into the back of the outer dust bin. Adjusting the screws in and out moves the box farther from and closer to

the door and compresses the gasket less or more.

Finally, to complete the airtight box, apply a bead of acrylic caulk around the opening for the cyclone before bolting it in place.

The top is a vise

The cool thing about this top is that, like my new-fangled workbench, it has a clamping system built into it. All you need are two $\frac{3}{4}$ -in. pipe clamps—this bench is designed for Jorgensen No. 50 Pony clamps—some $\frac{3}{4}$ -in.-dia. dowel, and $\frac{3}{4}$ -in.-internal-dia. vinyl tubing. The dowel is cut into short lengths to make benchdogs and the tubing slides over the dogs to keep them from marring or denting your work, something you don't want to have happen when you're sanding a door just before applying a finish.

Here's how it works. A block of plywood with a dog hole drilled in it is pushed against the sliding jaw of the pipe clamp. The other jaw is fixed to the apron. You can move the sliding jaw wherever you need it, and the dog hole moves along with it.

The top is made from layers of plywood strips, but it is plenty rigid for power-tool work (and some hand-tool work like light planing). Screw the top and middle layers together. Mark the locations of the stationary benchdogs, partially disassemble the parts, and drill the holes.

Now that the basic structure of the top has been assembled, make and attach the riser layer. The two end risers need holes for the pipes to pass through. Drill them at the drill press.

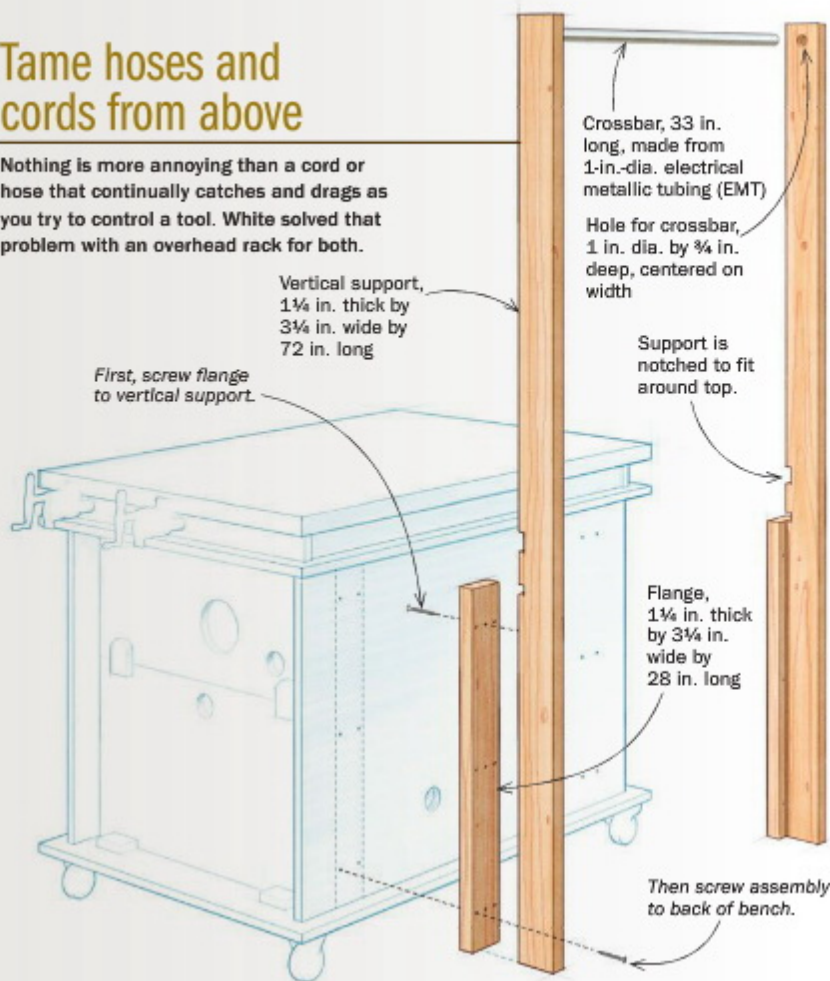
Next, make and install the sliding benchdog blocks. Assemble the layers and drill a hole for the benchdog. Take off the bottom layer, add some tape to make the groove a bit wider than the tongue on the top, and install the blocks. Now attach the bottom panel to the risers. Then set the entire assembly onto the base and attach it by screwing through the cleats and into the bottom panel.

Make filler blocks for the slots. Then make some benchdogs from a length of dowel and slip some vinyl tubing over one end. Finally, install the pipe clamps. □

John White is a former shop manager at Fine Woodworking.

Tame hoses and cords from above

Nothing is more annoying than a cord or hose that continually catches and drags as you try to control a tool. White solved that problem with an overhead rack for both.



Elegantly simple. White used a key ring and O-ring bought at a local hardware store to suspend the hose. Another one holds the cord. They slide easily over the electrical tubing used for the crossbar.



GO-ANYWHERE DUST COLLECTION

No matter how many hoses or ducts you have running from your main dust collector, you need a shop vacuum. Compact and mobile, they can go anywhere you can tote a power tool. Many tools, especially sanders, actually work better with a vac attached, and today's HEPA filters mean you can toss your dust mask.

Shop Vacuums

With better filters and features, new vacs are must-have companions for power tools

BY ASA CHRISTIANA

As part of our research for "A Revolution in Dust Collection" (pp. 52-59), *FWW* shop manager Bill Peck and I brought in the best shop vacuums we could find. We used them in our filter testing, and planned to show just a few as part of a whole-shop guide to dust management. But somewhere along the line, one of us realized, "Duh, we've got a full tool test of shop vacs on our hands." So here is your guide to the most effective and user-friendly shop vacuums on the market.

Three Indispensable features

We selected only the vacs that come standard with HEPA filters, the finest available. Simply put, anything less is less safe, allowing the finest, most dangerous dust into your shop air and your airways. Where there was more than one similar model and the only difference was capacity, we went with the smaller model to save you some money. We did allow in one vac that

doesn't offer HEPA as a standard item—the 12-gal. DeWalt D27904—because it has a self-cleaning feature (shared only by the Bosch Airsweep), and we ordered the accessory HEPA replacement filter for it.

Two features that have become state-of-the-art for shop vacuums are variable suction and an onboard power outlet. These features are related: If you have a tool plugged into the vacuum, the combined amp draw might trip your breaker. So it's nice to be able to dial back the suction a bit to draw less power. Also, with some sanders, full suction will pull the tool against the wood, making it harder to move it.

And of course, onboard power is a wonderful thing. You just plug in your router, sander, or whatever, and when you turn it on, it triggers the vac too. One less switch to hit, and one less extension cord to drag around. And the vacuum keeps running for a few seconds after you switch off the tool, grabbing the last few chips.

All but one of the vacs we tested—the Dustless Technologies HEPA Vacuum—include these user-friendly features.

The problem with filter bags

Because of their HEPA filters, all of these vacs also have some kind of bag inside as a pre-filter, which keeps the superfine filters from clogging and cutting suction in half.

The bags do their jobs well, keeping airflow close to its initial high, but most woodworkers probably won't use them in the long run. They reduce the capacity of the vac canister—drastically in most cases—and they fill quickly. Unfortunately, they can't be emptied and re-used, and at an average of \$5 each, we don't think you'll go on replacing them for long. Without them, however, the HEPA filter clogs quickly. At that point, for most of the vacuums, you'll have two choices. You can bang them out over a trash can, filling your head with a cloud of the very dust you are



Friendly features

You'll appreciate these every time you plug a power tool into your vacuum. In fact, we consider them to be essential for woodworkers.



Tool-activated startup

All but one of the models we tested have an onboard tool outlet that starts the vac when you turn on the tool, and runs for a few extra seconds when you are done. That makes one less cord to drag around, and one less switch to hit.

HEPA filtration

You need very fine filtration to keep the tiniest, most dangerous dust out of your nose and lungs. HEPA filters are the best choice, and all but one of the vacs we tested make it a standard item.



trying to avoid, or you can add a dust separator (see "Best of the separators," p. 58). The best will catch 99% of the chips and dust, keeping your HEPA filter remarkably clean. But a separator is another expense, and another thing to drag around at the end of the vacuum hose.

Bosch is the exception

Two of the vacuums, the Bosch Airsweep and the DeWalt D27904, have automatic filter shakers, designed to unpack the pleats and get the air flowing freely again. So in theory at least, you should be able to run both of these vacs without a separator. But in our tests, one filter-cleaning system worked much better than the other.

With the Bosch, when you turn off a tool that is plugged into the onboard power outlet, the vac automatically shuts off after 7 extra seconds of run time, and then the cleaner switches on, shaking the dust off the filter. If you don't have a tool plugged in, you can activate the cleaning function with a push-button. The DeWalt filter vibrator turns on much more often: once every 15 seconds while the vac is running.

Of the two, the Bosch Airsweep worked best in our tests, restoring the airflow almost to full power so you don't need to attach a separator to the vacuum or shake its filter over a trash can. Its working airflow was the highest in the group, no matter how much dust we fed into it. It also has the second-highest canister capacity. So the Bosch was an easy choice for Best Overall.

Adjustable power



All but one of the vacs has a power dial. These are handy when you have a powerful tool plugged into the vac, and the combined amp draw could trip a circuit breaker.

3 ways to keep the filter clean

HEPA filters clog more quickly than the standard filters in shop vacuums, which can cut suction power almost in half. So it is essential to keep them clean.

1. USE THE BAGS

All of the vacs we tested employ a disposable bag as a pre-filter, and these work well if you are willing to replace them frequently (see below).

Why you'll probably ditch the bags



Small, pricey, and not reusable. Dust bags reduce a canister's capacity, and they fill quickly in a woodworking shop. Unfortunately, they aren't easily emptied and re-used. And being sophisticated filters themselves, they cost \$4 to \$6 each, meaning replacement costs will mount up quickly.

2. ADD A SEPARATOR

In our article on whole-shop dust collection (see p. 52), we found separators to be extremely effective in keeping shop-vacuum filters unclogged and working efficiently.



BEFORE



AFTER

Unclogged in seconds. In our airflow tests, the Bosch system brought suction close to full strength again, no matter how clogged the filter had been.

3. OR BUY THE BOSCH

The Bosch's filter shaker turns on automatically when you have a tool plugged in, and you can activate it manually when you don't. The DeWalt D27904 has a filter cleaner too, but it wasn't as effective in our tests.



Shop vacuums for woodworkers



BOSCH AIRSWEEP 3931A



DeWALT D27904



DeWALT D27905H

The Bosch has two small drawbacks: It is the noisiest vacuum in the group, so wear ear protection (which you should be doing with power tools anyway). And it has one of the narrowest hoses. This didn't hurt its airflow much, and it's fine for collecting chips and dust from a power tool, but it will be more prone to clogging if you use your vacuum to sweep big shavings off the shop floor. (I used to do that, but then I discovered Rockler's Dust Right accessories, which let me use my powerful, full-size dust collector as a big vacuum for general cleanup. For a review, see *PWW* #203, p. 22.)

Dustless Technologies looks like the bargain of the lot, but it lacks an on-board tool outlet and you'll need to buy either a pile of bags or a dust separator to keep its HEPA filter clean and flowing freely, and then it won't be any cheaper than the Bosch. So we went in a different direction with our Best Value award. Based on our testing, the least expensive way to get a shop vacuum with good filtration and powerful airflow is to keep the vacuum you have and add an after-market HEPA filter and a separator. □

Asa Christiana is editor of *Fine Woodworking*; Shop manager Bill Peck handled the testing.

BY THE NUMBERS

The "working airflow" number represents the cubic feet per minute of airflow without the bags in place, after filling the canister twice but not cleaning the filter. We did activate the Bosch's self-cleaning feature, however, and the DeWalt D27904's ran on its own. We also list each vacuum's initial airflow for comparison.



MODEL/SOURCE

Bosch Airsweep 3931A
boschtools.com

DeWalt D27904
dewalt.com

DeWalt D27905H
dewalt.com

**Dustless Technologies
HEPA Vacuum**
dustlesstechnologies.com

Fein HEPA Turbo III
fein.com

Festool Cleanex CT 26
festoolusa.com



**DUSTLESS TECHNOLOGIES
HEPA VACUUM**



FEIN HEPA TURBO III



FESTOOL CLEANTEX CT 26

STREET PRICE	POWER	CANISTER CAPACITY	BAG CAPACITY	NOISE	INITIAL AIRFLOW	WORKING AIRFLOW
\$550	11 amps	13 gal.	8 gal.	91 db	86 cfm	77 cfm
\$500*	9 amps	12 gal.	6 gal.	85 db	77 cfm	58 cfm
\$550	9 amps	10 gal.	3 gal.	72 db	68 cfm	27 cfm
\$450	10.6 amps	16 gal.	6 gal.	78 db	79 cfm	60 cfm
\$550	11 amps	15 gal.	4 gal.	74 db	90 cfm	59 cfm
\$550	10 amps	7 gal.	6 gal.	73 db	61 cfm	31 cfm

* plus \$115 HEPA accessory filter



Best Value is the vac you already own.
Outfit it with an aftermarket HEPA filter and a dust separator, and you'll have a safer, more powerful shop vacuum for under \$100.

Pivoting Plywood

Never wrestle with sheet goods again

I build a variety of furniture using solid wood, veneer, and plywood, and since I work in a one-man shop, I constantly look for ways to make the experience as easy and efficient as possible. One of these ways is my panel cart. With this cart, I can stop struggling with 4x8 sheet goods such as medium-density fiberboard (MDF) and plywood, and easily move them about the shop. And because I built the cart to the height of my tablesaw, I can tilt the sheets horizontally to feed them directly from the cart onto the tablesaw.

Large swivel casters, a brake, and a steering handle make for easy maneuvering. A simple design and very basic joinery, tied together with bolts, make this a project that easily can be built in a day, so you can get right back to making furniture. Next to its usefulness, the best thing about this cart is that the materials

MOVE AND CUT LARGE PANELS WITH EASE



Roll. Large wheels and a pull handle help you tow a heavy load (left). Note that the back side can hold a pile of rough lumber. A foot brake locks the cart in place (above).

Cart

BY
MICHAEL
PURYEAR

are relatively inexpensive. Because you can use dimensioned construction lumber and/or scraps you have kicking around the shop, the cost is limited and mostly for the hardware.

Using the cart

I load 4x8 sheets on the panel carrier side and rough lumber on the other. I can then move the cart around the shop wherever it is needed, and it doesn't disturb the lumber when I tilt the sheet goods to the horizontal position. The four swivel casters allow me to push the cart in any direction without having to turn it around, and the handle lets me tow the loaded cart.

The cart lets me store, move, and rip up to eight 4x8 sheets. With multiple sheets stacked on the cart, the top sheet will be higher than your table-saw when you tilt the sheets up into position. But you can still slide it onto the saw table and cut it safely. When you lift the pivoting frame, two latches lock it into position.

To lower the pivoting frame, you pull a cord to release the latches and lower the



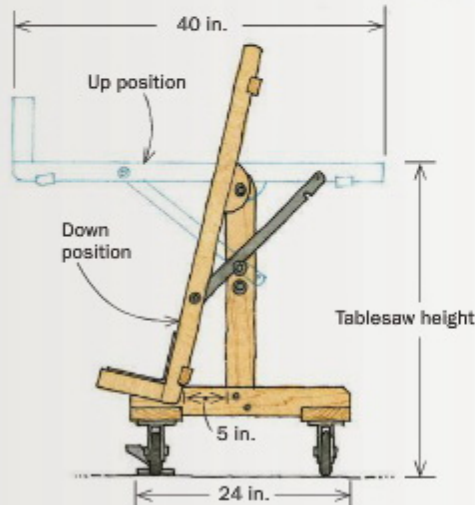
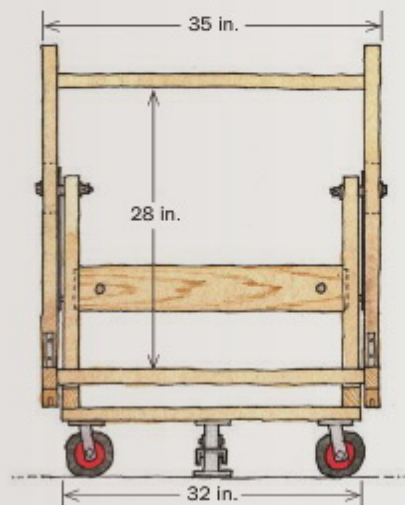
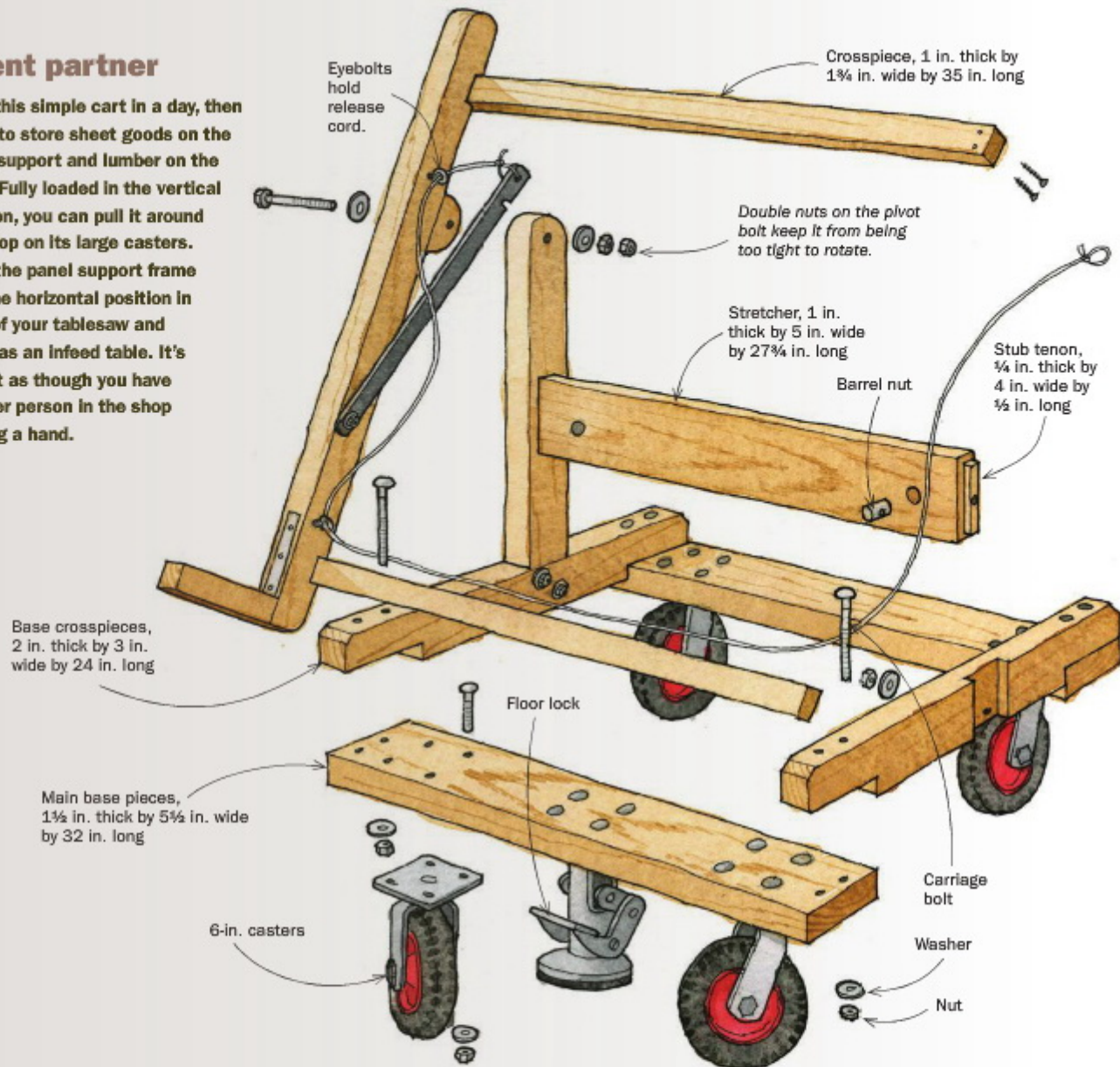
Pivot. Tip the support frame that holds the sheet goods into the horizontal position, where it locks automatically. Then move the cart into position and apply the brake.



Push. The cart supports the back end of the plywood, freeing you up to feed the material and apply pressure against the fence.

Silent partner

Build this simple cart in a day, then use it to store sheet goods on the panel support and lumber on the deck. Fully loaded in the vertical position, you can pull it around the shop on its large casters. Pivot the panel support frame into the horizontal position in front of your tablesaw and use it as an infeed table. It's almost as though you have another person in the shop lending a hand.



SOURCES OF SUPPLY

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leevalley.com (No. 05G07.01)

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harborfreight.com (No. 94354)

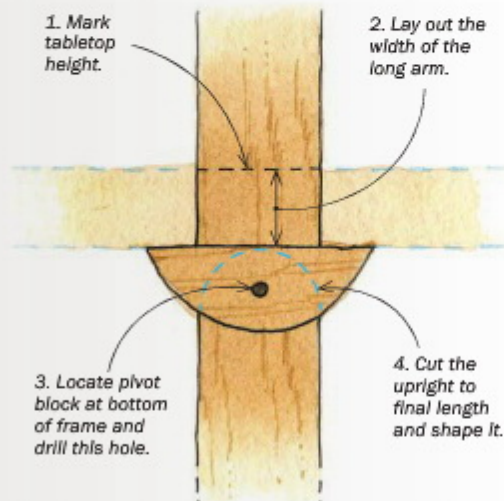
FLOOR LOCK AND CASTERS
globalindustrial.com (No. CJ241851, lock; No. WB601122, casters);
harborfreight.com
(No. 41565, casters)

SET THE PIVOT HEIGHT

The frame's height is important. It can be a little higher than the tablesaw height, but not lower.



Take time to get it right. Once the base frame is built, add the casters and clamp an upright to the base. Adjust a marking tool to the tablesaw table. Puryear uses an Accuscribe from FastCap, and then he transfers that mark to the upright.



Long arm, 1½ in. thick by 2 in. wide by 40 in. long

Upright, 2 in. thick by 3 in. wide

Pan-head screw keeps latch in place.

Notch

Steel bar

Semi-circle pivot block

Fender washer

Lag screw

Drawbolt

Bolt

Angle bracket

Pull handle

Notch, ½ in. deep, inset 2½ in. from bottom

Bridle joint

Short arm, 1½ in. thick by 2 in. wide by 9 in. long

structure. What a pleasure not having to wrestle sheet goods onto the tablesaw when working alone.

A very basic base with casters

The base construction is simple. Except for the mortises in the uprights, I cut all of the joinery on the tablesaw. To line up everything perfectly, cut both crosspieces at once, clamping them together and using a miter gauge and dado blades with multiple passes. The uprights that hold the tilting panel support frame determine the final height of the cart in its horizontal position. Base their length on your caster height and the height of your tablesaw. Right now, cut them longer than you will need until you settle on a final height (a little later in the process).

The bottom end of each upright gets a half-lap that corresponds with the half-lap in the base of the crosspieces. Each upright also

PUT THE PIECES TOGETHER

The final assembly is straightforward. Work from the ground up.

FINISH THE BASE



Assemble the base. Connect the four base pieces, attach the casters, and add the stretcher and two uprights.

LOCATE THE PANEL SUPPORT



One L at a time.

After making the two L-shaped pieces and notching them for the crosspieces, but before gluing in the crosspieces, you need to locate the Ls on the uprights. To do this, bolt a semi-circle pivot block to its upright, and clamp one of the Ls to the base (above) so its lower crosspiece will hit the base about 5 in. from the upright. Mark the block's location on the L.



gets a centered mortise (cut with an edge guide on a router) to hold the stub tenon of the stretcher. I reinforce this joint with a drawbolt. I clamp the stretcher to the uprights and drill through both for the drawbolt and barrel nut. Once this joinery is cut, bolt the casters and the crosspieces to the main base. Don't attach the uprights yet.

This is a good time to talk about the casters. The loaded cart can get heavy. I use four heavy-duty 6-in. swivel casters rated at 330 lb. each, which are not available with total locking brakes. In lieu of brakes, I added a floor lock. I prefer all four casters to swivel because it makes maneuvering around the shop easier. I wouldn't use casters smaller than 5 in., because small obstacles on the floor will stop them dead.

Tilting panel support affects the height of the uprights

To build the panel support frame, start by making the two L-shaped pieces. Cut the notches for the crosspieces using a dado blade. The elbow is a bridle joint that I reinforced with angle brackets because they will carry all the weight of the 4x8 sheets.

To determine the height, clamp an upright to the base. Roll this assembly up to your tablesaw and mark the height of the table on the upright.



Glue on the pivot block. With the pivot blocks marked for position, glue and clamp one to each L. Now you can glue in the crosspieces to complete the panel support frame.

ATTACH THE PANEL SUPPORT AND RELEASE



Then move to the bandsaw and cut two semicircular pivot blocks from 1½-in.-thick lumber and drill a hole centered between the corners and 1 in. from the flat side. Clamp each block to its upright with the flat side parallel to and 2 in. below the line marked as the tablesaw height. Center the hole in the block on the upright, and drill through it into the upright. Repeat for the second upright. Now the pivot blocks are located on the uprights so that they will hold the support frame level with the top of the tablesaw when the frame is tilted to the horizontal position.

Cut the uprights to length, radius their tops, and bolt each one to the base. Then round over the top and bottom of each L (for aesthetic purposes only). Once that's done, insert a bolt through one pivot block and into its upright. Rest one of the Ls on the block and adjust it so that the bottom of the lower crosspiece will land on the base 5 in. from the upright. Clamp the L to the base and then to the pivot block and mark the block's location on the L. Transfer the marks to the other L and glue the blocks in place.



Connect the panel support frame to the base. Nuts and bolts with washers on either side keep things together (far left). The notch in the latch rests on a lag screw between a washer and the upright (left). An extra screw will act as a stop and keep the latch from jumping out of line. The washer guides the bar back in place.



Simple release. A cord that runs from the end of one latch around the frame through eyebolts and to the end of the second latch is pulled to lift the latches, releasing the panel frame so it can pivot into the vertical position.

Latch system holds panel support horizontally

For the latch system, I use two steel bars (available at most hardware stores). I drill holes on each end and use a hacksaw to turn one hole into a notch (I also drill a smaller hole for the release cord). One end gets screwed to the L of the support, and the notched end hooks over a lag screw in the upright. To mark the latch's bolt hole on the L, pivot the panel support horizontal and level and place the latch notch over the lag screw on the upright. Drill the bolt holes, then bolt the latches loosely in place so they move easily using locking nuts. Place pan-head screws on the uprights above each latch so that the latches can disengage but not rise above the fender washer. Leave ⅛ in. between the head and the upright.

Because I can't unhook both of those bars and hold the cart support while it's pivoting, I attached a cord that runs between the bars and allows me to unhook them at the same time. Finally, attach a pull handle to one end of the cart. □

Michael Puryear is a furniture maker in Shokan, N.Y.

readers gallery

WORKBENCHES



GREG SCALA

Toronto, Ont., Canada

Scala knew that he needed a workbench that was dead-flat, sturdy, equipped with good vises, and built at the right height for his 5-ft.-9-in. frame. He also wanted a board jack, a Veritas twin-screw end vise, lots of benchdogs, and a vintage feel. He modeled his maple and walnut bench (34 in. wide by 82 in. long by 32½ in. tall) after Lon Schleining's "Essential Workbench" in *FWW* #167. Then he added an "outrigger" along the back edge to hold chisels, a built-in paper supply to protect the top during glue-ups, and two moveable lights. Scala also put a row of dog holes in the front apron to support long boards. The bench is finished with polymerized tung oil and Scala says it took him about 100 hours to complete. Go to FineWoodworking.com/extras for a link to an article about making the bench that Scala wrote for the Lee Valley newsletter.



Custom-cut end vise.

To give the vises a vintage look, Scala embedded the Veritas twin-screw hardware in the walnut jaws and shaped the ends of the jaws to mirror the trestle feet. He covered all the mechanical parts with a brass plate, which he etched with a scrolled design. Then he applied flux to the raised portions of the design and built them up with auto-body solder. Finally, he painted the metal parts black.



THOMAS BOROWICZ

Brantford, Ont., Canada

A tool-and-die maker and industrial engineer, Borowicz is interested in precision, and his bench shows it. A granite plate (3½ in. thick by 12 in. wide by 18 in. long) in the top elevates for use when lapping or honing tools and adds heft to the bench. The bench is 26½ in. wide (37½ in. including the front vise) by 85 in. long by 34¾ in. tall, made from curly and bird's-eye maple, ribbed mahogany, curly sycamore, ebony, and purpleheart. Borowicz machined most of the hardware on his metalworking lathe and used UHMW plastics to reduce friction on the vise slide guides and under the feet, to make the bench easier to move. Borowicz worked on the bench evenings for four months. The finish is Tried & True Varnish Oil.



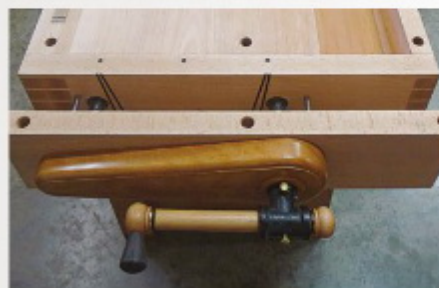
Precision plate. The crank handle under the benchtop (left) moves the granite plate up for sharpening (right) and down for normal bench use.



DARNELL HAGEN

Saskatoon, Sask., Canada

When Hagen set out to build his dream bench, he knew he'd be using it for the next 40 years, so he went all out. The 15¾-in.-wide top and the panels used on the back and ends all came from the same giant beech board. He used the same board for the bookmatched drawer fronts. The drawer boxes are sugar maple with Baltic-birch bottoms and hand-cut dovetails (half-blind in front, through in back). The front vise is a Veritas Tucker with a hand-carved flush mount. On the end is a modified twin-screw Veritas vise with one handle removed and a custom chain cover (right). Hagen turned the vise handles from curly beech and added brass accents. Still not satisfied, he added a tool tray, a built-in pencil sharpener, ebony dovetail-angle guides in the vise jaws, and a cup holder. The dovetail guides show him how to angle the boards so the saw cuts are plumb. It's easier to saw accurately that way. The bench is 27½ in. wide by 76½ in. long by 37 in. tall and weighs 460 lb. empty; 600-lb.-plus with tools. The finish on the base is wipe-on poly, the top is unfinished. Hagen says building the bench took five months of weekends. For construction details and more photos, go to FineWoodworking.com/extras for a link to Hagen's blog.



Custom cover. Hagen modified a Veritas twin-screw vise by removing one handle and building a custom wooden chain cover. The inlaid ebony dovetail-angle guides are visible on the inside face of the vise.

Riving-knife retrofit not an option for most tablesaws

Q: After reading Asa Christiana's Q&A on the safety of American tablesaws (*FWW* #220, p. 88), I went looking for a riving knife to put on my older saw. However, I couldn't find one. Am I not looking in the right place, or aren't there any?

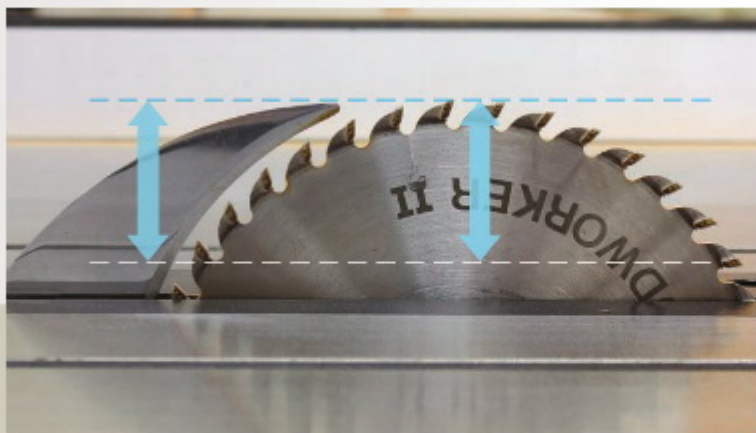
—ANDY WHITE, Prince George, B.C., Canada

A: UNFORTUNATELY, YOU WON'T FIND a riving knife for your saw, because the design of traditional American-style tablesaws can't accommodate one.

The advantage of a riving knife is that it moves in tandem with the arbor and can be set just below the height of the blade, so it never really needs to come off the saw. That's possible because the mounting bracket for the riving knife is directly behind the blade and is part of the assembly that holds the arbor. On traditional American saws, the arbor is at the end of a pivoting arm that is attached at the front of the saw, and there is nothing behind the arbor that could be used to attach a riving knife.

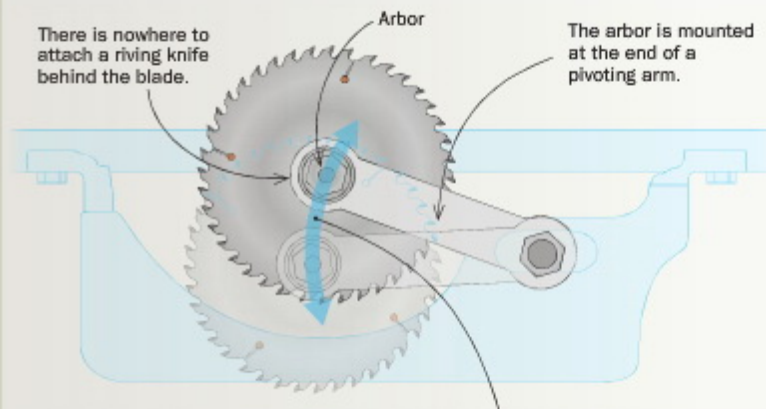
Since you can't retrofit a riving knife, your best option is to make a zero-clearance insert with a shopmade splitter (see *FWW* #217, p. 84).

—John White is a former *FWW* shop manager.



Always at the right height. A true riving knife raises and lowers with the blade, so it can stay just below the high point, and stay on the saw for all types of cuts.

OLD SAWS WEREN'T DESIGNED FOR THEM



The blade swings through an arc as it changes height, so even if there were a riving knife attached, its height would change in relation to the top of the blade.



A shopmade splitter is the next best thing. It can't move with the blade, but it works for the majority of cuts, which are made with the blade at 90°.

Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

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Resaw difficult woods without ruining your blade

Q: I followed Michael Fortune's advice for resawing in his video ("Resawing on the Bandsaw," FineWoodworking.com), but I did not get plies of consistent thickness when resawing some mesquite. The blade bowed back and forth, producing wavy cuts. Any advice?

—BILL BELKNAP, Modesto, Calif.

A: THE CULPRIT IS A DULL BLADE, most likely made worse by the mesquite. It tends to pick up grit from the soil as it grows—murder on a bandsaw blade. That is a potential problem for any board with a natural edge. But I often resaw that type of wood without trouble. Before you start, make sure you have a sharp blade on the saw, and then scrape the outer surface of the wood, especially the top edge (where the teeth of the blade enter).

—Michael Fortune is a contributing editor.



Sharp blades stay on track. One that wanders or leaves a curved surface is dull and needs to be changed. When resawing natural-edge boards, scrape the upper edge before resawing. The blade will stay sharp longer.



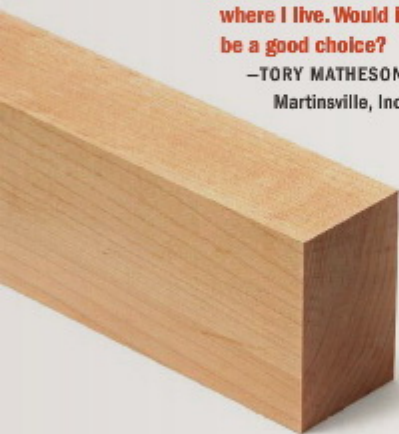
For a benchtop, use light-colored, closed-grained wood

Q: I'm making my first workbench and want some advice on which wood to use for the top. I like ash and it's readily available where I live. Would it be a good choice?

—TORY MATHESON, Martinsville, Ind.

A: SELECT A WOOD FOR A BENCHTOP based on five criteria: color, hardness, stability, ease of handplaning, and pore size. First, choose a light-color wood, like maple, because it reflects light better and makes it easier to see your work. And because benches take abuse, the harder the better. A wood that's dimensionally stable moves less, so you won't need to flatten it as often. But you will need to flatten it eventually, so choose a wood that's easy to plane. Ash has open pores that can collect dust, dirt, and grime, which can dull a plane blade very quickly when you are flattening the top. I'd use hard maple, soft maple (not really soft, actually), or beech.

—Matt Kenney is a senior editor.



Just right. Choose a wood that is light in color, easy to plane, and has small pores, like maple.



Don't make this job any harder. Planing a benchtop flat is a serious workout, so build your top from a wood that planes easily. Hard maple is a great choice.

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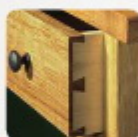
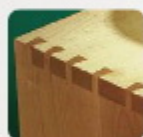
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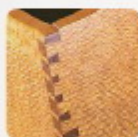
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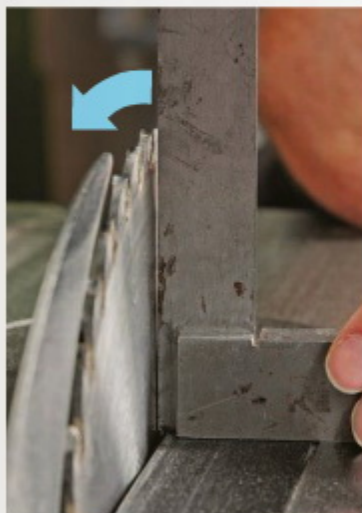
Don't trust the internal stop to set a tablesaw blade at 90°

Q: I spent a long time adjusting the 90° stop on my tablesaw. At first it worked fine, but now the blade always stops short of 90°. What's wrong and how can I correct the problem?

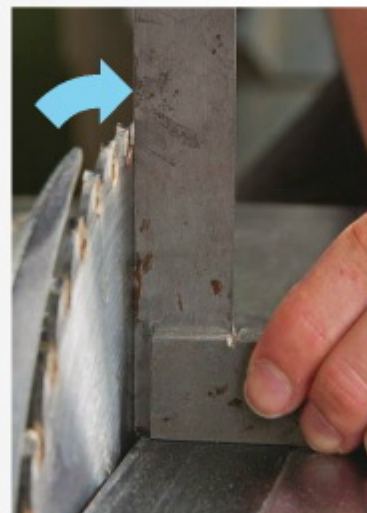
—CARL HURST,
Plainview, Texas

A: MOST LIKELY THERE IS SAWDUST BUILT UP on the setscrew. Clean it off and it should work fine. However, you'll just need to clean it off again in the near future. That's a hassle, so instead I set my stop so that the blade can go past 90°. I then place a square on the table and move the blade back until it's just right. It takes just a minute and it assures a precise setting.

—Michael Pekovich
is the art director.



Go past square first. Don't set the stop for exactly 90° or any dust buildup will void the accuracy. Instead, allow the blade to go slightly past vertical.



Then come back. Place a square next to the blade and adjust the blade's tilt until the angle is correct. (Make sure you're not hitting a tooth.)

One coat of wax does the trick

Q: Is there any reason to apply more than one coat of wax over a finish?

—KEITH PATTERSON,
Dearborn, Mich.

A: NO. ONE COAT IS ALL YOU NEED. Although wax provides a little more water resistance to a finish like shellac, its main benefit is the sheen and tactile surface it leaves behind. It just invites a touch. To maintain its appeal, just put down a fresh coat over the old one once a year.

—Peter Gedrys is a
professional finisher in East
Haddam, Conn.



Wax looks and feels good. But it doesn't add much protection, so use just one coat.



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BY MATT KENNEY

DEDICATED SPACE

Make your sharpening area large enough to ensure that sharpening equipment and other accessories can fit on top, and remain there permanently.



FLATTENING AND
GRINDING AREA

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HONING AREA

I have used hand tools for as long as I've made furniture, and I quickly learned the importance of keeping them sharp—nothing is more frustrating and unproductive than a dull tool. But I faced a major difficulty because I lacked a convenient space for sharpening.

I dreaded the hassle of gathering my sharpening gear, heading into the house—so I could be near the sink—and setting up the kitchen island as a sharpening station. Packing up my stuff afterward and cleaning up the mess were also frustrating and time-consuming.

As a result, many of my tools stayed dull and nearly unusable.

That changed when I decided to give sharpening its rightful place in my shop. By creating a dedicated space where everything is set up and ready to use, I am always just minutes from finely sharpened tools.

Consider the four key sharpening steps

Before designing a permanent sharpening station, I took some time to think about my sharpening technique, how I could improve it, and what equipment I would need.

There are three basic procedures to sharpen edge tools like plane blades and chisels: honing and polishing the backs, grinding primary bevels, and honing secondary bevels. And for woodworkers like myself, who use waterstones, there's a fourth—flattening the stones, which requires water.

Although I don't perform each task every time I sharpen, I knew I wanted a station that would allow me to move quickly between all four steps, and

Build a suitable surface...

Countertop laminate is smooth, waterproof, and durable and makes an ideal surface for laying out sharpening stones and other gear.



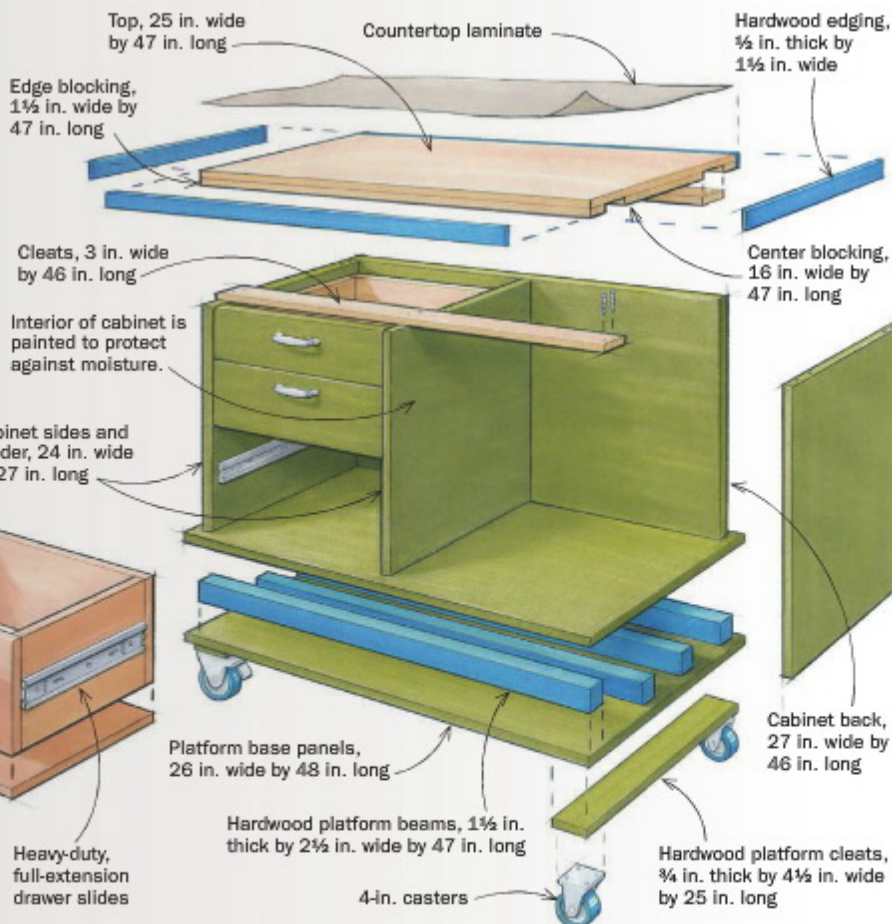
Laminate is an excellent choice. Use dowels to line up the laminate before affixing it in place with contact cement.

...or an entire workstation

Kenney recently built this mobile cabinet with a sturdy surface and plenty of storage.



Note: All cabinet parts are made from $\frac{3}{4}$ -in.-thick ultra-lightweight MDF, except the top and bottom panels of the platform base, which are $\frac{1}{2}$ in. thick.



Apply shellac to drawer box to protect against moisture.

False drawer front

Drawers are glued and screwed together.

Heavy-duty, full-extension drawer slides

Just add water

To flatten waterstones, keep water close by. It comes in handy for other shop tasks, too.



Think small. Plastic containers offer easy access to water, and can be kept on a benchtop or stored in a cabinet.



Or go big. If you have access to a water supply and waste pipes, install a utility sink.

No grinder? No problem

A granite slab can replace a grinder for sharpening bevels, and also works for flattening and polishing.

Size your slab properly. Grinding will be quicker on a stone that holds at least three different grits of sandpaper simultaneously.



A grinder can't do this. The slab is an ideal spot to flatten the backs of plane blades or other edge tools.



Add a guide for angle grinding. A honing guide paired with sandpaper and granite makes it easy to grind new primary bevels.

that would have places store all my sharpening gear.

I managed to kill three birds with one stone by building a mobile sharpening station with a flat and durable work surface and a convenient place to store all of my gear. And, since water is essential for me, I installed a utility sink next to the cabinet. Of course, not everyone is lucky enough to have easily accessible water sources in their shop. Those without a sink can store water in a Tupperware bin or empty jug (for another take on ways to store and use water, see *Methods of Work*, p. 16).

The sharpening station has plenty of room on top to spread out my gear, and six drawers below to store everything. It sits on a heavy-duty, mobile platform—similar to the torsion-box design for shop furniture built by John White (See “Choosing and Using Casters,” *FWW* #190)—designed to handle the daily rigors of shop abuse. Together, the unit is waterproof, mess-proof, and solid.

Setup enhances technique

Having a dedicated station allowed me to refine my sharpening technique.

Grinding bevels is one example. When I started woodworking, I never reground them because I lacked a bench grinder. Then I learned to regrind bevels using a honing jig and sandpaper that I stuck to my tablesaw—a workable but messy

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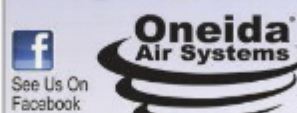
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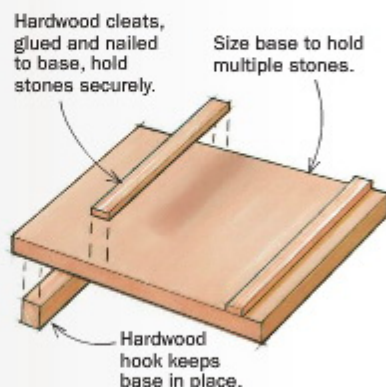
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Build a honing hook



Repurpose a few cutoffs. Thin strips of hardwood attached to a piece of MDF hold sharpening stones securely. A piece of shelf liner keeps the jig from sliding.



system. Now, with a large and dedicated work surface at my disposal, I purchased a slab of granite at a local stone yard. It sits prominently on the right side of the cabinet, with a rubber mat beneath it to hold it in place. At roughly 12 in. wide by 20 in. long, the granite is wide enough to accommodate three separate grits of sandpaper at once—a quick and simple way of grinding that is easy to clean up. Of course, if you prefer to use a bench grinder, you can just as easily clamp one to the cabinet's top instead.

My sharpening technique has also benefited from having a source of water next to the cabinet. I need it to flatten my 4,000- and 8,000-grit waterstones, which I use to hone secondary bevels. It's a messy task I used to avoid. Not any more—now I do it every time I use them, so my stones are always ready and require less time to flatten.

To hold my waterstones in place, I built a small bench hook out of the MDF cutoffs and added a few solid-wood cleats on its surface. It sits on my station permanently, always ready for touching up my plane blades and chisels.

And when it's time to clean up, the drawers store all of my sharpening gear—making it easy to find what I need, whether it's a honing guide, paper towels, or a bit of oil to prevent rust. □

Matt Kenney is a senior editor.



A separate spot for honing. Leave space on the top for polishing secondary bevels—one of the most frequent tasks in keeping hand tools sharp.

Be smart about storage



At the ready. Organize sharpening equipment to quickly move between different tasks.

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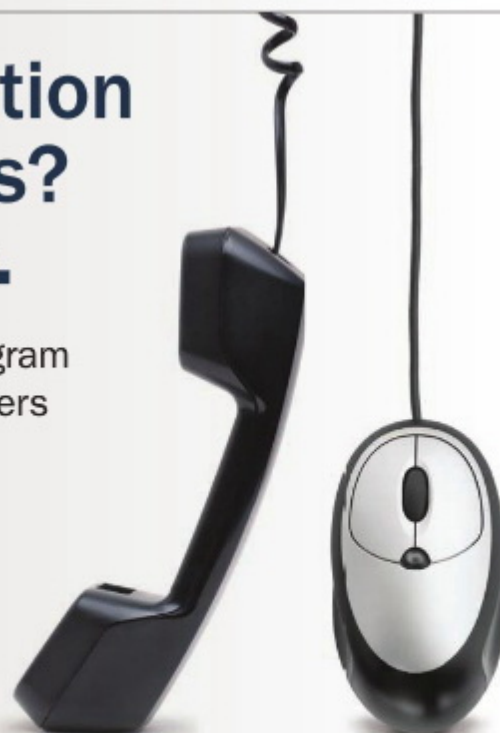
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how they did it

Lumber from a log

BY JONATHAN BINZEN

The raw material for Adrian McCurdy's riven oak furniture (see the back cover) is whole log sections. Delivered by crane truck to his backyard workspace in Scotland, the pieces are typically about 4 ft. long and 4 ft. in diameter. McCurdy splits, or rives, along the medullary rays, producing planks with spectacular ray fleck on both faces. He smooths the split pieces but usually doesn't flatten them, preferring to retain the irregularities of the riving process in his furniture. To join unflattened planks—especially in case pieces—requires extensive scribing, a skill McCurdy learned while building reproductions of centuries-old timber-frame buildings.

Even triangles.
The splits tend to go straight when there is an even amount of wood on both sides of the riving line.



Rive along the rays.
McCurdy darkens the medullary rays—which are often curved, not true radii—with a marker and splits along the line. He sometimes scores the line with a circular saw or the tip of a chainsaw. He uses a stove to widen the splits, but leaves some fibers connected to keep the log intact and self-supporting until all the riving is finished.



An adze produces a slightly scalloped surface. To prepare the top surface of some of his benches and stools, McCurdy uses an adze, creating a field of shallow scoops that reflect the light and feel good to the touch.



Some planks get the spokeshave. After riving, McCurdy sometimes uses a wooden spokeshave to smooth planks. Then he stacks them in a shed for several years of air drying. The spokeshaving is easier while the wood is green, but he does some when the pieces are dry, too.



Riving legs is an adventure. The wood must be split both along the medullary rays and perpendicular to them. Some logs split on a straight line, others follow a curve. McCurdy used a drawknife to fine-tune these riven legs.



Lots of small wedges tame a big log. McCurdy uses both wooden and steel wedges. The wooden ones, made from elm, are "grippers," he says, but they don't last as long as the steel ones. The first split is the most difficult, because it's the longest. If it splits cleanly, you know you have a good log.



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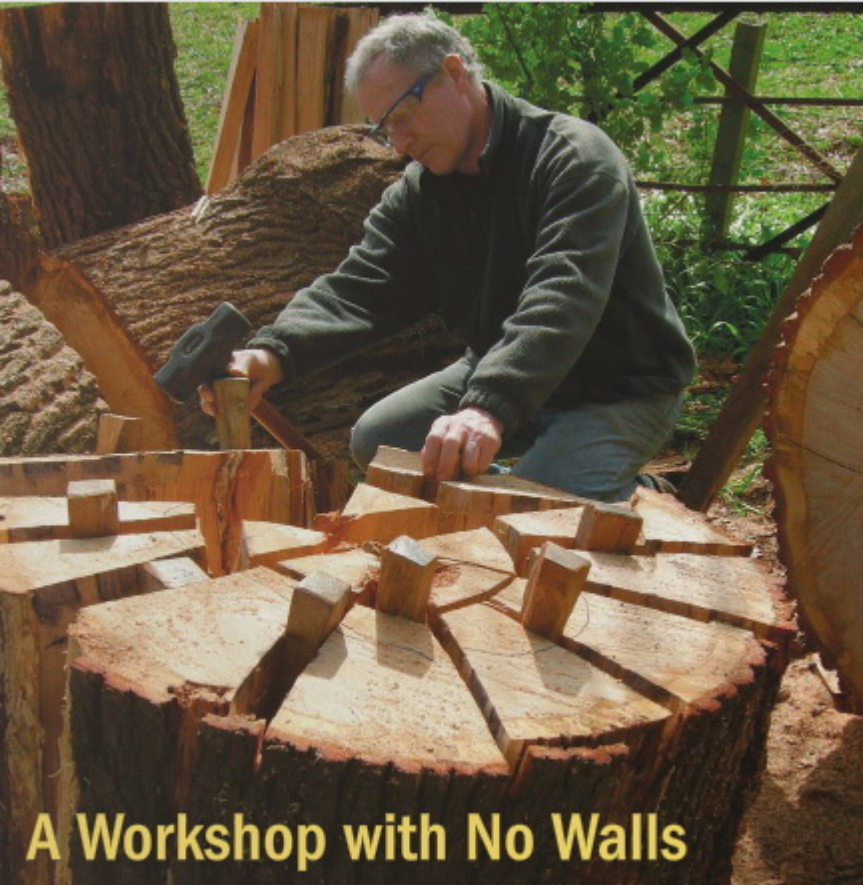
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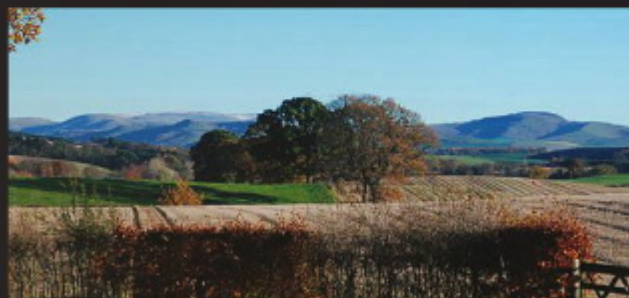
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A Workshop with No Walls

Adrian McCurdy makes furniture from riven wood. No commercial lumber, no jointer, no planer, no dust collector. And for the most critical parts of the process, he works in a shop with no walls. Out on the grass behind his house, in a small Scottish farming village south of Edinburgh, he splits out whole logs of local oak. Cleaving along the medullary rays, McCurdy wallops the wood apart with ranks of wedges made from elm or steel, producing planks so perfectly quartersawn that the ray fleck flashes all the way across the surface. He dresses some boards at this point with an adze or a spokeshave—"they cut the green wood like cheese," he says—and stacks them in a shed for several years of drying. When the wood is ready to work, he brings it in and shapes it (primarily with hand tools but also the occasional machine), usually retaining the quirky lines of the natural splits. Originally trained as a sculptor, McCurdy builds reproductions of furniture from the 15th and 16th centuries (inset above), much of it for historical houses and museums. But he also builds original pieces, like those at right, which marry modern simplicity with medieval woodcraft.

—Jonathan Binzen



Photos: Adrian McCurdy

How They Did It Turn to p. 98 to see how McCurdy splits and rives massive logs to make his furniture.

Pro Portfolio For an audio slide show featuring more of McCurdy's work and techniques, go to FineWoodworking.com/extras.