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Tools & Shops

ANNUAL ISSUE

Tool test: Router tables

Buyer's guide to chisels

Lumber storage solutions

Choosing and using miter saws

Build a bench for $250

Shop heating

Winter 2005/2006
No. 181

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Fine Woodworking

Tools & Shops

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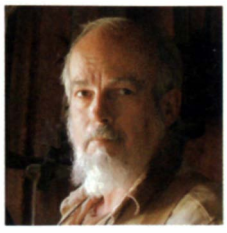
contributors

Cecil Braeden (*"Rock-Solid Plywood Bench"*) served 25 years in the U.S. Air Force, the highlight of which was his time as a reconnaissance systems officer on the SR-71 (mach 3+) aircraft. Braeden says it was the best job he ever had, but he still can't give details. After retiring from the Air Force, he spent 20 years in the aircraft industry, first at Hughes Aircraft and then at Boeing, serving as an engineering manager in defense aircraft electronics. He and his wife, Maureen, designed their retirement home and had it built on a picturesque site overlooking the Puget Sound. Braeden was careful to include ample space for an office and a woodshop, with windows that take in the view. Besides woodworking, gardening and crab fishing keep him busy.

Alan DeVilbiss (*"A Shop Built Around an Island"*) has two interests—electronics and woodworking—that tend to overlap: At 13, his first woodworking project was a table for his ham radio station. He went on to design spacecraft electronics for NASA before moving to Colorado Springs for 35 years as a circuit and software designer. Retiring in 2000, he finally built his dream shop next to his dream house, both with a view of Pikes Peak.

Gary M. Katz (*"Choosing and Using a Miter Saw"*) returned to school after 20 years in the construction business and studied literature. But after finishing his master's thesis–comparing *Frankenstein* to *Paradise Lost*—Katz stayed with carpentry. As a general contractor in southern California, he has spent more than 30 years specializing in finish work. A contributing editor to *Fine Homebuilding*, he has published two books and a DVD series, *Mastering Finish Carpentry*.

Jim Weinman (*Cutoffs: "Protecting your tools against theft"*) is a freelance writer who lives in Hood River, Ore., with his wife, Jackie, two dogs, and three cats. In 1998, they built a shop and guest room from the pine and fir they had harvested on their property. In his spare time, Weinman prowls pawnshops hoping to find what was taken when his shop was burglarized.



Bob Smalser (*"All About Chisels"*) is a sawyer, tree farmer, and habitat biologist near Hood Canal at Camp Union, Wash. He builds and restores classic wooden boats as a sideline. Smalser and his wife, Betty, are building their retirement home on forest land they set aside as a wildlife refuge.

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letters

Spotlight

ISSUE NO. 179
October 2005
Page 38

FREEHAND HONING IS FASTER

I own one of the honing jigs you reviewed and agree that some of these products work well. But I have found that with a little practice, such frippery, at least for me, is a waste of time and money.

A few years back, after fussing with my jig, I decided there had to be a better, faster way to get sharp tools. Using a couple of Japanese waterstones, I polished the back of the blade, then worked the front, all without a honing guide. After only five blades, I began to get the hang of it. Today, in about 30 seconds, I can produce a nice, fresh edge that will shave my hairy legs.

—CHUCK PEZESHKI, Pullman, Wash.

There must be a better way

In a world where the resources are simply running out, it seems plain wrong to extol the virtues of throwing away a foam brush after use (Finish Line, *FWW* #179, pp. 116-118). There also must be an environmental impact from solvents used to clean a traditional brush. A balance needs to be struck. Perhaps *FWW* should commit to an environmental-impact assessment of techniques it recommends? If the resources last longer, so will *FWW*!

—GRAEME J.W. SMITH, via email

Dangers of offsetting a tablesaw fence

Offsetting the tablesaw fence so that it's no longer parallel to the blade (Q&A, *FWW* #179, p. 96) will avoid re-cutting at the back of the blade, but comes with a new danger: Those who periodically move their intentionally misaligned fence over to the opposite side of the blade will find that material binds in the tapered angle between the blade and the fence.

—SHANE BOYD, Woodbury, Minn.

Clarification

In *FWW* #171, we published a tip titled "Magnetic dovetail guides" (Methods of Work, p. 14). Lee Valley Tools has informed us that they have patented a like device, and that any attempt on the part of our readers to make this jig would violate that patent. In respect of their request, we ask our readers not to make this tool themselves, but instead to buy one from Lee Valley Tools (www.leevalley.com).

Fine Woodworking regrets the inadvertent publication of how to make this or any other patented device. We do not knowingly publish such information, and we exercise reasonable care to avoid doing so. But given the growing number of patents in our field and given the natural inventiveness of woodworkers and their willingness to share information about their methods of work, unintentional oversights like this are likely to happen from time to time.

To conduct exhaustive patent research on every tip or shopmade jig or fixture that we publish would make publishing them economically and procedurally impossible. We are happy to hear from patent holders who tell us that a reader's tip violates their patent, and, if their claims appear valid, we will always publish an apology and urge our readers to respect the patent holder's right to sole manufacture.

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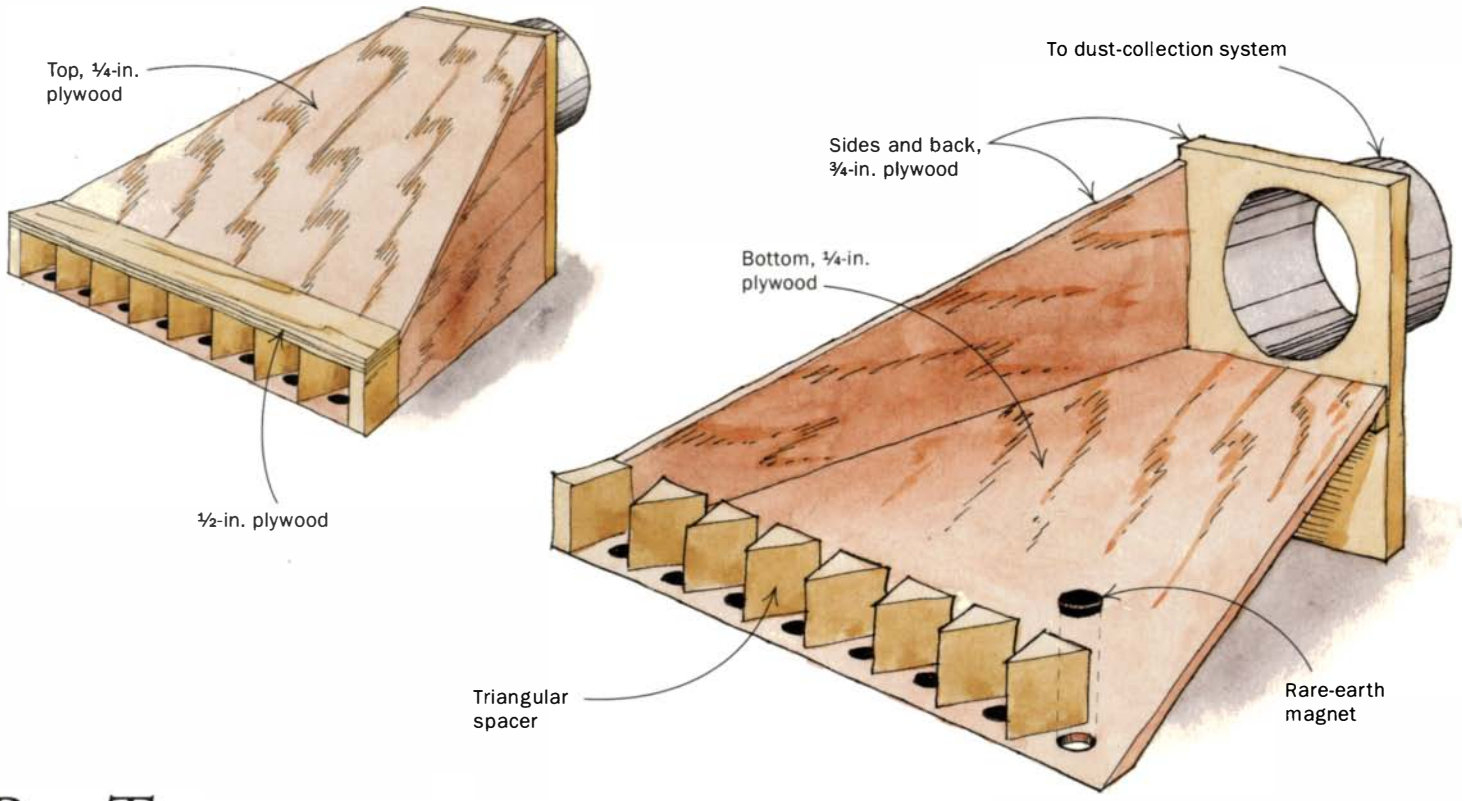

Best Tip

Floor sweep catches metal

A Massachusetts building-code official, Paul Tacy has been a woodworker for more than 35 years. He enjoys studying Shaker history and building reproductions of Shaker furniture. This floor sweep helps keep his shop tidy. "I think the Shakers would approve," he says.

A floor sweep is a great addition to a shop dust-collection system. When constructing my shop-built unit, I decided to install a row of rare-earth magnets at the entry throat to catch any metal objects that might otherwise get sucked into the ductwork.

To ensure that sweepings would pass directly over the magnets, I used triangular spacers to divide the throat into several smaller openings. This setup also increases the velocity across the entire opening, and prevents large chunks from entering.

All components are assembled with simple butt joints, sealed with vinyl adhesive caulk, and nailed. The sides and back of the sweep are ¾-in. plywood; the top and bottom are ¼-in. plywood. I used ½-in. plywood for the top of the opening to add stiffness. Once the funneling triangles were glued and brad-nailed in place, the front was sturdy enough to resist the occasional bump or kick.

My floor sweep is about 22 in. wide at the mouth, and each of the eight openings is about 1 in. wide. To make it a little easier to mount the hose from my dust-collection system, the dust port is positioned well above the floor (6 in. from floor to port centerline). Also, to reduce dead space (the area where sawdust and chips tend to collect and remain forever) and to improve airflow, the top, bottom, and sides of the sweep are tapered to create an air funnel that leads directly into the dust port. The sides are kept square at the bottom edges to rest on the floor, and the sloping ¼-in. plywood bottom is let into grooves in each side from the floor in front to the bottom of the rear port. The bottom also is planed to a very steep angle at the front edge so that it sits flat on the floor. This design allows virtually no restriction for shavings or dust entering the sweep.

—PAUL TACY, Ashfield, Mass.

A Reward for the Best Tip

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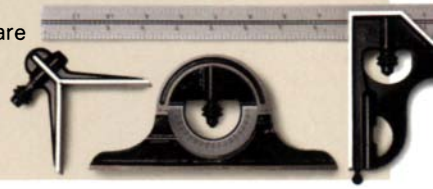
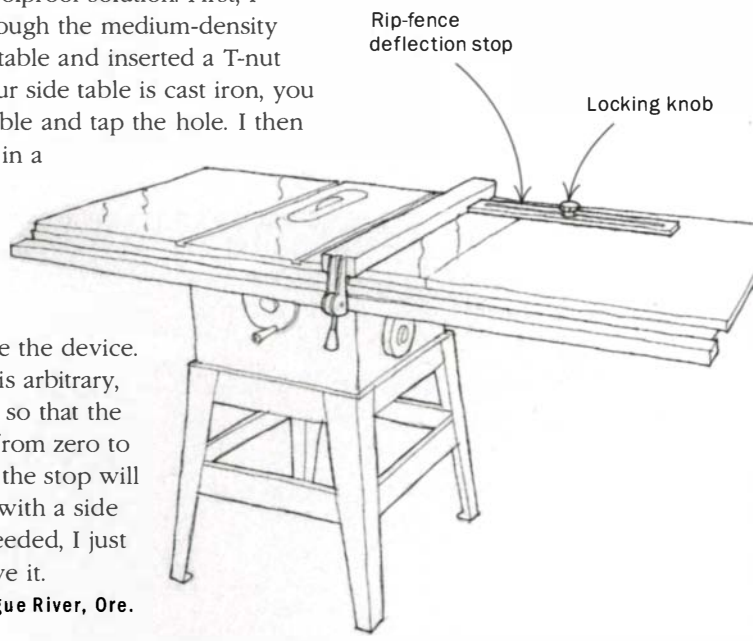


Simple stop backs up rip fence

Frustrated by my contractor-model tablesaw's rip fence deflecting under pressure, I devised an economical, fast, and foolproof solution. First, I drilled a ⅜-in. hole through the medium-density fiberboard (MDF) side table and inserted a T-nut from underneath. If your side table is cast iron, you can just drill into the table and tap the hole. I then made an elongated slit in a piece of hardwood 2 in. wide by 27 in. long. A piece of 5⁄16-in. threaded rod, a fixture knob, and a fender washer complete the device. The length of the stop is arbitrary, but I decided on 27 in. so that the fence can be adjusted from zero to 24 in. For less than $3, the stop will work on any tablesaw with a side table. When it is not needed, I just swing it away or remove it.

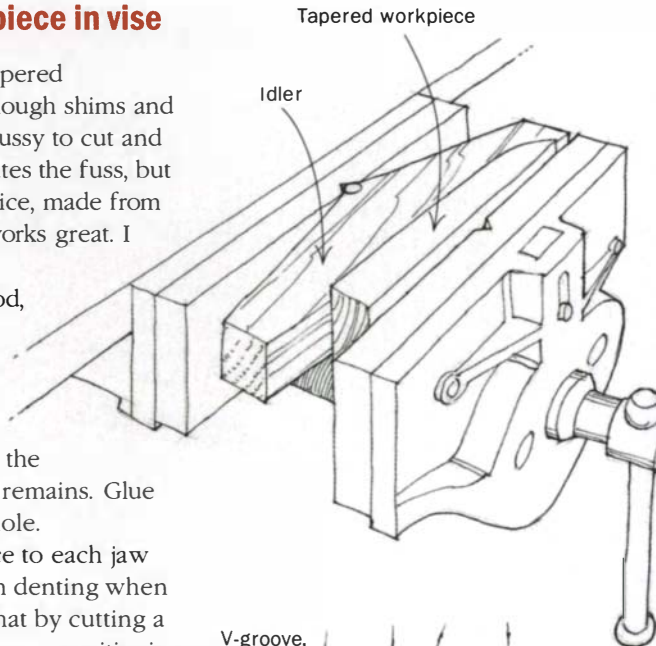


—BOB GLASCOCK, Rogue River, Ore.

Idler holds tapered workpiece in vise

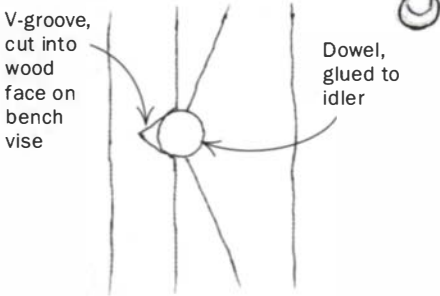
It's often a challenge to clamp tapered workpieces in a bench vise. Although shims and wedges work fine, they can be fussy to cut and fit. A patternmaker's vise eliminates the fuss, but at a steep price. This simple device, made from scrapwood, is easy to use and works great. I call it an idler.

Start with a chunk of hardwood, 2 in. thick by 3 in. wide, the same length as the vise jaws. Drill a through-hole (the diameter isn't critical; ½ in. is fine) near one edge, then bevel the piece so that only half the hole remains. Glue a 3-in.-long dowel in that half hole.



Long ago, I added a wood face to each jaw to help protect workpieces from denting when squeezed by the vise. I found that by cutting a V-groove in each of the wood faces, positioning the idler in the vise got a little easier.

To use the idler, place it in the vise with the dowel in one of the V-grooves. Then place the tapered piece in the vise and close the jaws. As the jaws close, the idler automatically pivots to match the angle of the taper, and the workpiece is held securely.

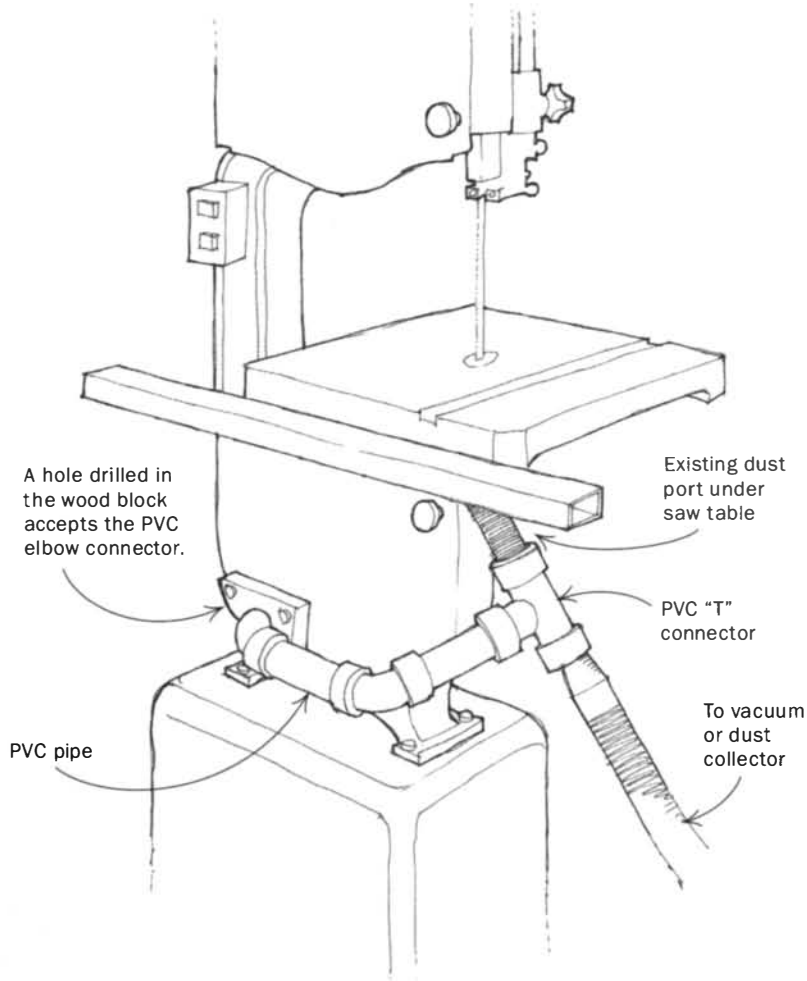


—PHILIP A. HOUCK, Boston, Mass.

Improving dust collection on a bandsaw

When I use my bandsaw, a good deal of sawdust tends to migrate to the lower part of the saw. To improve the dust-collection efficiency, I cut a hole in the bottom of the door and added a vacuum port, connecting it to the bandsaw's regular vacuum fitting with 1½-in.-dia. PVC pipe and connectors.

—CARL N. PAULI, Mt. Tabor, N.J.



Quick Tip

When setting up shop, I nailed three clear shoe organizers to the walls. The sturdy, see-through pockets are big enough to hold a hammer, Dremel tool, tape measure, or roll of duct tape—all those little items that clutter up your workspace or are misplaced easily. One quick glance and you can find what you're looking for.

—JOANNE INCLAN, Lone Tree, Colo.

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From the ground up

GETTING A BASEMENT SPACE TO WORK FOR YOU

BY WILLIAM DUCKWORTH

Nowadays I make a living with words, not wood, but for the better part of two decades I worked full time as a cabinetmaker. Along the way I had five different shops, two of them in basements. To be kind, I'd characterize those basement shops as less than ideal—there was not much light, not much air circulation, and not much headroom. One had a river running through it every time it rained. So when my wife and I built an addition to our house recently and decided that the new basement was the place for my shop, I was determined to steer clear of those miseries.

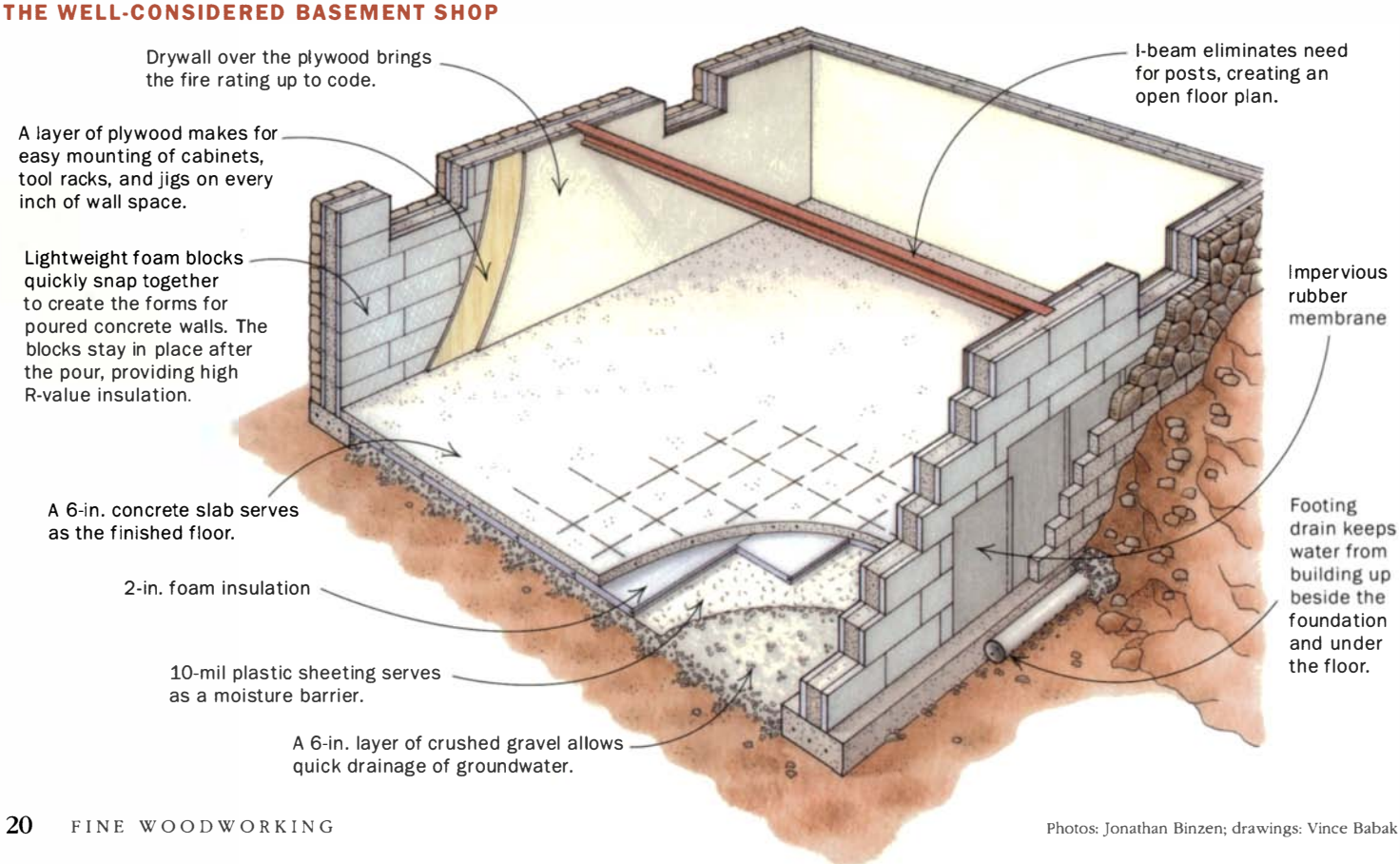
If you are planning to include a basement shop in a new house, an addition, or an existing space, you might benefit from my experience. I found that by attending to a few key design considerations you can make a sweet shop in a subterranean setting. One important note before I begin: Whether or not you are working with an architect, it's best to address all of your concerns before the drawings are done. Making changes after construction begins is needlessly expensive.

The floor plan: Strive to keep it open

One of my old shops was in a post-and-beam building with a grid of support columns cluttering the floor space every 8 ft. The posts limited the placement of machinery, interfered with work flow, and drove me mad.

When my wife and I designed our addition, we decided to avoid the encumbrance of posts or load-bearing walls by carrying the load from the floor

THE WELL-CONSIDERED BASEMENT SHOP



Photos: Jonathan Binzen; drawings: Vince Babak

Well lit from without and within. *Glazed doors and a half dozen small windows fill the east-facing basement shop with daylight. High-output fluorescents carry the load at night and help balance the light during the day.*

above with a steel I-beam. My wife is an architect, but we consulted an engineer to size the beam. We also had to work out the details of how it should tie into the concrete foundation walls and fabricate the forms accordingly.

The beam was surprisingly affordable, and it provided a convenient mount for a hoist to lift heavy machines.

Water is the enemy: Keep the space dry

Having suffered the indignity of rusted tools in that riverine basement shop, I was determined to guarantee a bone-dry space. After the hole for the new basement was dug, I was taken aback by how much water ran steadily underground. Because our house is on a hill, the solution was a footing drain made from perforated 4-in. PVC pipe bedded in gravel that drains downhill to daylight. For a house on flat terrain, you might need a sump pump.

To keep water from seeping through the foundation walls, I applied a heavy-duty, self-stick rubber membrane on the exterior before the walls were covered with a stone veneer and backfilled. The 39-in.-wide membrane strips are applied vertically with a 3-in. overlap. Each strip begins slightly above grade and runs down to the base of the footing, covering the seam between the wall and the footing. This stuff wasn't cheap, but I'm convinced that it will hold up longer and provide a more impervious moisture barrier than a layer of tar.

Before the floor slab was poured, I put down a 10-mil plastic moisture barrier.

By attending to a few key design considerations, you can make a sweet shop in a subterranean setting.

As soon as the concrete was firm enough to walk on, I applied a waterproof treatment. Overkill? Maybe, but it's been several years, and I haven't glimpsed the slightest hint of moisture in the space.

Doors: Easy access is critical

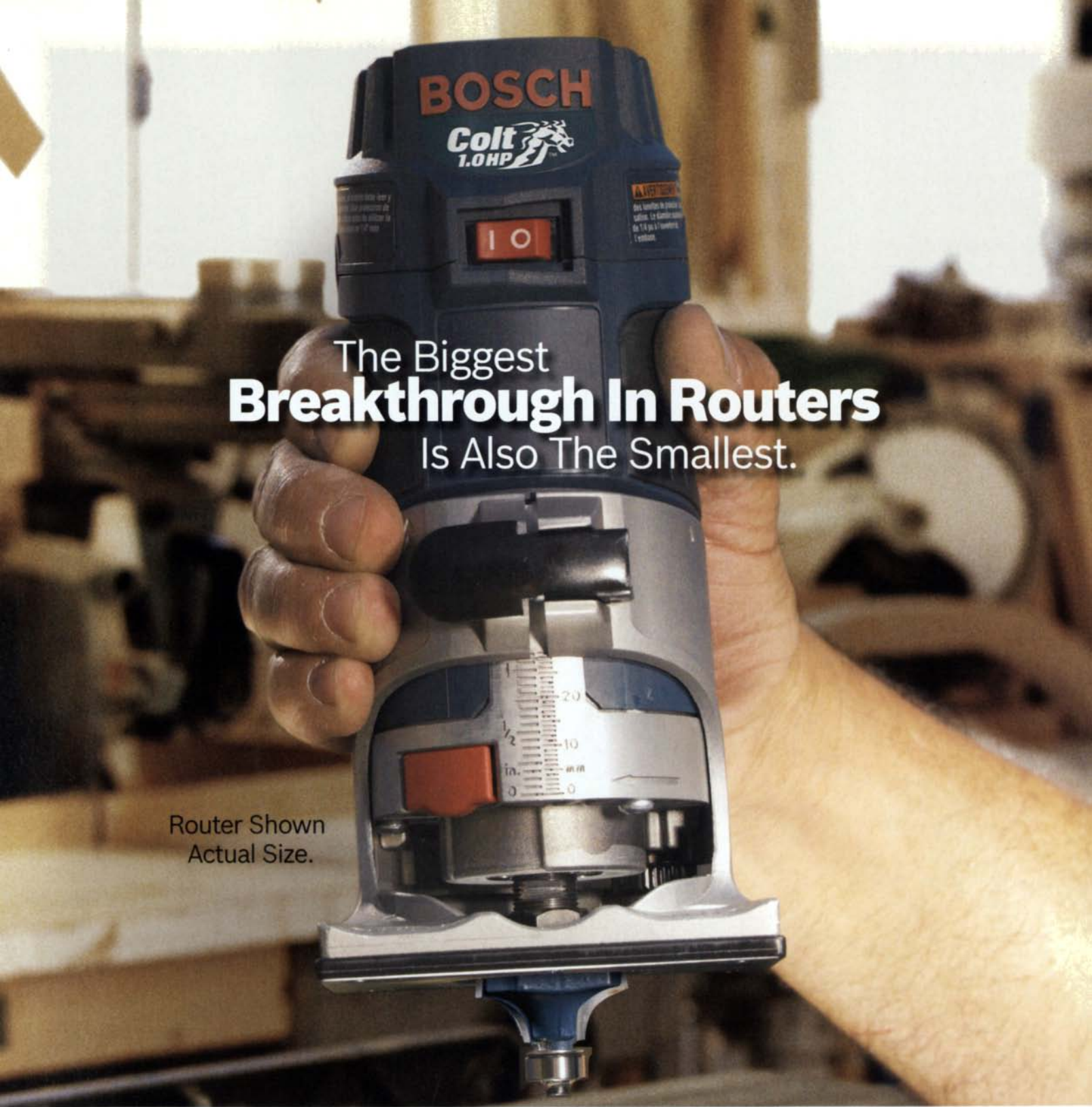
I've accumulated a collection of fairly large woodworking machines, so generous access to my shop was a necessity. Given that our addition was going on the downhill side of the slope we live on, it was a no-brainer that we'd build a walk-out basement. We installed double doors, which provide an opening that is 68 in. wide. If you're limited to one door, I'd recommend a minimum 36-in.-wide opening.

If your property won't allow a walk-out basement, Bilco doors may be the next best way to avoid dragging equipment and lumber through the house.

Light: You need a lot

The glass doors we chose for the shop do wonders for lighting the space during the day. Even the six small windows I put in help in that regard (and provide cross-ventilation).

I took the advice from Jack Lindsey's article in *FWW* #154 (pp. 56-61) and installed fluorescent fixtures, which provide even lighting at a low cost. I chose standard industrial strips with



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8-ft.-long, high-output lamps. I painted the walls and storage cabinets white to enhance the reflected light in the room.

Ceilings: Higher is better

Having worked in basements with 7-ft. ceilings, I'm especially sensitive to the grief low ceilings can cause when handling long planks or sheets of plywood. Our original plan called for a 10-ft. clearance between the finished floor and the underside of the joists to the floor above. But we lost a foot when the excavator hit hardpan. Still, I had a 9-ft. clearance, which is ample. A standard 8-ft. ceiling would have been workable, but the extra foot not only makes material handling easier, it also gives my shop nearly 100 extra square feet of wall space for storage.

Electricity: Don't skimp on the power

I did most of the wiring for my shop myself but hired an electrician to bring in a 100-amp subpanel, which is more than enough power for what I need. I used the brand-name circuit breakers that the panel manufacturer recommended.

In our area, the electrical code states that receptacles are to be placed so that no point on the wall is more than 6 ft. from an outlet. I installed mine every 5 ft. and put in 20-amp circuits, using No. 12 wire in metallic-coated cable. In addition to the regular receptacles, I put in one 220v receptacle for my dust collector and another 220v circuit for my three-phase converter.

I wired the lights on two different circuits: In the unlikely event that one of them blows, I won't be fumbling in the dark to see where I'm going. □

Ample access from outdoors. *Double doors on Duckworth's walk-out basement make it easy to move in machines and materials and to carry out finished work.*

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MACHINES

New 8-in. jointer an excellent value

When we reviewed 8-in. jointers that sell for less than $1,400 in the last issue (*FWW* #180, pp. 67-73), we had hoped to include this new jointer from Grizzly, but the models were not yet in stock.

This machine arrived at the *FWW* shop packaged in a sturdy crate. The fence had come loose during shipment, but aside from a minor scratch on the outfeed table, we found no other apparent damage. Once we put it together and ran some tests, we discovered another nice surprise from Grizzly.

The infeed and outfeed tables were not as perfectly flat as those on the other Grizzly jointer we tested (model No. G0500); but at an average of 0.002 in., they were well within the parameters of most manufacturers' specs.

The knives were razor sharp and set perfectly parallel to the outfeed table, and both tables were set nearly perfectly parallel to one another. The result was evident in the sample cuts on cherry and hard maple made with this machine: smooth and free of even slight veining in the surface.

This jointer has the same standard cast-iron fence found on most of the other machines we tested, but Grizzly has introduced one feature not found on the others. The fence position is controlled by a geared handwheel that moves it back and forth. The gear ratio advances the fence about 1/16 in. per revolution.

Another nice feature on this machine is the beefy switch mount made of heavy-gauge steel welded together and bolted to the base. Also, an indicator light on the magnetic switch tells you when it's powered on. Priced at $625 (the lowest price of those we compared) this machine is an excellent value.

—William Duckworth is a contributing editor.

GRIZZLY G0586
800-523-4777 www.grizzly.com

Price: $625
Net Weight: 428 lb.
Bed Size: 9¼ in. by 75 in.
Fence Size: 3⅞ in. by 38¼ in.
Motor size (Claimed): 2 hp
Number of Knives: 4
Optional cutterhead: Yes
Avg. Table Flatness 0.002 in.
Table Alignment (width/length): 0.000 in./0.000 in.
Noise level: 88 db.
Comments: Geared handwheel adjusts fence position back and forth; perfectly aligned tables; sharp knives perfectly aligned

FIRST AID

LIQUID BANDAGES

CALL ME ACCIDENT PRONE, but it seems I can't complete a project without drawing blood at some point. That's why I always keep a good supply of hydrogen peroxide and bandages on hand to prevent infections. I recently discovered a wonderful new product for my first-aid arsenal: 3M's Nexcare liquid bandage drops, a sterilized version of cyanoacrylate glue. A few drops create a watertight, flexible bond that wears off slowly and allows the wound to heal without becoming infected. And unlike bandages, this stuff holds up to repeated hand washings. My only complaint is with the price: almost $10 for a 1-ml tube.

—W.D.

Photos: Rodney Diaz

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SANDING

STAINLESS-STEEL SANDING DISKS

THE FOLKS AT MICROPLANE CAME OUT with their first woodworking tool, a hand-held rasp, in 1990. The cutting edges are chemically etched in the hardened steel, not punched, a process the manufacturer says makes the edges sharper. Since then they've offered cutting blades for handplanes, hacksaws, and drills. Recently, they introduced a new product: stainless-steel sandpaper, available for 5-in. random-orbit sanders or ¼-sheet finishing sanders.

I tested a medium-grit disk with a hook-and-loop backing on a random-orbit sander, and it cut hardwood more aggressively, but conventional 100-grit aluminum-oxide sandpaper left a smoother surface. The disks come in three abrasives: coarse (40-60 grit), medium (100-120 grit), and fine (180-200 grit). The manufacturer claims one disk will last as long as 30 sheets of regular sandpaper. Two-disk packs sell for $9.95 with a discount for larger quantities. Call 800-555-2767 or go to www.microplane.com.

—W.D.

Like no sandpaper you've used. *Microplane, the maker of these stainless-steel disks, calls them sandpaper. They come in coarse, medium, and fine grades, and they cut more aggressively than standard sandpaper.*

ACCESSORIES

Flatten waterstones quickly and easily

MY JAPANESE WATERSTONES had been showing signs of neglect. Tools took longer to sharpen, the sign of a clogged stone, and were starting to dish. My stones needed flattening.

Dress worn-out waterstones in no time. *Norton makes its flattening stone of silicon carbide, often used to make grinding wheels.*

The last time I flattened them, I spent a dull hour or so rubbing the stones back and forth on sandpaper laid out on my tablesaw. I wasn't looking forward to repeating that task. On a visit to www.toolsforworkingwood.com, I found a silicon-carbide flattening stone made by Norton for about $25. As soon as I got it, I headed for the basement shop. I was not disappointed.

After soaking the Norton stone in water for a few minutes, I started rubbing the waterstones across its surface. It took no more than a minute to flatten each side. Of course, once the stones were flat, I had to hone a plane iron. What a difference! Half a dozen strokes, and I was ready to work wood.

—Andy Engel is a senior editor.

FINISHING

WALNUT-OIL FINISH IS FOOD-SAFE

FOR TURNED BOWLS THAT WILL BE used in food service, toxicity is always a concern. So it was with some hope that I invited eight members of a recent bowl-turning class to help me test Mahoney's Utility Finish Oil, a boiled walnut oil sold by professional turner Mike Mahoney (www.bowlmakerinc.com).

Food-safe, but slow-drying. *The author could discern no difference between the drying time of this heat-treated product and regular walnut oil from the grocery store.*

Unlike some vegetable oils, walnut oil eventually will polymerize to a hardened finish, and it contains no potentially harmful metallic driers.

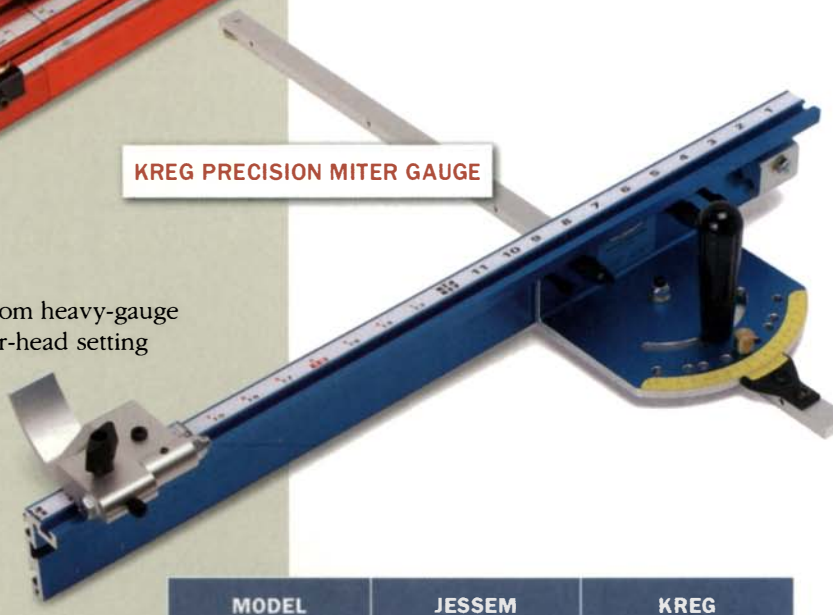
To test the drying time of this "boiled" oil, we applied some to a cloth on a Monday morning and placed it on a concrete floor. On Friday the cloth was still supple and the oil viscous—no sign of hardening. Likewise, the oil applied to a wooden bowl seemed to have no more tendency to harden than walnut oil from the grocery store.

One bright spot was the price: At $10.99 for a 16-oz. bottle, it is cheaper than walnut oil from the grocery store. Also, the plastic squeeze bottle is handy. Mahoney also offers a custom blend of food-safe waxes mixed with walnut oil.

—ERNIE CONOVER teaches woodworking at his school in Parkman, Ohio (www.conoverworkshops.com).

Head to Head

Miter gauges from JessEm and Kreg



HERE ARE TWO NEW REPLACEMENT MITER gauges that have come on the market since I reviewed gauges in *FWW* #165 (pp. 74-79).

JESSEM MITE-R-EXCEL IS SOLID AND ACCURATE

The Mite-R-Excel from JessEm has a head and fence made from heavy-gauge aluminum. Large and small brass locator pins adjust the miter-head setting accurately up to every ½°. You also have the option to set the angle manually. The steel miter bar has two adjustment mechanisms to provide a slop-free fit in the miter slot. The fence and very solid flip-stop provide for 36 in. of total crosscut capacity, including the sliding fence extension. While I have several excellent miter gauges, I find myself reaching for the JessEm most often.

KREG MITER GAUGE HAS MICRO-ADJUST

Kreg's Precision Miter Gauge is designed with nine positive stops, at 10°, 22½°, 30°, 45°, and 90°. The tool has easy-to-read markings for setting the gauge to other angles. The 24-in. fence and the stop on the Kreg are made of extruded aluminum, and the stop is solid and easy to adjust. The 24-in.-long miter bar is aluminum and contains five nylon adjustment plugs. This gauge also features a unique micro-adjuster, which allows for precise angle adjustments.

—Tim Albers is a frequent contributor.

MODEL	JESSEM	KREG
SOURCE	www.jessem.com	www.kregtool.com
PRICE	$220	$160
POSITIVE ANGLE STOPS	190: every ½° on each side of 90°	Nine: 10°, 22½°, 30° and 45° on each side of 90°
FENCE LENGTH	36 in.	24 in.

CORDLESS TOOLS

LITHIUM-ION BATTERIES BUILT FOR POWER, STAMINA

MILWAUKEE TOOLS RECENTLY announced a new line of cordless tools, based on its 28v lithium-ion battery. I looked at the cordless drill, a tool found in most woodshops. At a little less than 7 lb., it is slightly heavier than less-powerful drills but really packs a wallop. Using a 3-in. hole saw, I bored through hardwood and plywood, and drove delicate hinge screws with consistently great results. The tool is well balanced and the battery can be mounted in two positions.

The lithium-ion batteries hold a charge up to twice as long as conventional nickel-cadmium batteries. Carbide jaws in the ½-in., single-sleeve, ratcheting chuck securely grip any bit with a twist of the wrist; the 20 torque settings offer finely tuned control.

The street price for the Milwaukee No. 0724 drill kit is $420. Call 800-729-3878 or go to www.milwaukeetool.com.

—ROLAND JOHNSON is a contributing editor.

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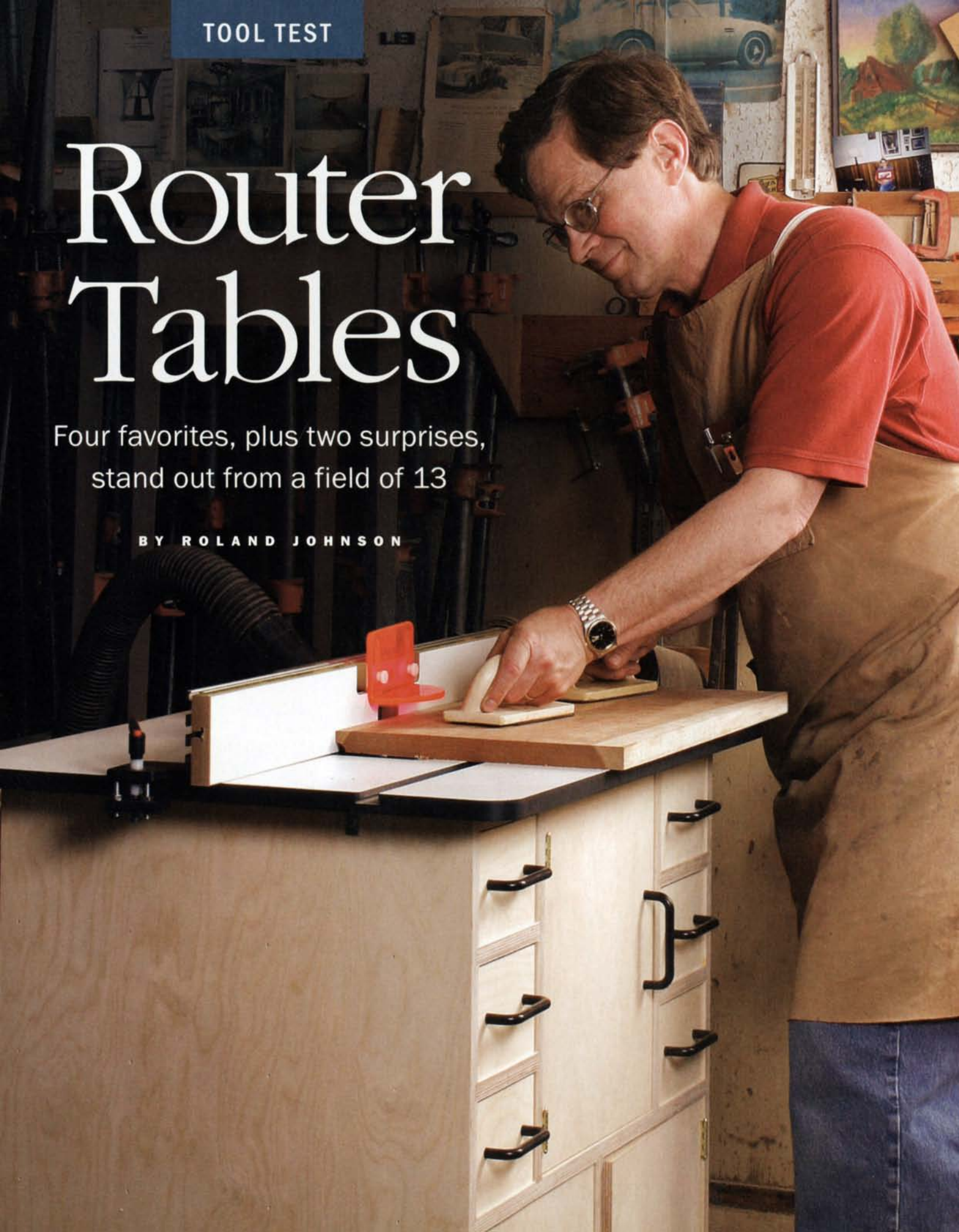
TOOL TEST

Router Tables

Four favorites, plus two surprises, stand out from a field of 13

BY ROLAND JOHNSON



Routers have become one of the most useful power tools in the woodshop. Mounted in a table, the router becomes a mini-shaper that easily can make small moldings and joints, work with short stock, safely raise panels for doors, and pattern rout (shape wood using a template that rides along a bearing-guided bit). Most bit manufacturers recommend using large panel-raising bits or molding bits only in a table-mounted router because the bite a large bit takes makes it dangerous to use in a handheld router.

I evaluated 13 router tables for the sturdiness of their tables and fences, dust collection, and ease of operation and setup. All will do the jobs listed. Six stood out as exceptional, and are discussed in greater depth.

Tabletops must be flat and strong

The tops of router tables should be rigid enough to stay flat, strong enough to anchor the fence, and large enough to support panels and wide stock. Three materials are commonly used for tops, and two are very reliable. Phenolic-plastic tops can be relatively thin yet extremely rigid. Steel or cast iron make stout tabletops.

Medium-density fiberboard (MDF) can make a good top, especially when covered with a plastic laminate. But the MDF should be at least an inch thick, or reinforced with steel or aluminum, to resist sagging. I checked all of the tabletops for flatness, and the only tops that sagged were made of MDF. Covering both sides with plastic laminate reduces the chance of warping. Check any MDF top before purchasing or immediately upon delivery to verify that the top is flat.

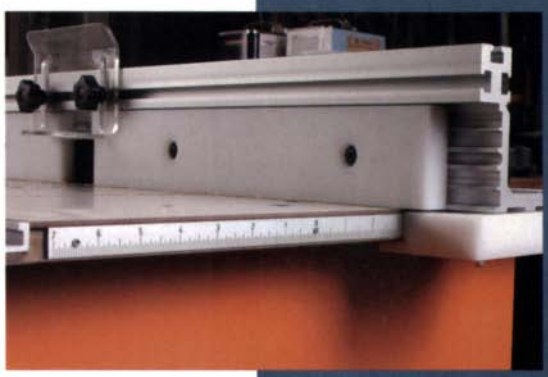
How flat is flat enough? It depends. If you use your router table to make smaller, flexible moldings, hold-downs will make the stock conform to the table and all will be well. If you do rigid work, such as raised-panel doors, the routed profile will reflect the table's sag. As a practical matter, I think a sag of greater than 0.030 in. is a problem.

In most cases, the router is fitted to the table via a removable plate that rests in the tabletop. The plate adjusts flush to the top with screws or shims. The screws were easier to use, but since you level the plate with the top at the initial setup only, I didn't give much weight to this detail. Unless you have a very odd router, all of these tables will work with your existing router. I tried them out with my Porter-Cable 890, which adjusts up and down with a T-wrench inserted through the base.

Fences guide work, collect dust, and mount accessories

The best of the fences adjust easily, hold position, lock in place quickly, and can accommodate sacrificial faces. Most incorporate T-tracks, making possible the use of track-mounted accessories such as hold-downs, featherboards, stops, or shopmade jigs.

Many of the fences have separate infeed and outfeed faces, so the opening can be adjusted for any size router bit. Most of the faces are replaced easily, so they can be run into a spinning bit to create a zero-clearance fence that minimizes chipping of the workpiece.



Three things count with router tables: tables, fences, and bases. *The table must be flat, the base stout, and the fence sturdy and able to support jigs and hold-downs.*

The Freud and Grizzly have infeed and outfeed fences that can be adjusted independently with a thumbwheel to provide an offset for jointing. All of the fences provide for dust collection.

Cabinet bases provide storage and dust collection

Above all, a router-table base must offer stability. An enclosed cabinet is a real plus. The base not only provides storage, but helps reduce the noise level and offers superior dust collection. Routers are messy machines that create volumes of fine and coarse shavings. Fine dust is pretty easy to collect with a basic fence-mounted dust collector. Some heavy chips fall below the fence but are collected easily from an enclosed base.

Open bases, in turn, don't do much to control dust and debris. If chips aren't captured by the fence-mounted dust collector, they will end up on the floor.

Roland Johnson is a contributing editor.

Photos: Andy Engel

Router tables at a glance

MODEL AND SOURCE	PRICE	FENCE	TOP	COMMENTS
OPEN-BASE TABLES				
Bosch RA1200 www.boschtools.com	$350	Cast-aluminum construction accommodates dust collection, guard, and hold-down; MDF infeed and outfeed faces; no T-tracks	1 3/16-in. MDF; plastic laminate, both sides	Convenient paddle switch; folding base affords mobility but lacks the rigidity of fixed bases
Freud PKG0026 www.freud-tools.com	$400	Cast-aluminum construction with separately adjustable plastic-laminated MDF infeed and outfeed fences; no T-tracks	1-in. MDF; plastic laminate, one side; raw MDF edges	Price includes Freud FT2000E router; base flexes during use; table sagged 0.025 in.
Grizzly G0528 www.grizzly.com	$335	Two-piece aluminum; infeed and outfeed fences adjust independently; T-track, front; functional hold-downs	3/4-in. cast iron and aluminum; forward table slides	Only sliding table in the survey; router mounts with difficulty
BEST VALUE Hart Design 46603C w/Vortex cabinet www.hartvilletool.com	$330	One-piece aluminum; T-tracks, front, back, and top	1 1/16-in. MDF; plastic laminate, both sides	Scales allow easy fence positioning; Vortex cabinet offers good dust collection; sturdy base; T-tracks running side to side and front to back; table sagged 0.028 in.
Hawk 940-0050 Routershop www.rbiwoodtools.com	$900	Two-piece aluminum, fixed (see comments); T-track, front only	1/4-in. steel	Back of table (and router) tilts to 90°; router adjusts to fence or lower table with screw-driven carriage
BEST OVERALL JessEm 03140 www.jessem.com	$530	One-piece aluminum with phenolic faces; T-tracks, front, back, and center	3/4-in. phenolic	Well-designed and -executed table; sturdy, open base
MLCS 9593 www.mlcswoodworking.com	$350	Cast iron with aluminum faces; T-tracks, front and back; simple, effective hold-downs	3/4-in. cast iron	Router mounts with difficulty; 4-in. port allows full-scale dust collection
Rockler 22344 table with 68834 stand www.rockler.com	$245	One-piece aluminum with adjustable MDF faces	1 1/8-in. MDF; plastic laminate. both sides	An entry-level table with a sturdy steel base; table sagged 0.050 in.
Rousseau Model 3550 www.rousseauco.com	$360	Three-piece cast base with birch-plywood infeed and outfeed faces; no T-track	1 3/16-in. MDF; plastic laminate, both sides	Good table with a useful, spring-loaded hold-down
CABINET-BASE TABLES				
BEST VALUE Bench Dog 40-037 ProTop Complete www.benchdog.com	$380	One-piece aluminum; replaceable MDF face; toolless adjustment; T-tracks, front and back	1 1/16-in. MDF; plastic laminate, both sides	Aluminum table edge with miter-gauge slot and T-track; easy-to-assemble cabinet helps with dust, but storage is limited
CMT Industrio Routing System www.cmtusa.com	$500	One-piece aluminum; high-density plastic faces; T-tracks, front, back, and top; replaceable zero-clearance insert	3/4-in. phenolic	Scales hard to read and their screws impede fence movement; aluminum table edge with miter-gauge track and T-track; open cabinet no help with dust collection
Eagle America Model RT4000 www.eagle-america.com	$500	Two-piece aluminum with plastic face; T-tracks, top, front, and back; fence moved under load	1 1/8-in. MDF; plastic laminate, both sides	Easy-to-assemble cabinet; upper doors help dust collection; router compartment has limited storage; table sagged 0.040 in.
BEST OVERALL Woodhaven 8244K www.woodhaven.com	$740	One-piece aluminum with sliding plastic-laminate-covered MDF faces; T-tracks, top and back	3/4-in. phenolic	Sturdy birch-plywood base; small router compartment helps dust collection without impeding storage

The best open-base tables

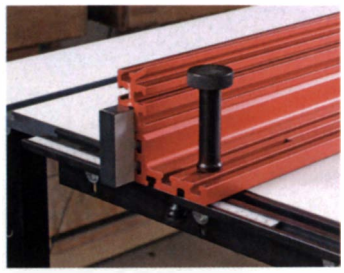
JessEm has a top-notch fence and insert

Model 03140 Rout-R-Table Price: $530; Mite-R-Slide: $300

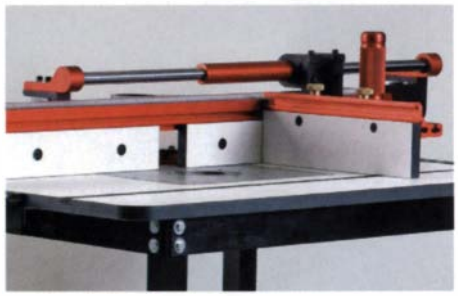
The JessEm is my favorite. The quality is top notch. The anodized aluminum base is exceptionally sturdy and fits together with a welcome precision.

The fence, one of the two best in the survey, is mounted securely with brackets at both edges of the table. Large, easy-to-reach knobs lock it to the brackets. Scales on the brackets make it a breeze to place the fence precisely. The fence also has a scale to provide accurate jig, stop, or hold-down placement.

The optional Mite-R-Slide miter gauge provides for accurate crosscuts without requiring the fence to be mounted perfectly parallel to the miter slot.



Scale helps with setups. *Identical scales on both sides of the table are easy to read from above.*



Optional miter gauge slides on bearings. *Its replaceable face is ideal for making tearout-free cope-and-stick joints.*

Hart Design features effective dust collection

Model 46603C Deluxe router-table system and Vortex cabinet Price: $330

I found the Hart Design router table to be the value leader of the open-base tables.

The fence can be locked securely and easily with a pair of over-center levers. Sacrificial fence faces can be added easily. The fence travels in a pair of T-track aluminum extrusions located in the plastic-laminated MDF tabletop with scales that zero at the front miter slot, providing a means of accurately locating the fence during repeat setups.

The Vortex cabinet does a very good job of dust collection, and the large paddle power switch offers ease and safety for the operator. A sturdy steel base rounds out the package.

The Hart table did sag 0.028 in. in the month I had it (less than 1/32 in). While that was disappointing, I liked the table well enough to overlook this defect.

A well-designed, sturdy fence. *A highly visible scale and a quick, solid fence lock help make the Hart table a good choice.*

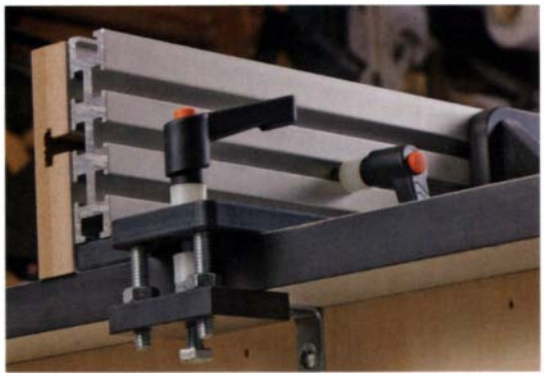
The best cabinet-base tables

Woodhaven's cabinet makes the difference

Model 8244K Price: $740

Woodhaven's router cabinet is a paragon of versatility. The two stacks of drawers that flank the centered router cabinet provide great storage for bits, wrenches, and the myriad pieces related to router operation. The lower divided cabinet offers great router storage and helps make the cabinet very sturdy. The easy-to-operate and versatile fence (three rows of T-tracks on the aluminum-back fence) and a phenolic top add up to a great package that gets my vote for best cabinet-style router table.

The small cupboard housing the router motor aids in dust collection without wasting storage space. Base parts come precut and are accurate, but it takes several hours to glue and fasten together all the drawers and cabinet pieces, hang the doors, and install the hardware and top.



T-tracks make for a versatile fence. *Commonly available T-track hardware can secure jigs to the Woodhaven fence in a number of spots.*

Bench Dog's cabinet base is a bargain

Model 40-037 ProTop Complete
Base price: $380, plus $70 for 40-008 Cab-Loc levelers and $75 for drawers

Bench Dog combines an easy-to-assemble cabinet with a versatile fence to create a first-class router table. Bench Dog's fence ties with JessEm for ease of use and versatility. The ¾-in.-thick sacrificial faces can be replaced easily with commonly available MDF or shop lumber, and the fence operation is toolless. Rocker-arm clamps hold the fence securely, and T-tracks at the top front and top back of the aluminum fence provide for jigs and featherboards.

An aluminum extrusion extends the length of the plastic-laminated-MDF table's front edge. It features both a T-track and a miter-gauge slot, providing a versatile location for jigs, featherboards, or a miter gauge. The miter slot can be fine-tuned for accurate fitting of miter-gauge bars.

Solid lockdown. *Rocker-arm clamps and ridges along the base keep the Bench Dog fence from drifting during use. The front of the table is a combination miter-gauge slot and T-track.*

Two tables with innovative features

Both of these tables function well as standard router tables. What sets them apart are particular features that no other table offers.

Hawk's tilting table adds versatility

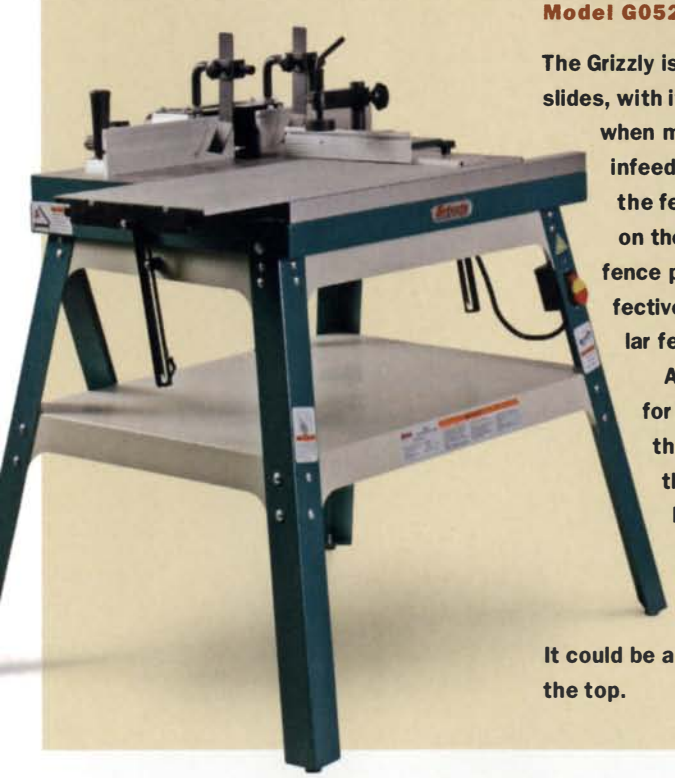
Model 940-0050 Routershop Price: $900

The only router table in the test with a tilt top, the Routershop, in essence, turns your router into a small tilt-arbor shaper. With the router tilted, common bits can cut a wide variety of shapes. Set it at 90° to the steel table, and you've got a mortiser. A threaded rod-and-crank handle moves the router up and down when the table is tilted, or front to back when the table is flat. The stationary fence mounts to the front of the table with T-handled screws. A T-track located at the top of the fairly short fence sections allows use of jigs or hold-downs.

A sturdy steel base supports the whole assembly—an interesting concept, but expensive for an open-base router table. For a woodworker who wants to increase the variety of molding profiles he can produce, or wants the basis for a horizontal mortiser, this table might be worth the money.

Tilting table adds options. *This router table can become a slot mortiser, or standard bits can be used at various angles to produce unique moldings. A crank moves a carriage and the router up or down, and when the table is horizontal, front to back.*

Grizzly's sliding table is useful for raised panels



Model G0528 Price: $335

The Grizzly is the only router table with a sliding top. The front portion of the table slides, with its edge 5½ in. from the center of the bit. This could be a useful feature when machining larger raised panels. The individually adjustable aluminum infeed and outfeed fences allow jointing operations, and have a single T-track on the fence and miter-gauge faces. T-tracks on the table and the included crosscut fence provide mounts for jigs. Simple and effective hold-downs are located on the regular fence and crosscut fence.

Although this table has a lot going for it, I found the bracket mounts for the router difficult to use. If I owned this table, I'd buy a dedicated router base and leave it attached. The cast-iron top tilts up and locks for access when mounting the router base, but its weight calls for caution. It could be a finger-pincher if the user were to drop the top.

Sliding table carries the workpiece. *Clamped by the miter gauge, this panel can be fed at an even rate for smoother cuts.*

A Shop Built Around

Space-saving design improves work support, storage, and dust collection

BY ALAN DEVILBISS

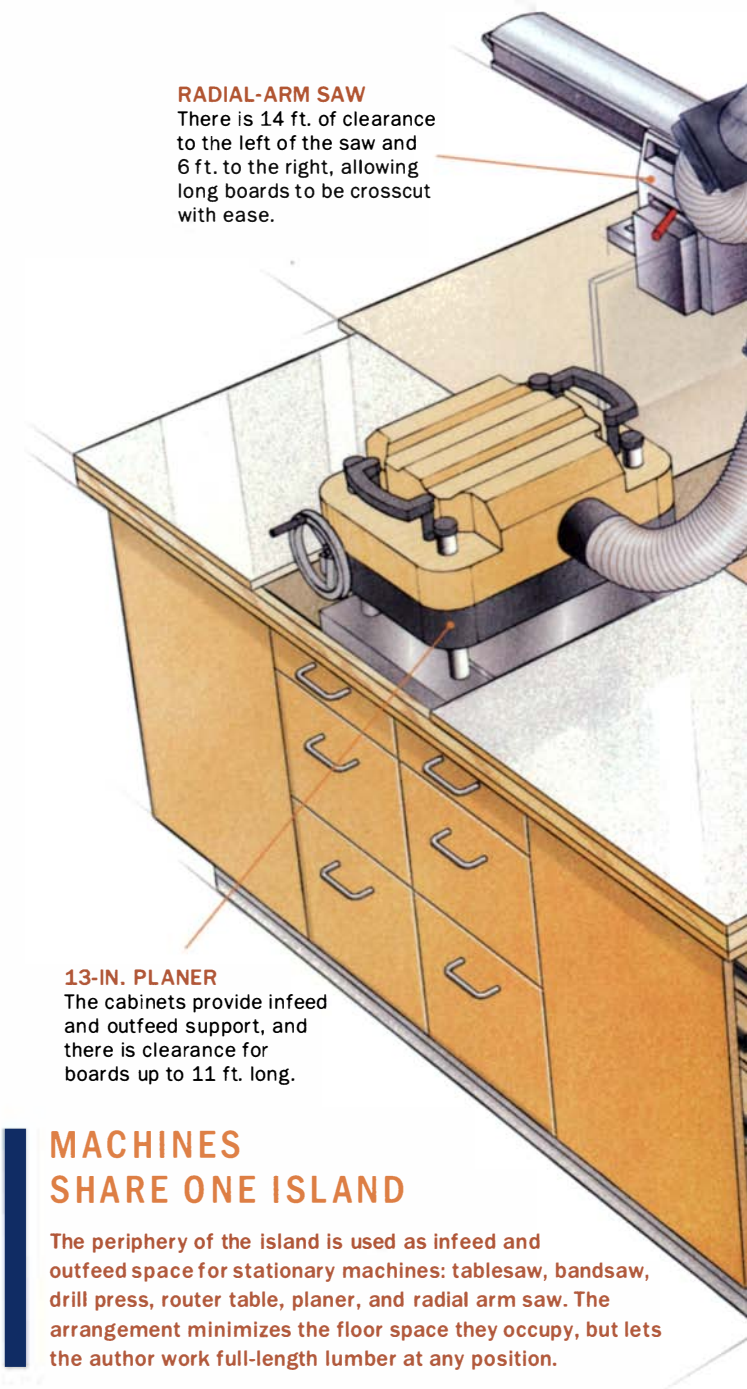
I'm sure every woodworker dreams of designing and building the perfect workshop. I finally got my chance after I retired as a circuit-design engineer for Hewlett-Packard. After two previous shops in two-car garages laid out conventionally with some tools around the walls and others on mobile bases, the engineer in me said there had to be a more efficient way to use space.

My design has a central grouping of stationary machines. By sharing infeed and outfeed space, I achieve maximum capacity for handling large boards in minimum floor space. An added bonus is that this design requires perhaps one-fifth of the dust-collection ductwork of a conventional shop with tools around the walls. This not only saved money but is more efficient.

Cabinets provide storage, infeed/outfeed support

The building is 24 ft. by 40 ft., giving about 875 sq. ft. of floor space, with a 10-ft.-high ceiling. Although about half the area could be used for parking, I park only one vehicle there.

After drawing detailed plans, I marked the outline of the island base on the concrete floor. I anchored 2x4 framing lumber to the floor using a ⅜-in. bead of construction adhesive and 2½-in. self-tapping concrete screws set into ³⁄₁₆-in. holes hammer-drilled into the concrete. Locating the lowest point on the 2x4 frame using a laser level and tape measure, I then used the level to measure points at approximately 2-ft. intervals along the 2x4s to determine their heights above the low point. I used 2x6 framing lumber standing on edge around the 2x4 base, selectively reducing



MACHINES SHARE ONE ISLAND

The periphery of the island is used as infeed and outfeed space for stationary machines: tablesaw, bandsaw, drill press, router table, planer, and radial arm saw. The arrangement minimizes the floor space they occupy, but lets the author work full-length lumber at any position.

Photos: Mark Schofield; drawings: John Hartman

an Island

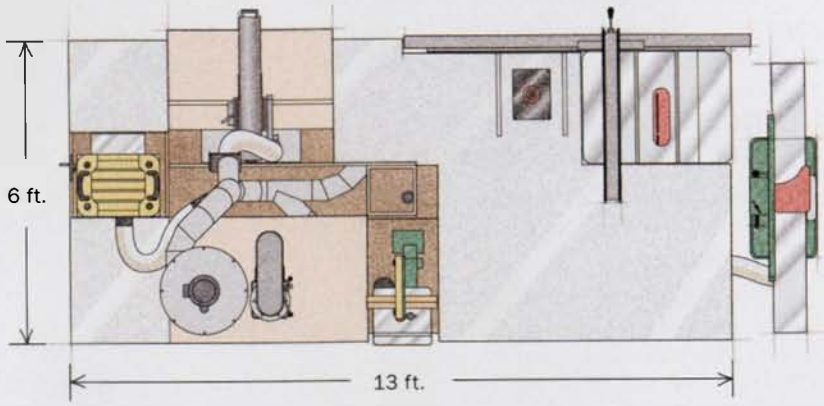
TABLESAW
Placed on a stand so that the table clears the jointer's fence, the tablesaw gets more than 4 ft. of outfeed support from the island.

8-IN. JOINTER
The only tool not built into the island, it is hooked up to the central dust collector and has clearance for boards up to 12 ft. long.

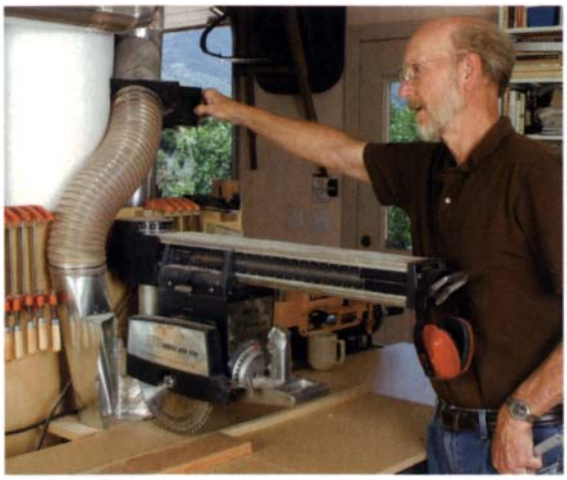
CABINET CONSTRUCTION
The cabinets are made from ¾-in.-thick particleboard, while the doors are ¾-in.-thick medium-density fiberboard with varnish. There are eight cupboards that hold larger tools and finishing supplies.

14-IN. BANDSAW
The base was removed to lower the table to the same height as the island. There is 6 ft. of support and nearly 11 ft. of clearance on either side of the saw.

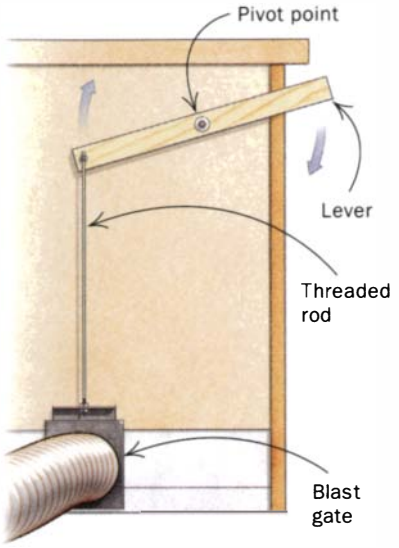
DRAWERS GALORE
The design gives masses of storage space, including 25 drawers that hold everything from router bits to hand tools.



Work island allows for efficient dust collection



Manual blast gates. *Although the dust-collection system comes on automatically when any of the large machines are started, the blast gates are operated manually.*



Easier to operate. *To avoid bending down, the author attached a simple lever to the blast gate for the tablesaw.*

it in width so that the top surfaces would lay in a level plane when attached to the base. The 2x6s are attached to the base with countersunk 3-in. screws and construction adhesive. With the base complete, I installed the dust-collection ductwork and blast gates (see drawing, facing page).

Another benefit of the island design is the large amount of storage space: 25 drawers and eight cabinets with shelving inside. The base cabinets are made of ¾-in.-thick particleboard on five sides, with the front left open. This construction method is inexpensive, fast, and efficient, wasting no materials or space on face frames. But it is important to cut the panels accurately and square, and to align the edges carefully at assembly. I cut dadoes ⅛ in. deep by ¾ in. wide to help align the panels, and I used clamps to hold the panels in position while I predrilled and installed 2¼-in. #8 screws at each joint. It's important to get the top surface of the base frame level and flat, so the front opening of the cabinet won't rack out of square when the cabinet is screwed to the base and to the adjacent cabinets.

Each box was screwed to the top of the 2x6 base, and the countertops were attached with screws from inside the boxes. The cabinets are 28 in. deep with a 12-in. space between the two rows for ductwork and filter bags. The cabinet doors and drawer fronts are all made from ¾-in.-thick medium-density fiberboard (MDF) with rounded-over edges on the outside. The drawer sides and backs are ½-in.-thick Baltic-birch plywood; the bottoms are ¼-in.-thick tempered hardboard, except for some 26-in.-wide drawers that got ½-in.-thick plywood bottoms.

The construction method for the drawers is similar to the one described by Lonnie Bird (*FWW* #166, pp. 70-73), with the sides fastened to the fronts with sliding dovetails. I sprayed two coats of clear varnish on the drawers and doors and left the particleboard cabinets unfinished. The drawers were installed in the cabinets using 100-lb.-rated, side-mounted, full-extension, 24-in. ball-bearing slides.

To allow all of the tools to share the 6-ft. by 14-ft. island, the working heights of the tools (except for the jointer) are harmonized at 38 in. above the floor. I placed the tablesaw so that it is higher than the fence of the adjacent 8-in. jointer, while I lowered the base of the 14-in. bandsaw.

Dust control is centralized and effective

Perhaps it comes from working in the microchip industry with its necessity for clean rooms, but I was determined to keep my shop as dust-free as possible. The workhorse is a 1½-hp dust collector located over the tool island. The ductwork runs between the cabinets in the base with the longest run only 19 ft. All the ducts are 5 in. dia., and the vertical run from the cabinet base to the cyclone inlet is 6 in. dia.

Power to the dust collector is controlled by a current-sensing switch, which means the dust collector comes on whenever I start any of the stationary machines. I operate the blast gates manually, and thanks to the short ductwork, the airflow is good enough to let me work with two gates open at once. □

Alan DeVilbiss, a retired engineer, does woodworking on the west side of Colorado Springs, Colo.

for more information

www.finewoodworking.com
See the author give a guided tour of his Colorado dream shop.

www.FineWoodworkingNetwork.com
Become a member and talk about shop design with Alan DeVilbiss in our expert forums.

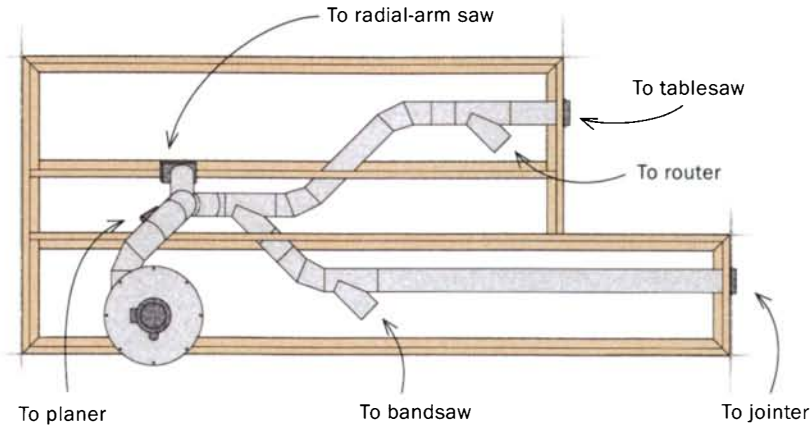
CENTRALIZED DUST COLLECTION

Grouping all the machines around the island with the dust-collection system in the middle makes for short ductwork with no pipes snaking across the floor or up to the ceiling and back down again.

CYCLONE DUST COLLECTOR
The 1½-hp. dust collector and three 1-ft.-dia. filter bags are suspended from the ceiling.

DUCTWORK
The ducts run in the space below the cabinets and consist of 5-in.-dia. metal tubing and flexible hose with a blast gate for each machine. The vertical pipe to the cyclone intake is 6 in. dia.

LEVEL BASE
The base consists of 2x4s screwed to the concrete floor, surrounded by 2x6s that are cut to width to compensate for any unevenness in the floor and to create a level platform for the cabinets.



Easy chip collection. *The chips from the dust collector fall into a plastic garbage bag kept in a dedicated cabinet. Foam weatherstripping seals the cabinet door when the collector is turned on. It takes only a couple of minutes to remove a full bag and replace it with an empty one.*

All About Chisels

Mortise? Bench? Butt? What do you need? We tell you what the catalogs don't

BY BOB SMALSER

Are you a bit overwhelmed by the array of chisels available today? I've been at this craft since the late 1950s and I still get confused. Back then, I worked part time in my uncle's boat shop, sharpening edge tools and handsaws for two lifelong wooden-boat builders. With generations of family tradecraft behind them, these gentlemen worked primarily with hand tools at a no-nonsense, commercial pace that would astound most modern woodworkers. I've followed in their professional footsteps ever since.

Pick up any two woodworking books and you'll find inconsistencies in the labels craftsmen apply to their chisels. That's because what a chisel is called is generally based on its function, not its shape, and varies depending on the trade, era, or country in which it was used. That said, specific functions require chisels shaped in specific ways. You'll find, for example, that mortise chisels from different cultures and times have similar characteristics. Read on to understand those characteristics and how they relate to the chisels sold today. I'll also mention a couple of older tools you can only find used.

Bob Smalser is a woodworker and boatbuilder in Seabeck, Wash.

Photos: Andy Engel

Chisel anatomy

A chisel is a simple tool—just a cutting edge attached to a handle. However, there are subtle differences found in both components. There are two main types of handles, with various designs to prevent them from splitting when struck. And it's crucial to choose a chisel made from good steel with the appropriate bevel for a given task.

LEATHER WASHER

STEEL HOOP

TANG HANDLE

SOCKET HANDLE

GETTING A HANDLE ON THINGS

Chisels come with either tang or socket handles. Tang-handled chisels have a tapered steel shank at one end, similar to that of a file. It's driven into a stepped or tapered hole bored in the handle, with a brass or steel sleeve, or ferrule, fitted to deter splitting. If the tang is bedded in epoxy for a perfect fit and the ferrule is strong, the handle can withstand a good bit of pounding without cracking the ferrule or splitting the wood.

Socket handles were preferred in earlier days because work didn't have to stop when the handle broke; the tradesman simply pounded the socket until he found time to replace the handle. Socket chisels are more expensive to make than tang chisels, but their handles tend to last longer and are replaced easily. Today, they are found only in a few premium brands. Many modern bench and mortise chisels look like they have traditional sockets but really don't—cut the handles off and you'll see they are tang chisels with a socketlike appearance.

The striking end of the heavier-duty chisel often is protected to prolong the life of the handle. This protection can range from leather washers on bench chisels, to steel hoops or striking rings for heavy mallet work.

THE TASK DETERMINES THE BEVEL ANGLE

Bevel angles are usually the result of a compromise between sharpness and toughness. Chisels designed to pare thin shavings are ground with shallow, razorlike bevels of 15° to 20°. Whack them with a mallet, and you'll quickly break down that fine edge. Chisels intended for general use are found with 20° to 30° bevels. Mortise chisels are ground with 30° to 40° bevels that support the cutting edge and enable it to stay sharp as mallet blows drive it into the wood. The trade-off is that mortise chisels don't pare as well.

The characteristics of the steel affect the bevel angle. Generally, the harder the steel, the steeper the bevel must be to prevent chipping. Blades laminated with very hard steel at the cutting edge, as found in most Japanese tools, require steeper bevels.

You can add a secondary or microbevel to the cutting edge to make the honing process faster. A secondary bevel is achieved by raising the chisel handle an additional 2° to 5° during honing. Since only a few thousandths of an inch actually does any cutting, why hone the entire bevel every time? Of course, continued honing of only the secondary bevel will, in time, increase its size until the speed advantage is lost. So, on every third or fourth honing, I lower the handle and restore the main bevel on a coarse stone.

PARING CHISEL

BENCH CHISEL

MORTISE CHISEL

Bevel-edge chisels

Most tool chests house a few bevel-edge chisels, whose angled sides ease working in tight quarters. There is some loss of strength, which doesn't affect, for example, a carpenter's butt chisel that mainly cuts out hinge gains, or a paring chisel that shaves with the push of a hand. Bench chisels will tolerate light mallet blows. Firmer chisels are slightly heavier versions of bench chisels.

BENCH AND FIRMER CHISELS: THE WORKHORSES

Bench chisels are basic, all-purpose tools required in every shop. Their cutting-edge bevel of 20° to 30° is a good compromise that can pare tenons, trim dovetails, do light chopping, and cut shallow mortises for hardware. Bench chisels also can be used to square up the sides of deep mortises after the bulk of the wood has been drilled out. Bench chisels often are called bevel-edge chisels, but they're actually a subset. *Bench* implies a longer chisel used and kept at the workbench instead of in a portable carpenter's box or shipwright's chest, where shorter chisels are stored more easily. The longer chisel is easier to hold plumb for accurate cutting, and is preferred where practical.

Over the decades, the label "bench chisel" also has been applied to what we now call firmer and paring chisels. In today's tool catalogs, bench chisel generally refers to a medium-length, bevel-edge chisel with a blade of moderate thickness and strength.

Firmer chisels are the same length or slightly longer than bench chisels but are made of thicker, heavier steel; usually straight-sided, sometimes bevel-edged. Their 30° cutting-edge bevels make them appropriate for paring and moderate striking. They generally have socket handles, but also come in the tang-handled "registered" pattern (like the mortise chisels on p. 50). Firmer chisels are made for fairly hard chopping in heavier stock.

BUTT CHISELS: TOOL-POUCH STANDARDS

A butt chisel is any short chisel, usually with beveled edges and a design suitable for paring and moderate striking. its cutting-edge bevel is usually 25° to 30°. Butt is an archaic word for hinge. These chisels were typically a finish carpenter's or shipwright's pocket chisel, easy to carry and store, with a major role in hanging doors and all-around trimming.

Today, butt chisels are inexpensive tools sold in almost every hardware store. They are important for repair work in spots too tight for bench chisels and too close to nails and other hardware, where you don't want to risk your more expensive bench chisels. Many older butt chisels began life as bench chisels, and as repeated sharpening wore away the length, their tradesmen owners reground them, added new handles, and turned them into butt chisels.

PARING CHISELS: ELEGANT TOOLS FOR FINE WORK

Longer and thinner than bench chisels, paring chisels have 15° to 20° cutting-edge bevels. This knifelike bevel can be honed to a fine edge, but that edge doesn't stand up to impact. That's fine, because paring chisels are meant to be pushed, not struck. They are cabinetmaker's chisels made to reach deep into a carcase or drawer to remove small wood shavings for a perfect fit. Paring-chisel blades often are forged with a slight bend in them to provide handle clearance when making a flush cut. They are elegant, lovely tools. Any chisel, however, can be reground into a paring chisel, and through the years many shipwrights, interior joiners, and finish carpenters have carried a short butt chisel with a thinned, finely beveled blade used for light trimming in conjunction with their block plane.

Some paring chisels have severely "cranked" or bent handles for clearance. These were used primarily by pattern makers making negative patterns in soft pine or basswood. if there is no wood carving in your immediate future, then you probably don't need these, as bench or butt chisels used bevel-down can perform many of the same tasks.

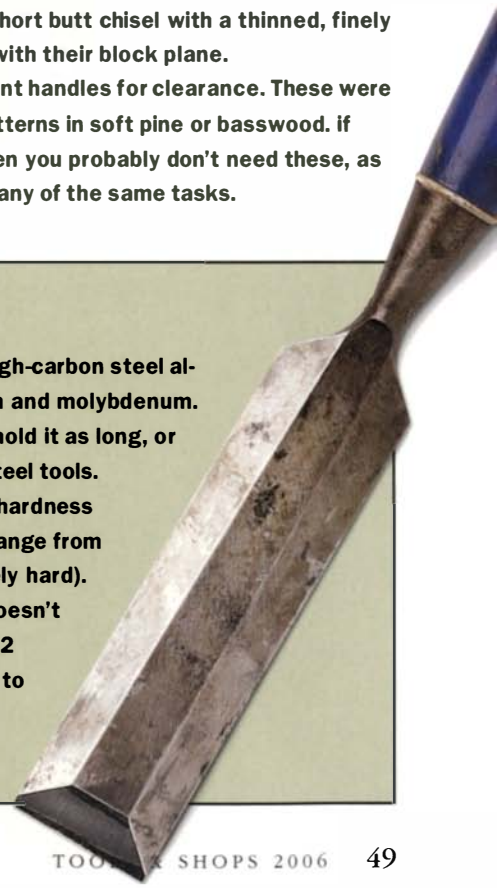
THE COLD FACTS ABOUT CHISEL STEEL

Today, all types of steel are uniform and of high quality, but that wasn't always the case. As a result, trade names from the late 1700s are stili used for high-quallty steel such as Crucible and Sheffield. These high-carbon steels remain the mainstay of edge-tool production. Properly forged and heat-treated, high-carbon steel takes an excellent edge and sharpens easily.

High-speed steel sometimes is used for chisels. Chromium, tungsten, molybdenum, and vanadium are added to resist softening when overheated. Used primarily in drill bits and lathe tools, this steel holds its cutting edge longer than carbon steel, but is very difficult to hone.

The modern compromise is A2, a high-carbon steel alloyed with small amounts of chromium and molybdenum. A2 blades take a very good edge and hold it as long, or longer, than the best prewar carbon steel tools.

Catalogs often state the Rockwell hardness number (Rc) of their chisels. Chisels range from Rc56 (relatively soft) to Rc64 (relatively hard). Softer steel is easier to sharpen but doesn't hold its edge as long. Steel above Rc62 holds an edge longer but takes longer to hone. it also can be brittle and prone to chipping.



Mortise chisels

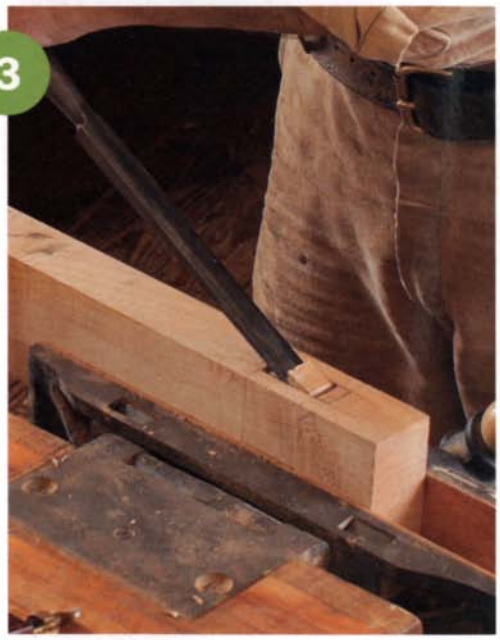
These heavy-duty chisels are designed to chop out mortises without any predrilling.

1

Mortise chisels come in several varieties and are generally straight-sided, although some have side bevels for ease in popping out chips. Today's manufacturers often refer to these chisels as "trapezoidal," as the blade looks like a shallow trapezoid when viewed from the working end. All usually are ground with 30° to 40° cutting-edge bevels, because steeper bevels hold their edge better under hard use.

SASH MORTISE CHISELS: FOR LIGHT CHOPPING

The most common mortise chisel, modern sash mortise chisels are medium length for bench use, generally with unhooped handles. They are intended for relatively light work, and originally were used in window construction, joining relatively thin mullions and muntins to heavier frames. There is some confusion in describing both medium and long mortise chisels as sash chisels. Traditionally, window and millwork factories used longer, heavier chisels. Today, the medium-length tools usually are called sash chisels.



CHOPPING A MORTISE

Lay out the mortise with a mortise gauge and a marking knife. Take a heavy blow with the chisel held plumb, just inside the knife mark (1). The next blow is taken bevel up (2), the waste levered out (3), and the process repeated from the opposite direction. For clearance as the mortise deepens, make the angled blows bevel down. Clean the mortise by levering the tool along the bottom (4). To support the short grain atop the mortise, leave the workpiece long, and trim it later.

REGISTERED MORTISE CHISELS: STRAIGHT, SQUARE SIDES
Some manufacturers call these large chisels "heavy-duty sash mortise chisels." They have heavy blades, square sides, and hooped tang handles for tougher use than many sash chisels can handle. "Registered" simply means that the sides of the blade are perfectly square and parallel with each other, not beveled like many bench chisels or trapezoidal like many bolstered mortise chisels. The square sides are an aid when chopping mortises. Most of the German-made mortise chisels are of this design, as are English "registered" or "shipwright" mortise chisels.

MILLWRIGHT MORTISE CHISELS: AN AMERICAN CLASSIC
Not made since World War II, many were 18 in. long for ease in holding plumb. Always with hooped socket handles, they were designed for factory hands to use making window sashes and other millwork on a rapid, piecework basis. Combined with a heavy mallet, these rigid mortise chisels stood up to heavy use better than any chisel I know of. Millwright chisels are common on the used-tool market (they frequently come up for sale on online auction sites such as eBay) but because of their size and appearance, they often are mistakenly called framing chisels. Timber frames in buildings and ships used much larger mortises than the ⅛-in. through 1-in. widths of these chisels.

ENGLISH BOLSTERED OR PIGSTICKER MORTISE CHISELS
Still made by Ashley Iles, pigstickers commonly are found on the used-tool market. These short and stubby chisels fit easily in a tool chest and have a thick, unhooped, oval tang handle that's designed for heavy striking. The handle is mounted against a disk-shaped guard or bolster to absorb the force of the blow. An incredibly tough chisel, pigstickers have been imported for sale to North American cabinetmakers and finish carpenters since before the 1850s. Many have the advantage of being available in 1/16-in. increments.

Specialty chisels

These chisels perform specific tasks, generally for advanced craftsmen whose work requires those tasks often enough to justify the purchase of a special tool. Most of the tasks can be performed adequately, but not as efficiently, with common bench and mortise chisels or other tools in the shop.

SKEWED PARING CHISELS

These are thin and skew cut to reach into corners, and usually come with tang handles. Bench chisels are converted easily to skewed parers by regrinding to thin the blades and applying 20° bevels to the cutting edges.

SWAN OR GOOSENECK CHISELS

Designed to deepen or clean up the bottom of a mortise, the curve in the gooseneck's blade functions as a fulcrum, levered against the mortise's sides. Most mortises can be cleaned up just as well with a conventional chisel by anchoring the bevel of the chisel against the mortise end and scraping the bottom. Swan and gooseneck chisels are made primarily for locksets and other mortises too long for that technique.

DOVETAIL CHISELS

Defined by triangular blades with 20° bevels, dovetail chisels are paring chisels with cranked handles designed to reach into sliding dovetails. Another "dovetail" chisel is a bench or paring chisel reground by the craftsman to reach into the spaces between dovetail pins instead of using a skewed parer for that task.

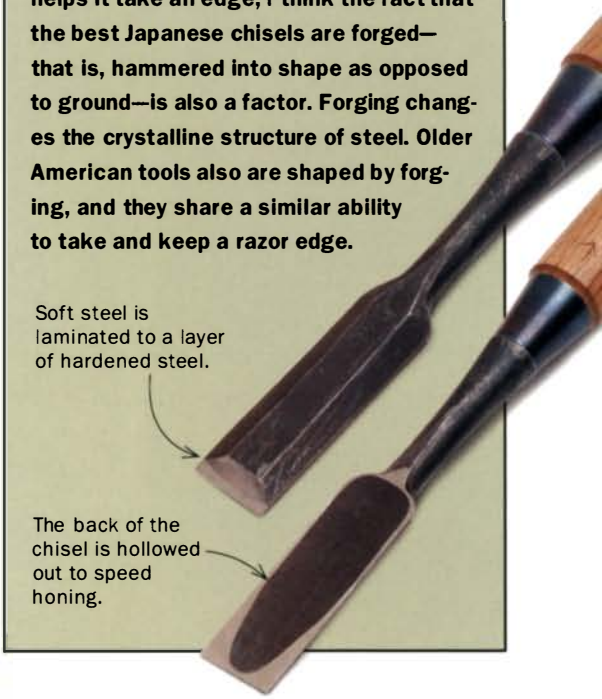
CORNER CHISELS

Once made strictly in large sizes for timber-frame mortises in buildings and ships, corner chisels now are made smaller for cabinetry. Their primary function is to square up mortises that have been drilled first, although that also can be done with conventional chisels. If you chop mortises with proper mortise chisels as opposed to drilling and then paring with bench chisels, you won't have a use for these.

JAPANESE CHISELS

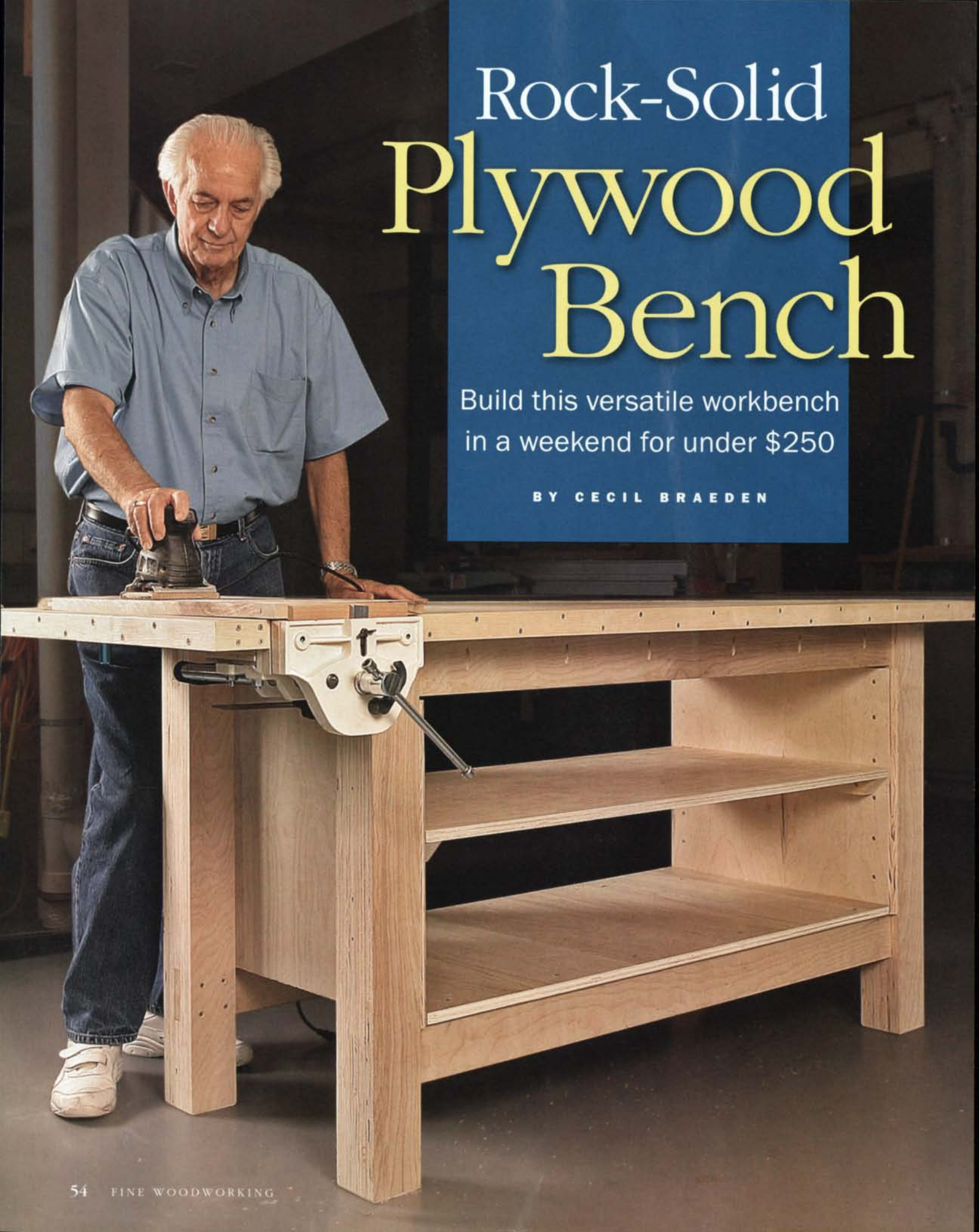
Hand-forged, best-quality steel is the mainstay of legions of knowledgeable woodworkers who use Japanese tools. Traditional Japanese chisels are forged from a combination of softer steel in the shank and body for toughness, and very hard high-carbon steel for the back, which takes a keen edge. This combination speeds sharpening, as only the cutting edge is of the hardest steel. The backs are hollow ground and can be flattened quickly.

While the steel's hardness certainly helps it take an edge, I think the fact that the best Japanese chisels are forged—that is, hammered into shape as opposed to ground—is also a factor. Forging changes the crystalline structure of steel. Older American tools also are shaped by forging, and they share a similar ability to take and keep a razor edge.



What to buy first

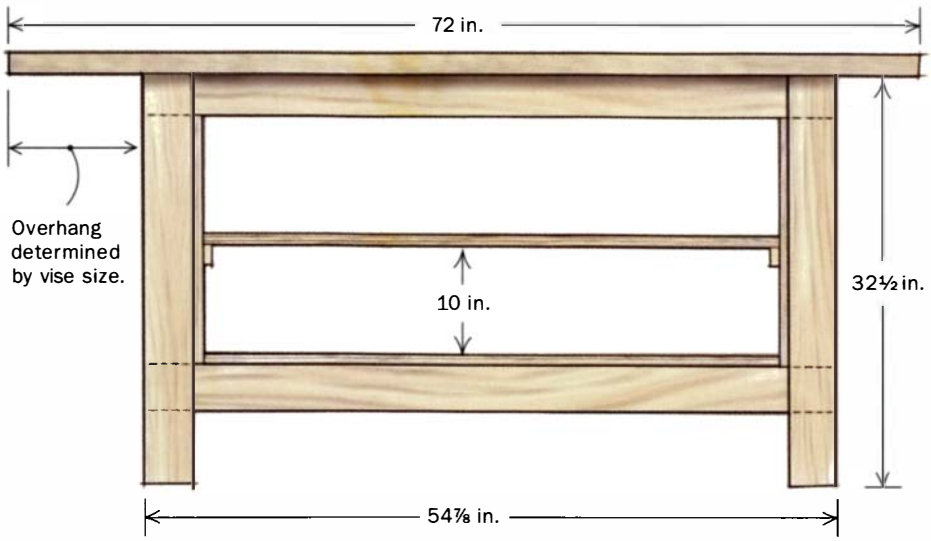
To begin building your set, you certainly don't need anything expensive. A set of beveled-edge bench chisels in ⅛-in. through 1-in. widths and a set of ¼-in., ⅜-in., and ½-in. mortise chisels (sash if you do lighter work; registered, millwright, or bolstered for heavy chopping) can make a lifetime of heirloom furniture and handle most household woodworking projects. That's all I used for most of my working life. Just as astounding as how quickly my mentors' wooden boats went together using mostly hand tools was how few tools those gentlemen owned.

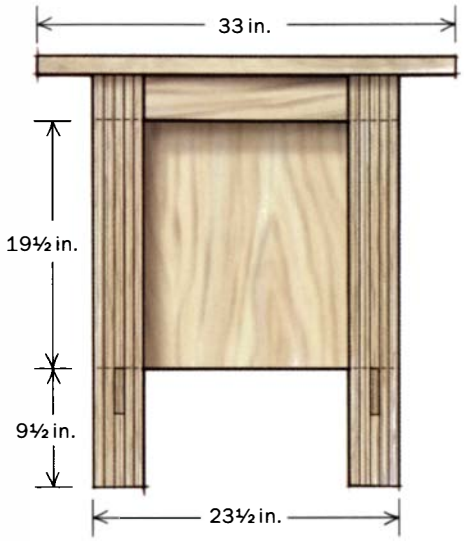


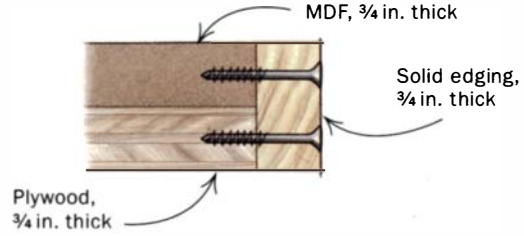
Rock-Solid Plywood Bench

Build this versatile workbench in a weekend for under $250

BY CECIL BRAEDEN







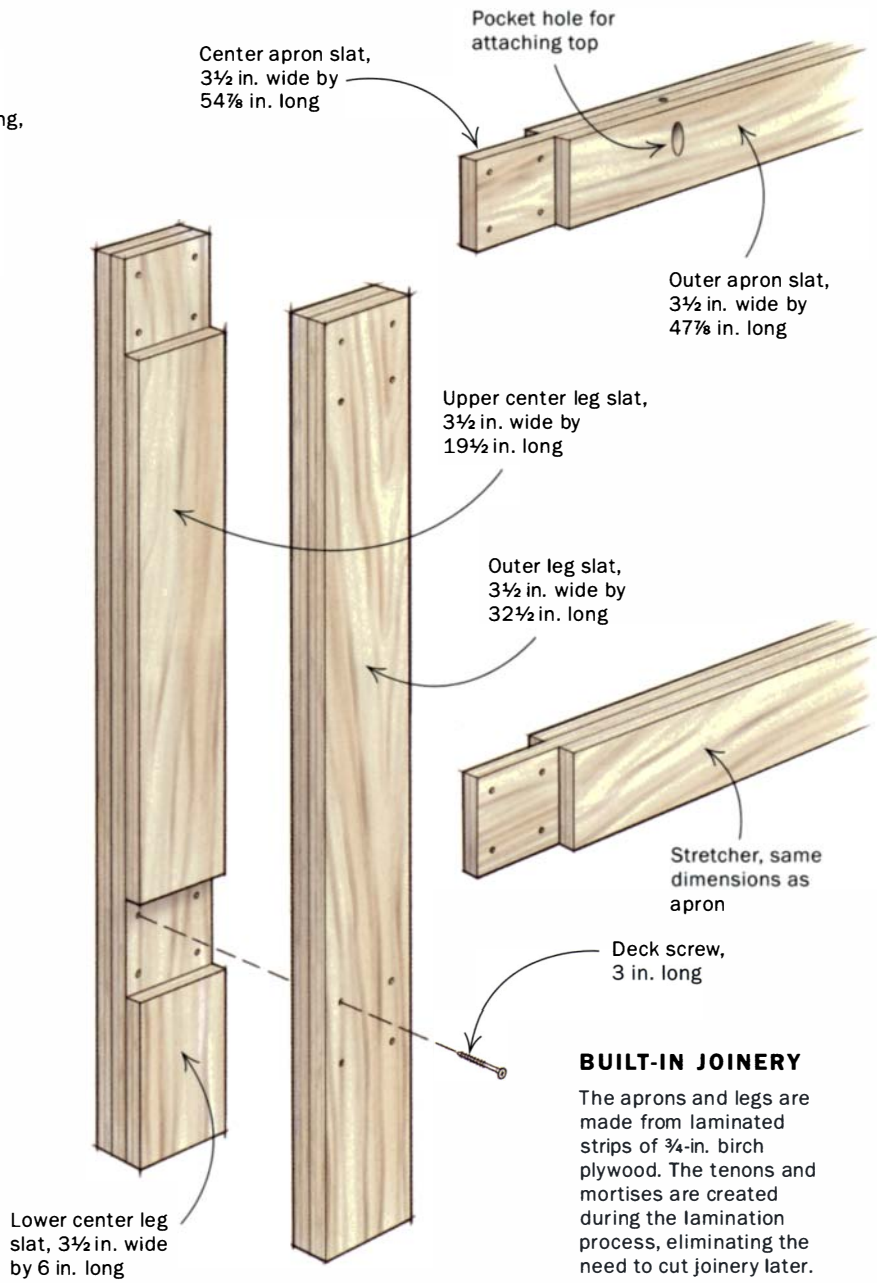
I had wanted to build a sturdy workbench for some time but was put off by the cost and complexity of a traditional hardwood bench. I knew that such benches derive much of their strength and rigidity from the mortises and tenons that join the framework, and I wondered if there was a way to combine this joinery with the inherent strength, rigidity, and dimensional accuracy of plywood. The design I created has a base of laminated sections of plywood and a top of plywood and medium-density fiberboard (MDF).

An advantage of this design is that the piece can be built without a planer or jointer, perfect for someone just getting started in woodworking. For under $250 including a vise, I have a bench with the rigidity I desired without breaking the bank.

Design the bench, create a cut plan, and begin

This method of construction can be adapted to almost any size and type of bench: You could even construct just the base and purchase a ready-made hardwood top. My bench is 33 in. wide by 72 in. long by 34 in. tall, a comfortable height for me to work at. It is also ⅛ in. lower than my tablesaw, allowing me to use the bench as an auxiliary outfeed table. The cut plan I used (see p. 56) allows you to create a bench with legs up to 36 in. long, giving a bench height of 37½ in.

All base components—legs, aprons, and stretchers—are laminations made from 3⁹⁄₁₆-in.-wide slats of ¾-in.-thick plywood. Set the tablesaw's fence and rip all the strips without changing the setting. You always



BUILT-IN JOINERY

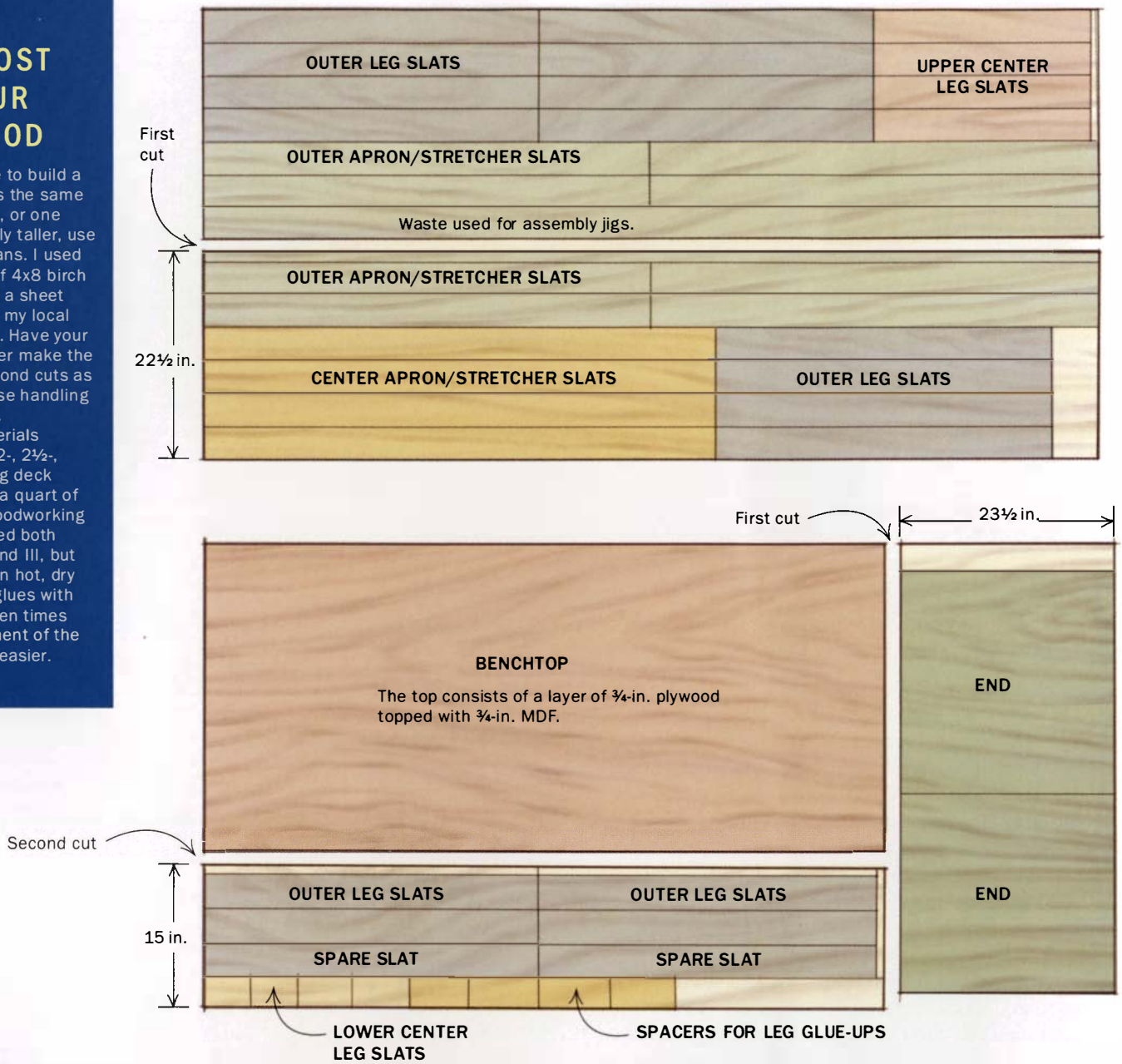
The aprons and legs are made from laminated strips of ¾-in. birch plywood. The tenons and mortises are created during the lamination process, eliminating the need to cut joinery later.

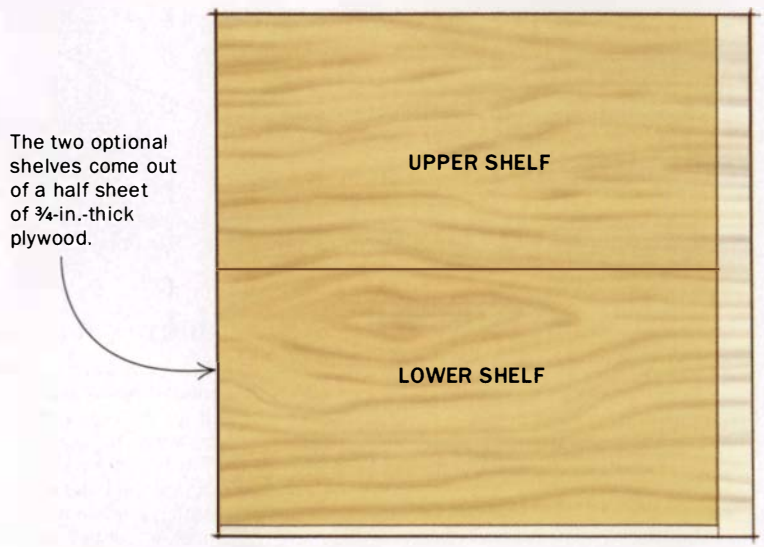
Photos: Mark Schofield; drawings: Chuck Lockhart

MAKE THE MOST OF YOUR PLYWOOD

If you decide to build a bench that is the same size as mine, or one that is slightly taller, use these cut plans. I used 2½ sheets of 4x8 birch plywood and a sheet of MDF from my local home center. Have your plywood seller make the first and second cuts as shown to ease handling the material.

Other materials needed are 2-, 2½-, and 3-in.-long deck screws, and a quart of fresh PVA woodworking glue. I've used both Titebond II and III, but particularly in hot, dry conditions, glues with extended open times make alignment of the laminations easier.



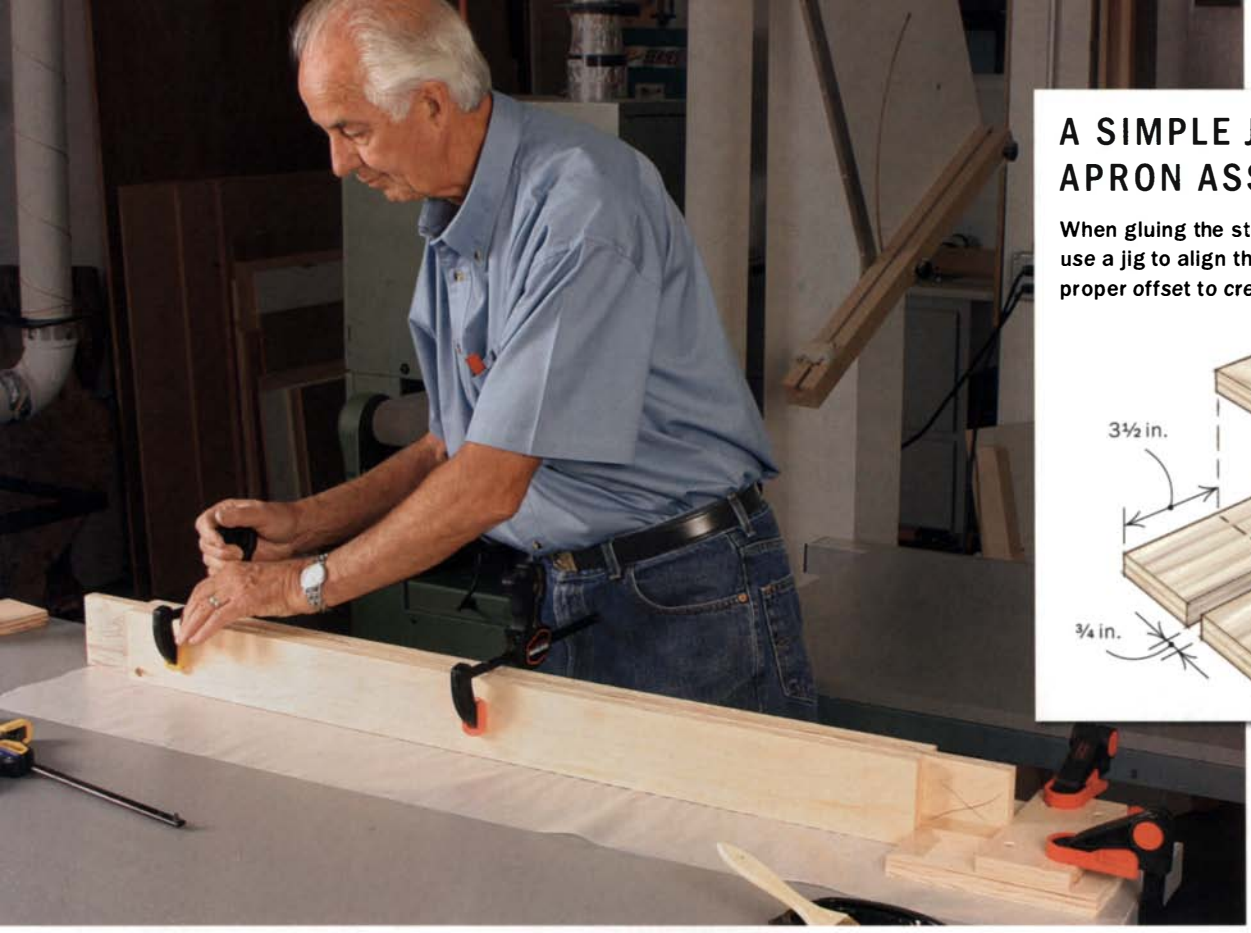


will get some tearout when you cut plywood: This can be minimized with a zero-clearance insert on the tablesaw, but in any case rip with the show side of the plywood up. If you do get some tearout, lightly sand away any splinters and keep the tearout side inward when assembling the components.

The last step before laminating the components is to drill pocket holes every 6 in. on one side of the two outer apron pieces to attach the top with pocket screws. Or you can use the battens described on p. 58.

Glue-up requires quick work, attention to detail

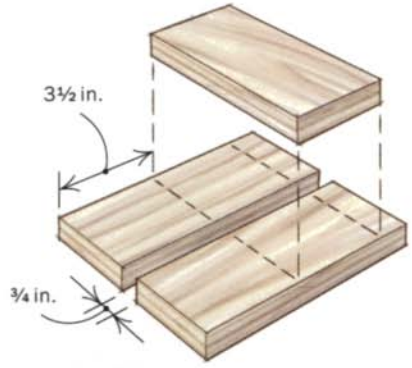
Even with glue that has a moderate amount of open time, you must work quickly, so do a dry run first and have all components in order. I apply the glue to all mating surfaces with a disposable brush that has the bristles trimmed, but a roller would work. Glue the laminates on a flat surface protected by waxed paper.



Construct the aprons and stretchers. *These parts consist of a center strip of plywood that includes the two tenons, and two shorter outer strips that form the shoulders of the tenon. Have multiple clamps ready for use.*

A SIMPLE JIG AIDS APRON ASSEMBLY

When gluing the stretchers and aprons, use a jig to align the center slat at the proper offset to create the tenon.



Assemble and glue stretchers and aprons—Make sure all like pieces are trimmed to exactly the same length. Draw a line 3½ in. from both ends of the longer center-slat pieces, and mark the ends of both sides with an "X" to indicate non-glue areas. If you are using pocket holes on the aprons, make sure the holes are facing outward and upward.

Glue the three pieces of each component together, being careful not to get any glue on the tenon ends. Turn the assembly on edge so that the plies are facing up and insert one end in the apron jig (see drawing, top right). As you apply clamping pressure, keep the slats aligned and pushed against the jig to maintain the 3½-in. tenon and even cheeks. When the glue is dry, run both exposed-ply sides of each component through the tablesaw to clean them up.

Next, make the legs—Prior to assembly, make the spacer blocks (see photos, p. 58) and wrap about 5 in. of each with clear tape. Used to create the lower mortise on each leg, the spacer is driven out after the leg has dried. Tape prevents glue from sticking to the spacer. The leg stack consists of two outside slats, the lower center piece, the spacer, the upper center piece, and two more outside slats. Locate the upper and lower mortise areas and mark both mating surfaces so that you will remember not to apply glue there.

A simple L-shaped jig helps to lay up the legs accurately. Glue the slats together, remembering to insert the spacer. After assembly, turn the stack so that the spacer is sticking up. Using both sides of the jig, keep the ends and edges of each slat in perfect alignment and the center slats pressed tightly against the spacer as you apply clamping pressure. Apply two small clamps to both outside pairs of slats that form the upper mortise.

After the glue has set, make cleanup cuts on the tablesaw. Use sandpaper to slightly chamfer the bottom edges of the finished legs to prevent splintering of the outer veneer if the bench is dragged across the floor.

Assemble the frame sides, then join them with plywood panels

Start by dry-fitting the tenon on each end of a stretcher into its respective mortise. If a tenon extends beyond the leg, trim it flush or slightly recessed. Lay a leg on a flat surface protected with waxed paper. Apply glue to the mortise-and-tenon, then insert the tenon and clamp lightly. Use a carpenter's square to bring the stretcher and leg to exactly 90°, and tighten the clamp. Remove the excess glue with a damp cloth, put the joint aside to set, and assemble the second leg and stretcher.

Once the glue has set, remove the clamps and lay the leg/stretcher down with the inside facing up. Drill four countersunk pilot holes at least 2½ in. deep into each joint and drive in waxed 3-in. deck screws. Reinforcing the joints in this manner may not be

Tip:
Once you spread the glue you'll have to work quickly, so do a dry run first and have all the components in order.

Leg assembly. *Insert a taped spacer block to hold open the lower mortise. An L-shaped jig keeps the sections aligned. Use a generous amount of glue, but don't apply glue to those areas that face the spacer block.*

Clamping the leg. *When the sections have been glued together, turn the assembly upward and apply the clamps. Waxed paper protects the work surface. When the glue has dried, knock out the taped spacer block with a mallet and a thin piece of wood to reveal the mortise.*

necessary, but it is very cheap insurance that the joints will hold forever.

Stand the assembly on the floor with the stretcher pointing up. Place waxed paper under the apron mortise; apply glue to the mortise and insert an apron tenon, being sure the pocket holes are oriented properly. Check for 90° and clamp the apron with a bar clamp. When the joint is dry, reinforce it with screws and then attach the other leg in the same manner.

The benchtop should rest on the aprons, not the legs, so if the top of a leg is higher than the apron tenon, trim it flush. Sand the exposed joints on the legs to remove glue residue.

If you are not using pocket screws to attach the top, prepare a couple of 2-in.-square battens with countersunk holes in two directions. Clamp the battens flush with the top inside edge of the aprons and attach them with 3-in. deck screws.

Stand the front and rear assemblies on their legs on a level floor, and cut two pieces of plywood to fit between the stretchers and aprons and to the desired width of the frame. These sides will serve as the end stretchers. There will be space to install an end vise above the side of the bench if desired. Chamfer the edges of the sides. Drill countersunk holes every 3 in., 1¾ in. in from both edges to locate the screws in the center ply of the legs. Clamp the sides in place with the edges flush with the outside edges of the legs. Be sure to check that the frame is square by measuring the diagonal between opposite corners; adjust until the

Clean up the edges. *After the legs, aprons, and stretchers have been assembled, run both edges past a sawblade to clean up glue residue and leave them at the final 3½-in. width. Cut the first edges with the fence at 3⁹⁄₁₆ in., and the opposite edges at 3½ in.*

distances are even, then tighten the clamps. Now drill pilot holes 1½ in. deep through the previously drilled countersunk holes, and drive 2½-in. deck screws.

Next, add two plywood shelves, the lower one attached to the front and rear stretchers with 2-in. screws, and the upper one screwed to battens attached with 3-in. screws through the end stretchers into the legs. Because the shelves, sides, and top are screwed on, the whole bench can be disassembled for moving.

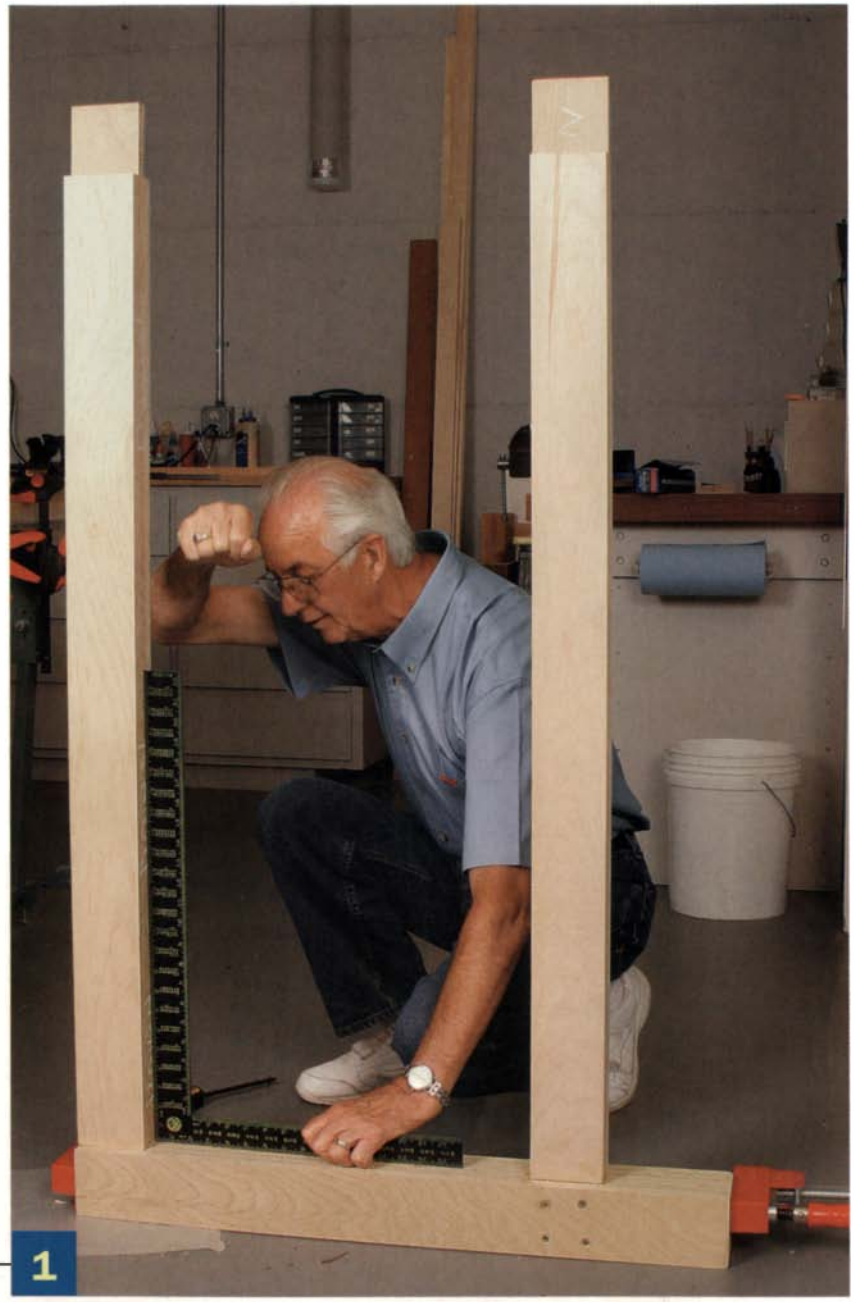
Make and attach the top

If you are making your own top, lay the layers upside down, making sure one end of the assembly is flush, and screw them together using countersunk screws that will not go through the top layer. Cut the other sides flush using a circular saw and straightedge or the tablesaw.

Ask a friend to help place the top on the frame and position as desired. Mark the corners of the legs on the underside of the top. Then turn the top over and mark the holes for the vise(s) on the bottom side so that you can drill small holes through. You may have to add a spacer block to bring the vise jaws level with the top. Turn the top back over and use a spade bit to drill recesses for the bolt heads at each of the small holes. Then drill for the bolts and attach the vise. At this point you can attach the top: Place it on the bench frame and secure it with the pocket holes or battens.

To protect the soft edge of the MDF top, I screwed a solid wood edging around the entire benchtop, leaving a gap for the vise. Drill holes for bench-dogs (if desired), and you are done. If you plan to use this bench primarily for glue-ups or finishing, a good choice would be to laminate the top; otherwise, apply a clear finish or just leave it natural. □

Cecil Braeden is a woodworker near Anacortes, Wash.



ASSEMBLING THE BASE

Begin with the frame sides. *Insert the stretcher and apron into the leg, making sure they meet at exactly 90° (1). Reinforce the joints with four 3-in. deck screws. With the side frame resting on the floor, add the second leg (2). Finally, add the plywood end stretchers (3). Clamp them in place, check the base for squareness, then attach with screws.*

Choosing and Using a

COMPOUND-MITER SAW

This type of saw has a greater height capacity, which is useful when cutting tall moldings (see photos, facing page).

SLIDING COMPOUND-MITER SAW

The sliding feature extends the saw's crosscutting capacity and makes this saw well-suited for cutting wide boards.

COMPOUND OR SLIDING COMPOUND?

A compound-miter saw (CMS) blade moves in three directions: up and down in a chopping motion; about 45° left and right to cut miters; and leaning left (single bevel) or left and right (double bevel) to make compound cuts. A sliding compound-miter saw (SCMS) does all of the above, but the blade and motor assembly also can slide back and forth on one or two tubes to enable crosscutting wide boards.

Miter Saw

BY GARY M. KATZ

Find the right saw for your work, then add a few helpful jigs and tricks

A good friend called a few weeks ago from a local tool store. He was looking to buy a miter saw, but was confused by the range of options and couldn't make a decision. More than a dozen tool companies make miter saws, each with three to five models, and the various saws range in price from $100 to $900. Before you go shopping for a new miter saw, ask yourself one important question: What am I going to use it for?

This article covers the two main types of saw, explores the most common uses for miter saws, and explains which saw best fits each use.

Choosing a saw: cutting wide boards vs. tall molding

Twenty-five years ago, miter saws were called chop saws because that's all they did: miter material with a chopping motion while having the ability to swing left and right. Today, nearly all models fall into one of two categories: compound-miter saws (CMS) or sliding compound-miter saws (SCMS).

Two of the main uses for miter saws are crosscutting boards and mitering molding. Unfortunately, there is no one type of saw that works best for both types of cut. Because of their inherent design, sliding compound-miter saws can cut wide boards but

TWO WAYS TO CUT CROWN MOLDING

"In position." *The most accurate way to cut molding is to lean it against the saw's fence (upside-down and at its installed angle) and simply set the saw's miter gauge at 45°.*

"On the flat." *If your saw does not have the capacity to cut wide molding in position, you must lay the molding on the saw's table, and then make a compound-angle cut employing both the miter gauge and the less-accurate bevel gauge.*

What size do you need?

Miter-saw blades vary from 8½ in. to 15 in. For many years, I preferred using a 15-in. chop saw because it could cut 7-in. molding leaning against the fence. New designs mean many 12-in. saws now exceed this capacity while they cost and weigh less. The 8½-in. saws more than offset this advantage with very little cutting capacity, so I recommend you confine your search to 10-in. and 12-in. compound-miter saws and sliding compound-miter saws.

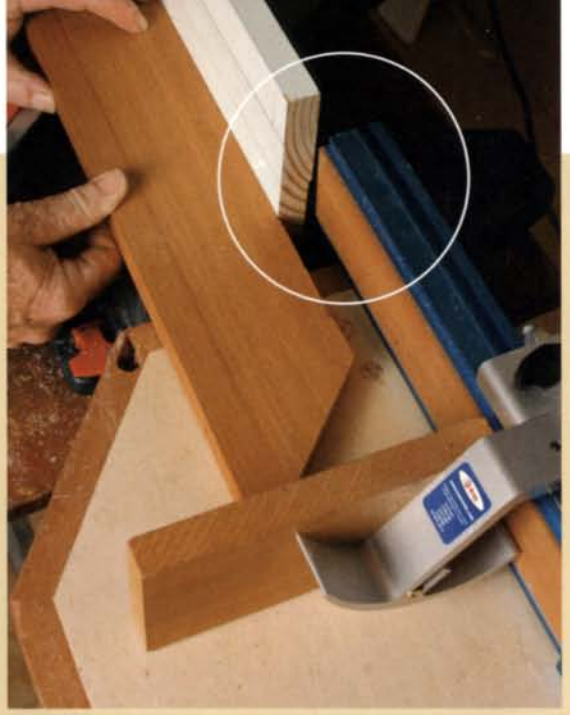
MITER-SAW CUTTING CAPACITIES

SAW SIZE AND TYPE	MAX. HEIGHT AT FENCE	CROSSCUTS AT 90°	CROSSCUTS AT 45°	45° BEVEL CUT	PRICE RANGE
10-in. compound-miter	4 in.	2 in. by 6 in.	2 in. by 4 in.	2 in. by 6 in.	$100-$200
12-in. compound-miter	6 in.	2½ in. by 8 in.	2¼ in. by 6 in.	2 in. by 8 in.	$280-$380
10-in. sliding compound-miter	3¼ in.	3⅝ in. by 12 in.	3 in. by 8 in.	2 in. by 12 in.	$450-$520
12-in. sliding compound-miter	4 in.	4½ in. by 12½ in.	4½ in. by 8½ in.	3 in. by 12 in.	$550-$650

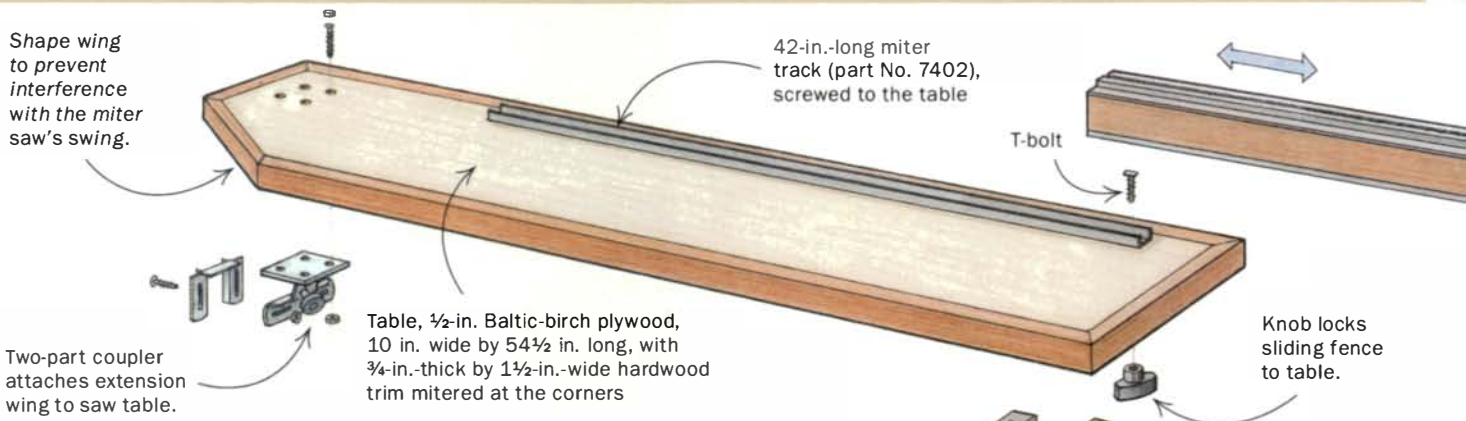
Photos: Mark Schofield

Add wings to your saw

Good cuts need good support. *A pair of extension wings with stop blocks support long pieces and make for accurate cuts.*



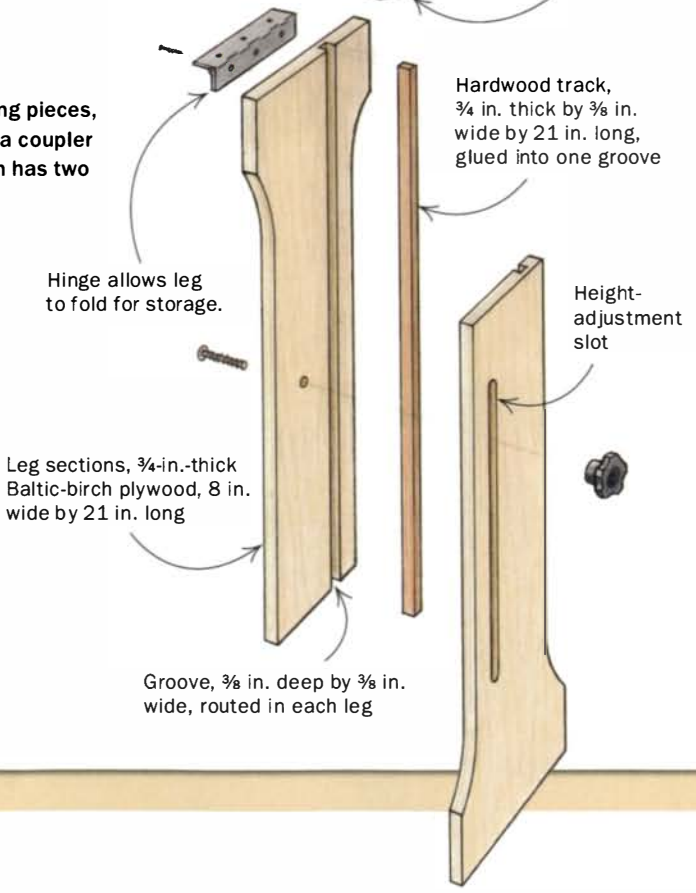
The fences are not aligned. *The purpose of the fence on the extension wing is only to carry the stop block. The fence on the saw aligns the workpiece.*



SHOPMADE EXTENSION WINGS

If you have a freestanding miter saw, extension wings not only support long pieces, but also aid accurate measuring and cutting. They hook to the saw using a coupler system and fold up and lean against the wall when not in use. This design has two wings, each 56 in. long, that can expand to support an 8-ft.-8-in. piece.

A good connection. *This two-part coupler (available at www.sawhelper.com; 800-441-1388) ensures that removable extension wings align evenly with the saw's table.*

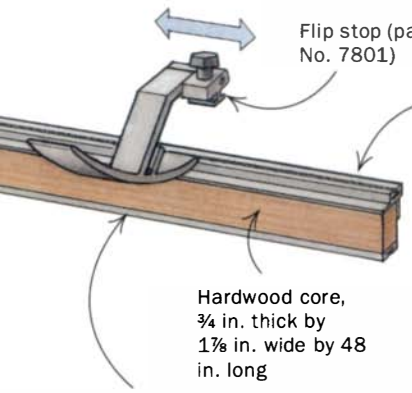


lack the height-cutting capacity of similar-sized compound-miter saws (see chart, p. 61).

Two ways to miter molding—When cutting miters you can choose to cut "in position," with the molding leaning against the saw's fence, or "on the flat," with the molding lying on the saw's table. The latter becomes necessary if the molding is taller than the vertical cutting capacity of the saw—a situation that has become more common as tall baseboards and historically accurate crown moldings grow in popularity.

To cut a miter in position, lean the molding against the fence at its installed angle but upside down, and swing the saw to the correct angle using the miter gauge at the front of the saw. Most miter gauges have about a 12-in. radius, which means you can dial in an angle to ½° without difficulty. To cut a miter on the flat, you tilt the blade using the miter gauge and the bevel gauge on the back of the saw. However, bevel gauges have only a 3-in. or 4-in. radius, so dialing in a bevel angle isn't nearly as accurate—you're lucky to get within 1°.

Sliding compound-miter saws cost more and weigh more than compound-miter saws. They also have more moving parts and must be treated with care. A good bump can throw one of these saws out of whack and spoil your carefully crafted joinery.



SLIDING FENCE

The purpose of the fence is to allow the stop block to be set in any position. The fence consists of a hardwood core with Kreg hardware available at www.kregtool.com; 800-447-8638.

Stop block for miters. *The author screws a block of wood to the stop block to give mitered ends a larger surface to register against.*

Choosing the right blade

Just as a premium iron can transform a cheap handplane, the right blade can transform a miter saw. I like to have 96 teeth on a 12-in. blade and 80 on a 10-in. one. However, more teeth mean more strain on the motor, so to offset this I use thin-kerf blades. I use either alternate-top-bevel (ATB) blades or blades that combine ATB and flat-top teeth. Last, I prefer a hook angle of 0° to 5° to give the operator more control and to leave a smoother cut.

A good stand and extension wings are necessities

Even the most expensive miter saw is worthless without good support. One of the best locations is to build it into an existing bench, perhaps one already used for a radial-arm saw. This also allows you to build some kind of dust-collection booth, at least for a CMS. Commercial extension wings are available, but I made my own using commercial hardware (see diagram, left). For a freestanding location that can be stored when not in use, a torsion-box table can be mounted on a pair of sawhorses with extension wings attached to either side to support long pieces.

Cutting small parts precisely and safely

To cut small parts on a miter saw, I make a one-piece auxiliary fence and table jig. I align the left-hand end of the jig with the left-hand end of the existing fence, clamp the two together, and then make a cut with the blade angled at 45° to the right. I repeat

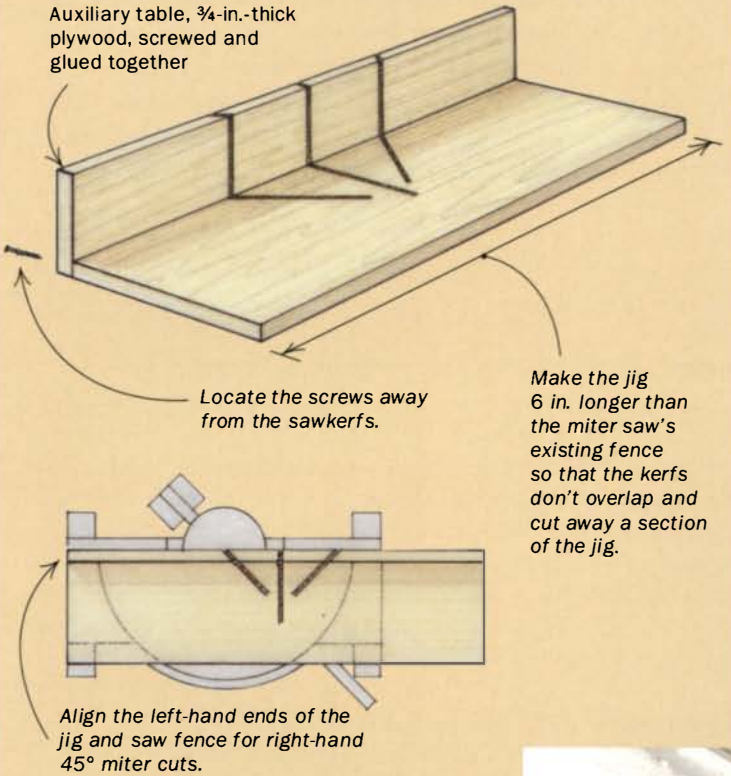
Or build it into your bench

A built-in miter saw. *Putting a miter saw into an existing bench provides support for long pieces and a dust-collection booth.*

Drawings: Vince Babak

Cut small parts safely

An auxiliary table and fence support small pieces. Aligning one end of the jig with the existing fence aligns the blade with the kerfs.



SAFETY TIP

Clamps replace fingers

When cutting a short piece, don't try to hold it. Instead, clamp it to the auxiliary fence.

the process aligning the right-hand ends and make a 45° cut to the left. Finally, I roughly center the jig and make a 90° cut between the two other cuts.

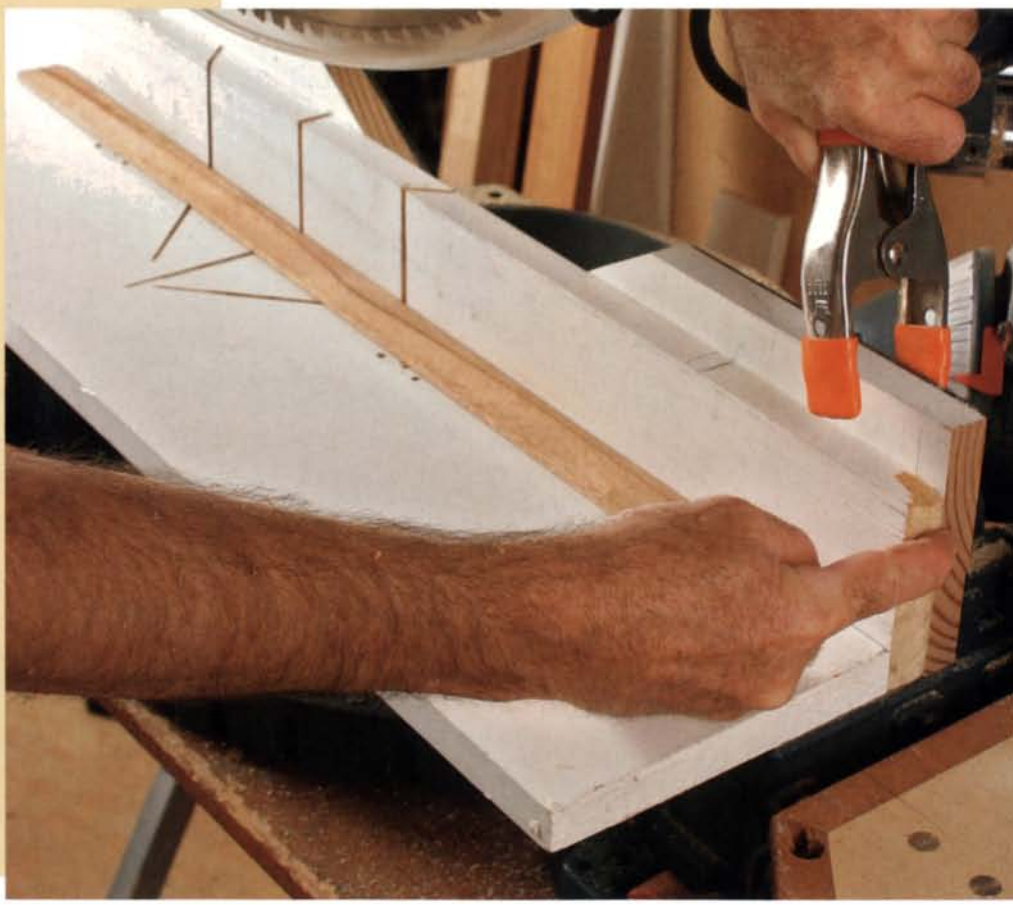
When cutting a miter, align the jig with the fence and align the pencil mark on the workpiece with the relevant sawkerf. The zero-clearance table and fence will support the piece and prevent tearout.

I try never to let my hand get closer to the blade than the end of the fence. When cutting short parts, instead of risking your fingers, add a thin additional fence to the jig and screw a toggle clamp to it. Clamp the workpiece and then position the jig as above. To prevent the small part from being flicked away by the blade after the cut is made, tape the section to the jig with masking tape before making the cut.

Clean cuts on wide boards and plywood

I'm often asked if it is possible to get a clean cut on a board when that board's width exceeds the crosscutting capacity of the sliding compound-miter saw. Another common problem is excessive tearout when crosscutting plywood. The photo sequence on the facing page shows the solution to both of these problems: You will need a good extension wing with an accurate stop on the fence.

Most cuts on the SCMS should be made by pulling out the blade, then lowering it onto the wood and making the cut on the push stroke so that the operator is counteracting the natural direction of the saw. In this case, draw the blade toward you across the



Cut to the line. *With the jig aligned, the blade will follow the existing kerf. This allows you to place the workpiece precisely.*

Cut wide boards cleanly

A scoring cut, then a full-depth cut. *Make a shallow cut while pulling the blade toward you. The surface is cut by teeth entering the wood, not exiting it, thus avoiding tearout. After the saw has been pulled out to its limit during the scoring cut, push the handle down and then away from you to make a full-depth cut.*

top of the workpiece as you cut, making a cut less than ⅛ in. deep. The shallowness of this cut avoids the inherent danger in climb cutting. Because the cut is made when the tooth enters the top surface rather than when it exits, tearout is eliminated. When the saw is at its maximum extension, lower the blade and make a full-depth cut in the normal way.

Then turn the board over, placing the uncut edge against the fence and ensuring that the end of the board is again in contact with the stop block. Run another light scoring cut across the uncut section, lower the blade, and finish the cut. You will be left with an uninterrupted cut free of tearout on both surfaces.

Which saw is right for you?

If you are mostly going to make crosscuts, a 10-in. SCMS is the perfect choice. A 12-in. SCMS adds limited cross-cutting capacity at substantial extra cost. If you mostly want to miter small moldings and picture framing, a 10-in. CMS is ideal. For cutting miters and compound miters on larger moldings such as baseboard and crown up to 7 in., a 12-in. CMS is best. For moldings larger than 7 in., you'll need the SCMS.

You should consider a 12-in. SCMS if you want to cut both wide boards and medium-size molding: Most 10-in. SCMS models have a maximum vertical cutting capacity of about 3½ in., while similar 12-in. saws will cut 4½ in. One inch may not seem like a lot, but it can mean the difference between cutting crown molding standing up or lying flat, which translates into making simple miters or complex compound-angle cuts. □

Complete the cut. *After flipping the board and ensuring that it is against the stop block, score the uncut section of wood and then make a full-depth final cut.*

Gary M. Katz is a contributing editor for Fine Homebuilding *magazine. For more tips on using a miter saw, see* Mastering the Miter Saw, *a two-part DVD series available at www.GaryMKatz.com.*

Lumber Storage Solutions

Shopmade racks and carts keep material organized and accessible

BY ANDY BEASLEY

I once read that the idea of infinite space was perhaps the most difficult concept for the mind of man to grasp. I beg to differ. Anyone who ever has tried to create a functional shop knows that fitting it into a finite space is a far more challenging proposition. Once all of the necessary tools, materials, and that last bottle of glue have been shoehorned into the workshop, you can find yourself on the outside looking in.

When building my shop several years ago, I experimented with different layouts until I found the one that worked best for me. I've been happy with the result, largely because the lumber-storage system I developed added considerably to the efficiency of my shop while taking up little of its finite space.

Wall rack handles the long stuff

The centerpiece of my storage system is a horizontal rack along one wall. The rack is exceptionally stable, and the various levels hold a lot of material within a small footprint. The design is straightforward, the

Photos: Tom Begnal

Wall rack for lumber

With stanchions spaced 32 in. on center, the rack can be made to fit a wall of any length and height.

Lumber at the ready. *A wall-mounted rack keeps lumber organized and accessible without taking up valuable floor space.*

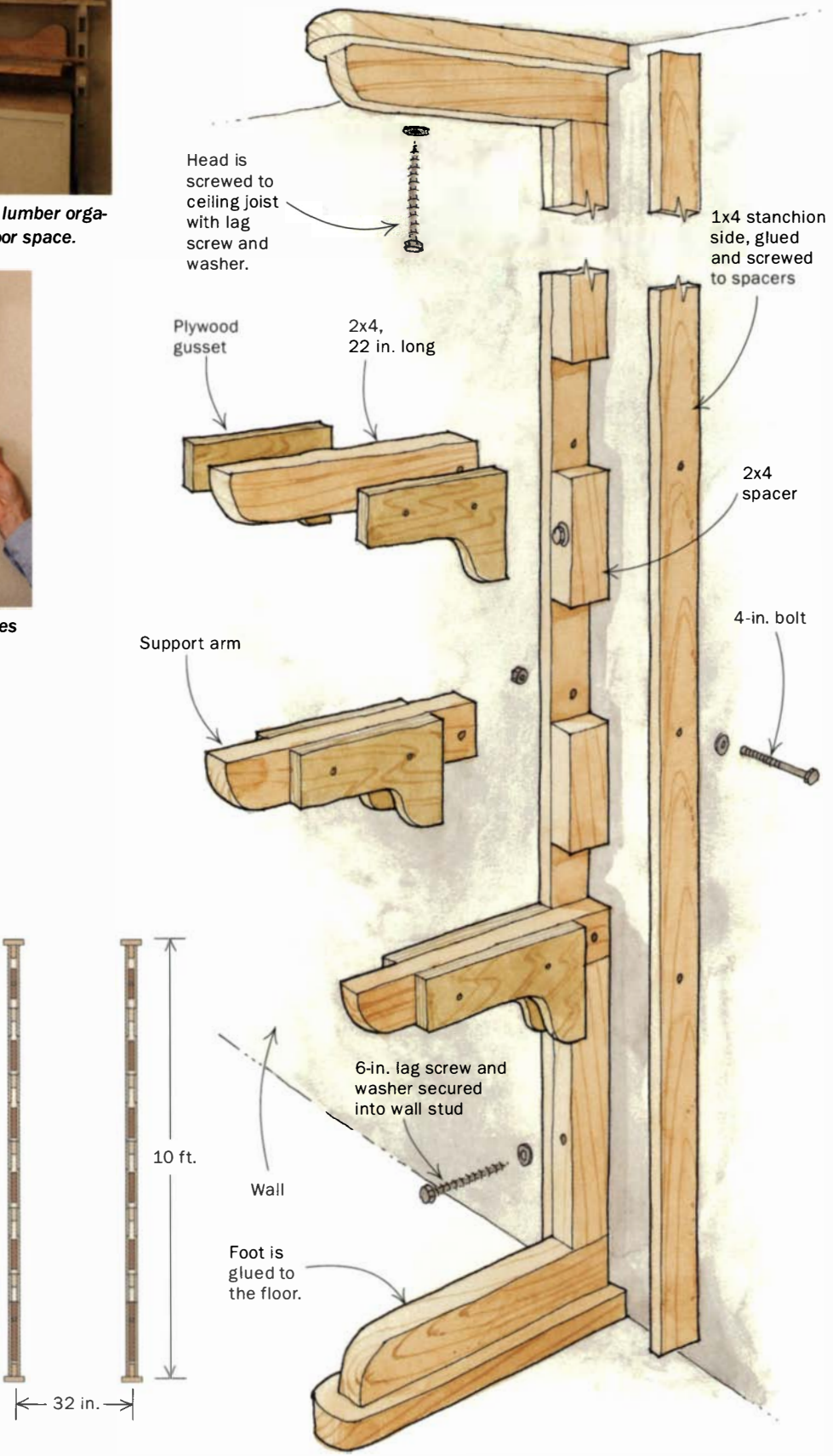
Simple mounting system. *Lumber rests on a series of support arms that are bolted to stanchions.*

materials are relatively inexpensive, and the construction time is short.

I frequently store 16-ft. lengths of molding, so I decided to install six vertical stanchions to provide the necessary horizontal space. The 2x6 studs in the shop wall are on 16-in. centers; I installed a stanchion on every other one, or 32 in. on center. These stanchions are merely lengths of 1x4 pine, glued and nailed to 2x4 spacers. The spacers add stiffness, create pockets for the support arms, and provide a solid attachment point for the lag screws that mount the assembly to the wall.

Although the stanchion assembly is simple to build, it helps to choose stock that is straight, without bow or twist. Gluing and nailing the pieces together on a level floor is an easy way to keep them true.

This rack is designed to support considerable weight if it is mounted securely to a sturdy wall. To attach the stanchions to the shop wall, I first marked the locations of the electrical wires in the wall so that I could give them a wide berth. Then I secured the stanchions with

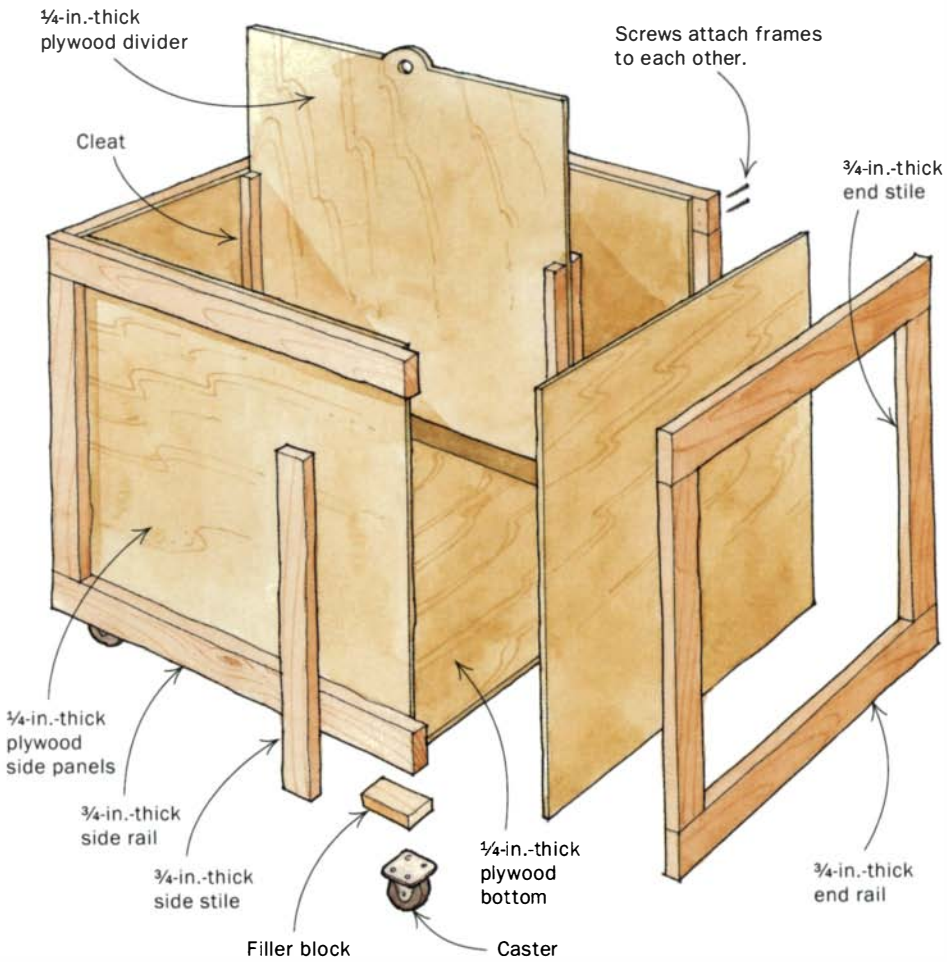


Drawings: Jim Richey

Rolling cart adds convenience. *A framed plywood box on wheels provides the perfect place to store offcuts.*

Cart for lumber offcuts

Simplified frame-and-panel construction means the cart assembles without much fuss, yet has plenty of strength.



6-in. lag screws through the spacer blocks and into the wall studs.

This rack can be attached equally well to a concrete wall as long as heavy-duty masonry anchors are used. The small, plastic expanding anchors used to hang pictures on cinderblock walls won't provide the necessary pull-out resistance. For similar reasons, don't mount this rack to a hollow gypsum or paneled wall.

The head and foot of each stanchion help prevent twisting, stabilizing the rack when it's under load. The head is screwed to a ceiling truss, while the matching foot is glued securely to the floor.

The horizontal support arms do the hard work. They're made of 2x4s with ¾-in.-thick plywood gussets screwed to each side. I angled the arms upward 2° to keep material from sliding off, and I rounded the protruding ends to soften any inadvertent collision between my head and one of the arms. My wife painted most of the rack before installation. However, to prevent lumber from picking up unwanted stains, the top edge of each arm was left unpainted.

I started at the top row and installed each arm by drilling a hole through the stanchions and the inner end of the arm. A ½-in.-dia., 4-in.-long bolt secures each arm. In the future, though, should I decide to change the elevation of the arms, the oversize pockets in the stanchions give me the ability to drill a new bolt hole and shift each arm to a new location.

Roll-around cart for short pieces

Besides death, taxes, and slivers, I think the accumulation of lumber offcuts is about the only thing woodworkers can take for granted. The woodstove can handle just so much, and besides, that peanut-size chunk of walnut may come in handy someday. Owning up to my pack-rat tendencies, I built three storage carts for offcuts that fit in the unused area under the bottom shelf of the wall rack. I left the rest of that area open for future storage needs.

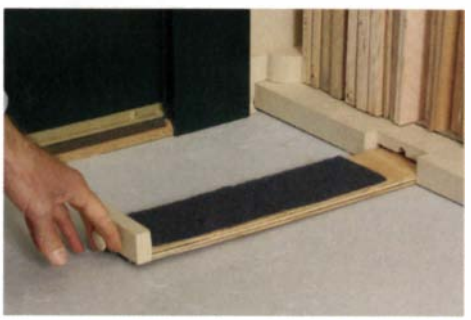
The carts are simple boxes on casters. To stave off the chaos that would ensue if I just threw scrap into the carts, I installed removable dividers, which allow for a rough sort of organization. By adding a removable plywood top to one of the carts, I immediately had a mobile workbench.

Vertical box stores sheet goods in minimal space

I'd initially planned to store sheet goods flat or on some sort of horizontal cart, but I discarded those ideas because they ate up too much floor space. The obvious answer was vertical storage. Holding 15 to 20 sheets, the rack I constructed is little more than a doubled-up plywood bottom, a few 2x4 posts, and a plywood top.

Because there's little outward pressure on this type of rack, it can be attached to a wall with either nails or wood screws. To this simple structure, I added a few user-friendly features. The 2x4 spacers on the side walls of the rack give me some

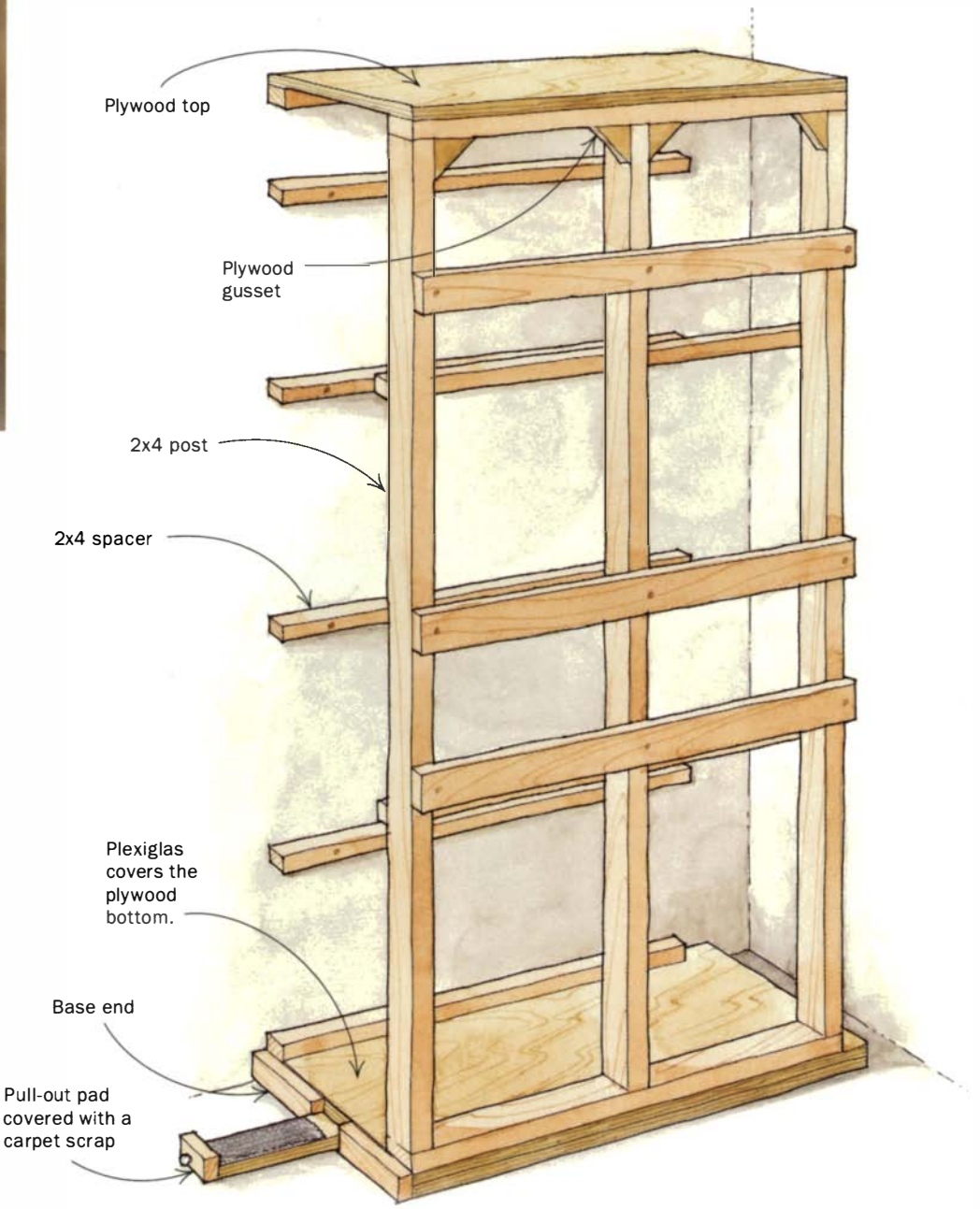
Choose and use. *This vertical rack makes it easy to flip through the sheets and pull one out without damaging it.*



Protective pad. *The outside bottom corner of sheet goods gets some protection from damage, thanks to a pull-out pad.*

Rack for sheet goods

Stored vertically in this rack, sheet goods like plywood and medium-density fiberboard (MDF) can be accessed with relative ease.



finger room when I want to withdraw a sheet that's located near the edge. A layer of Plexiglas covering the plywood bottom makes sliding even the heaviest sheet a breeze. And because I don't relish the idea of dinging the corner of an expensive sheet, I installed a pull-out pad to protect the pivoting corner as I load or unload material. To squeeze the last bit of utility from the rack, I use the outer frame as a place to hang levels, squares, and cutting jigs.

A storage system works only if you use it

Just as a closet won't pick up that shirt you've thrown over a chair, a lumber rack won't do you any good if you don't use it. I've developed habits to keep the shop both uncluttered and efficient. At the end of each day, I select the offcuts I intend to keep. Any boards shorter than 24 in. go into the roll-around lumber cart; longer pieces are stored on the horizontal rack. I used to put these leftovers anywhere, but each time I brought in a new load of boards, I had too many little things to rearrange before I could place the incoming material on the rack.

When I return plywood or sheet goods to the vertical rack, I always write the new width on the exposed edge. That prevents miscalculations when I'm reviewing the material I have on hand for a project, and I don't have to slide out a piece to check its width.

This storage system works exceptionally well. Now, when work is going smoothly and all my materials are stowed neatly away, I sometimes let my mind wander to those minor problems of infinity. □

Andy Beasley works on his unfinished house near Hillside, Colo.

Build a Plane From a Kit

Two editors find the labor intensive but rewarding

The idea of building a plane from a kit of parts began when Doug Evans and Ben Knebel of the Shepherd Tool Co. stopped by the *Fine Woodworking* office. They had a compelling sales pitch: Anyone could build a plane in a matter of hours, no metalworking experience required, and the finished planes would outperform the best ready-made planes.

Intoxicated by the idea of planing see-through shavings from the gnarliest of boards, two editors took the bait. To make the test more interesting and fair, we compared kits from Shepherd and the St. James Bay Tool Co. in Arizona. Both also sell finished planes. To prevent special treatment, we used personal credit cards to order the planes and had them shipped to the editors' homes.

SHEPHERD KIT: LOTS OF METAL BASHING

BY MATT BERGER

Assembling this kit was an exercise in metalworking. The 20-odd pieces had to be shaped precisely with files and fitted together with an ear-numbing amount of hammering. The only woodworking was sanding and finishing the pre-shaped infill parts.

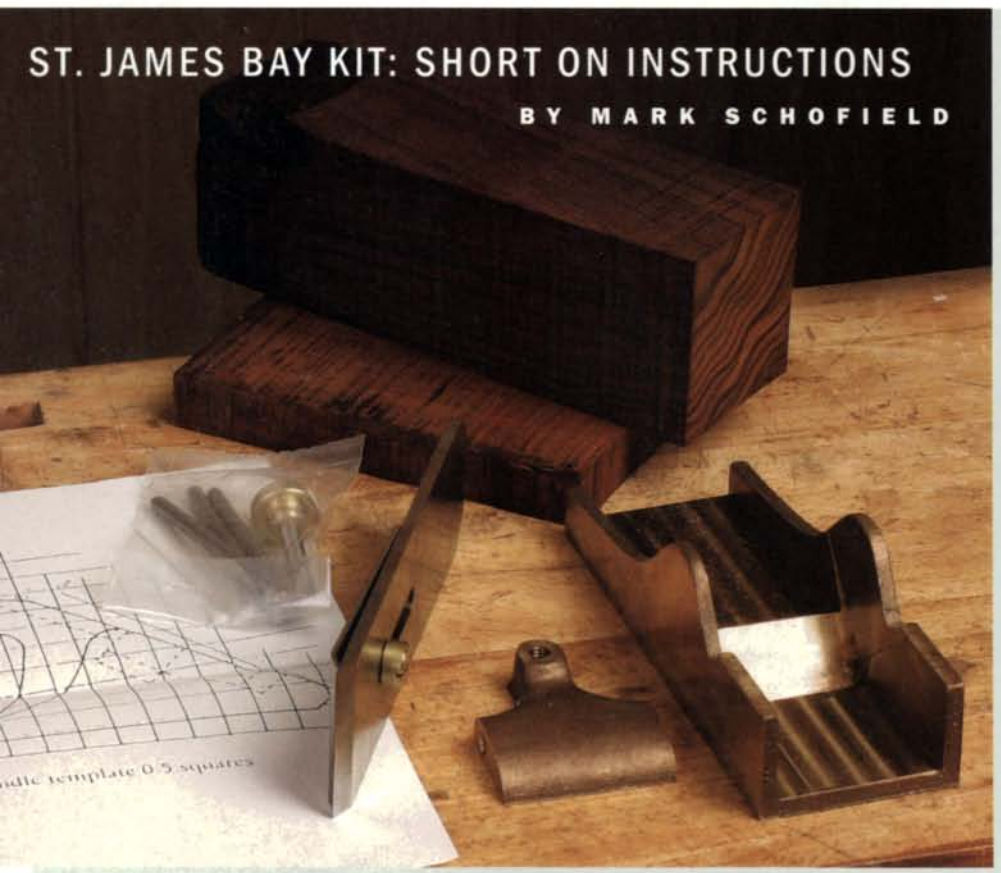
Despite this, familiarity with metalworking was not required. All the techniques were well described in the 30-page manual, and none were beyond the reach of the average woodworker. What I couldn't glean from the manual I often found by browsing Shepherd's Web site, where I turned often during the 40 hours I toiled away on the project (the company estimates you'll need 8 to 10 hours). If you call the company for advice, prepare to wait a few weeks for a response.

Metal dovetails differ from wooden ones—The most challenging aspect of

The Shepherd kit. *The metal sides and sole of the plane are joined with dovetails that must be hammered together. The wooden infill parts are pre-shaped.*

ST. JAMES BAY KIT: SHORT ON INSTRUCTIONS

BY MARK SCHOFIELD



After comparing the parts for the two kits, I thought that I definitely had the easier task: The body of this plane was in one piece and there were some nice chunks of cocobolo waiting to be custom-shaped to fit my grip. But I was annoyed to discover that the instruction booklet had been left out, and the only aid was a template for cutting the handle.

Getting to know Bob—I called Bob Howard, the owner of St. James Bay, who informed me that there were no instructions because many buyers like to customize the kits.

"So Bob," I asked, "what about mere mortals whose only goal is to build the kit?"

Bob explained that the basic procedure is to work forward from the back of the plane: Fit the rear infill; extend the bed angle; file the mouth and fit the blade;

The St. James Bay kit. *The metal body comes as one piece. The wooden infill parts must be cut from two pieces of cocobolo.*

Photos, except where noted: Mark Schofield

Pounding metal. *Using a wooden jig resting on an improvised anvil, the author joins the dovetails together with a ball-peen hammer.*

assembling the plane was joining the sole to the sidewalls with compound dovetails. Both the tails and pins are precut but must be beveled and tapered, requiring precise filing before I joined them by methodically hammering the parts until the metal flowed together to create a locking joint.

Aside from ensuring the integrity of the plane, quality work is essential to the finished look of the dovetails. This is particularly important when assembling a plane body from steel and brass, as the contrasting colors will highlight flaws. In retrospect, I should have spent more time fitting the pins and tails before I hammered the parts together. This stage was mostly thankless work, even discouraging at times with bulges of metal all over the place.

I AM VERY HAPPY WITH THE FINISHED PRODUCT, AND KNOW THAT I HAVE A TOOL THAT I WILL USE FOR THE REST OF MY LIFE.

The infill should fit snugly—The kit came with a pre-shaped infill, but the instructions also detail how to make your own and provide a basic pattern. The pattern likely would ensure that the infill exactly fit the body; my pre-shaped handle and bun were about 1/32 in. too narrow. I could have shimmed the infill, but I chose to bend in the sides. I don't intend to use the plane on a shooting board, so I can live with the sides about 1° out of true. Grinding them back perpendicular to the sole would have been a vast amount of work.

Fit the mouth and file the parts—I had to do a lot of filing to get the mouth, throat plate, and rear infill to align at 45°. This was mainly because Shepherd mistakenly included a 47½° throat plate, a flaw I didn't discover until the part was locked

and finally, fit the front infill. In the end, I found Bob not only charming but very helpful and accessible.

The next day I found that both sides of the plane body were tilted so far inward that the lever cap would not fit into the body. Bob sent out a replacement part whose sides were perfectly perpendicular to the sole.

THE PLANE CUTS LIKE NO OTHER I'VE USED AND I'M PROUD TO OWN IT. BUT IN THE FUTURE, I'LL STICK TO MAKING FURNITURE, NOT TOOLS.

Making the cocobolo infill—The rear infill consists of a handle and two side pieces. At Bob's suggestion, I made trial pieces out of poplar to get the correct size and to find the most comfortable handle shape. Once satisfied, I sliced into the two pieces of cocobolo. Working from a photo of an old Norris plane, I shaped the side pieces with a router and chisel so that they extended slightly onto the sides of the body, then thicknessed the handle until the three-part package slid tightly into the body.

Filing the mouth and fitting the blade—I was terrified of opening the mouth too wide and reducing the plane's ability to work difficult grain. The difficulty is that you must remove the surplus metal on the sides of the throat before you can test-fit the blade, but access to the throat requires that you open the mouth. After much filing and fitting, I ended up with a mouth that, while not perfect, was very acceptable.

Insert the steel pins tightly—After fitting the front infill, I drilled through the sides of the plane and drove in three ¼-in.-dia. steel cross pins that secure the front and rear infills and the lever cap. John White, *Fine Woodworking* shop manager and an experienced metalworker, provided me

Opening the mouth. *The mouth needs to be filed open very gradually until the blade just has clearance.*

Photo, bottom right: Matthew Berger

into place with steel pins. Check that you have the correct parts before you start.

With the parts fitted, the excess steel around the dovetails had to be removed. The instructions suggested using a belt sander, but once I got into a rhythm I was happy to file by hand. Make sure you have the following new files: a 12-in. mill bastard file for removing excess metal quickly; an 8-in. flat mill bastard file for beveling the dovetails; and a ⅛-in.-thick flat bastard file for working the throat. The only other vital tools are a ball-peen hammer and an anvil or a heavy steel plate to hammer against.

Was the effort worthwhile?—After making shavings with my plane on a piece of figured maple, I am very happy with the finished product, and I know that I have a tool that I will use for the rest of my life. Shepherd has developed a kit that can give a good result if you set your mind to it.

Matt Berger is managing editor at www.FineWoodworkingNetwork.com.

The Shepherd kit

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with a valuable tip here. Instead of using a ¼-in. bit, which would have resulted in a loose fit, he suggested using a fractionally smaller C bit followed by a hand reamer to create an exact ¼-in.-dia. hole.

Finish by burnishing and buffing—Bob suggested sanding the cocobolo to P600-grit and then using a buffing wheel. The results were amazing: The wood gleams and has the feel of a smoothly waxed antique. While at the buffing wheel I also burnished the lever cap and the top edges of the body.

I then assembled the plane, inserted the blade and chip breaker, and tensioned the lever cap. With the blade withdrawn slightly, I flattened and smoothed the sides and the sole using emery paper on float glass. Even though the sole came relatively flat, try to pick a cool day for this grunt work.

Was it worth the effort? The plane cuts like no other I've used, and I'm proud to own it. But in the future, I'll stick to making furniture, not tools.

Mark Schofield is a senior editor.

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Heating Your Shop

For every shop and climate, there's an efficient solution

BY ANDY ENGEL

My first woodworking shop was in a garage in northern New Jersey. I cobbled together some insulation, weatherstripping, and an old woodstove to make the shop mostly habitable—for me. For my tools and projects, though, I suspect it was a hostile environment. Morning often found the shop below freezing, which precluded storing glue or waterborne finishes there. Stoking the stove quickly launched the mercury into the 80s, a fluctuation in temperature and humidity that did my lumber no good. And, if the shop remained unused for any length of time during the winter, rust bloomed on my tools.

Better insulation and a heater I was comfortable burning in my absence would have fixed the problems. I think 50°F is good for an empty shop, and with decent insulation and air sealing, it's a temperature that shouldn't cost an arm and a leg to maintain in most climates.

Dust and fumes can be a hazard

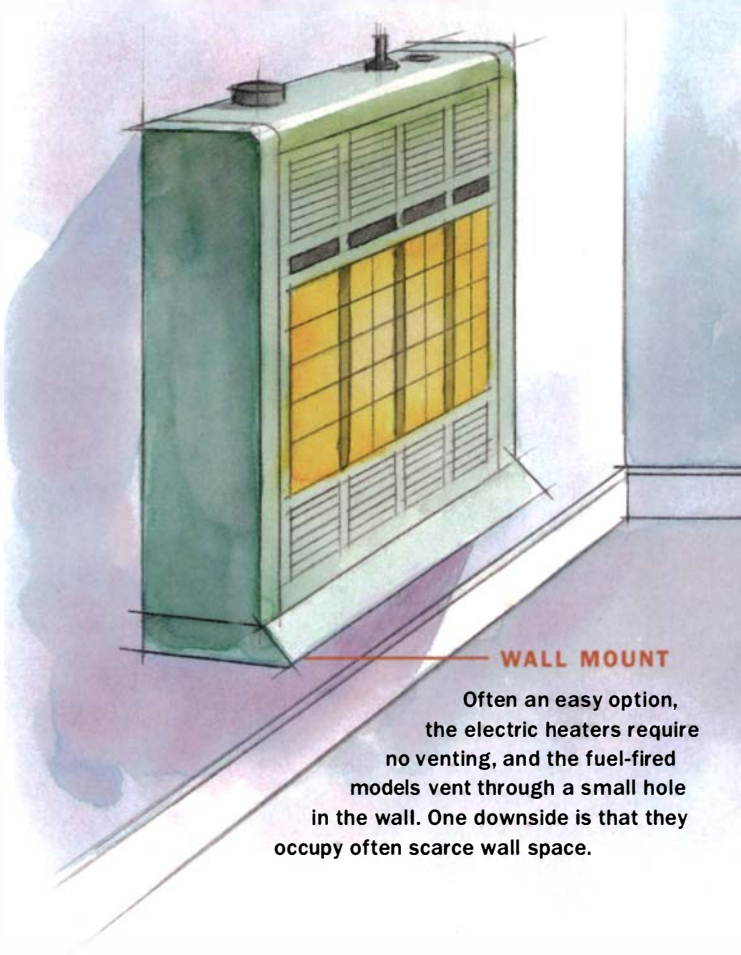
Wood dust will burn at 500°F or less, and clouds of dust can ignite if they're exposed to hot surfaces or an open flame. Aside from the fire risk, even relatively minor shop dust encrusting any type of heater will make it less efficient.

There are two types of fuel-burning appliances. Open-combustion appliances, such as woodstoves or gas heaters with pilot lights, feed the flame with air from inside the room and are potential ignition sources in dusty environments. Sealed-combustion appliances, such as most direct-vent kerosene heaters and many gas heaters, have no connection between the combustion chamber and the inside air. Rather, a supply duct brings air from outside into the chamber to support the flame. These are safer.

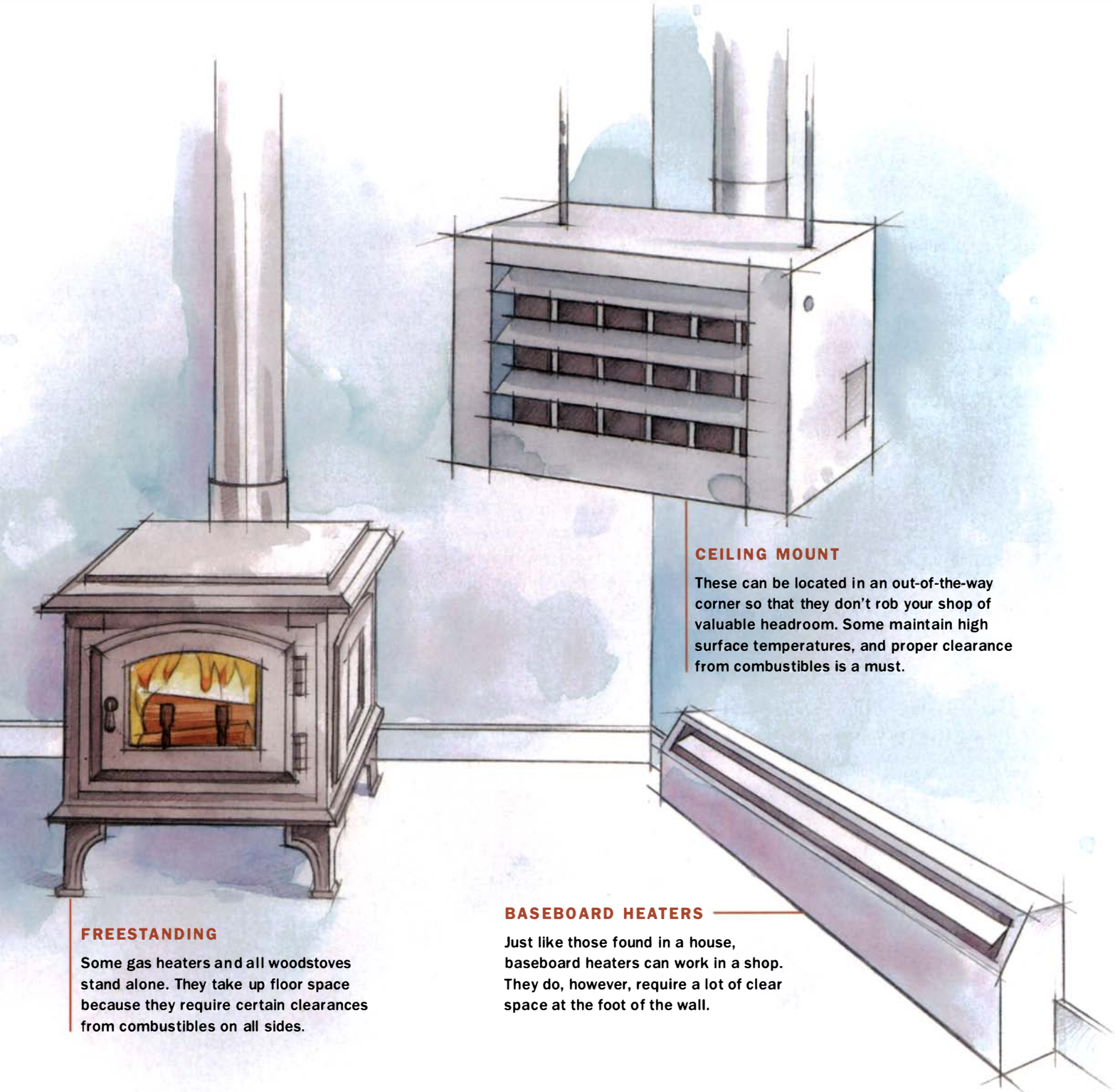
As a practical matter, a woodworker who installs a decent dust-collection system probably will never create enough airborne dust to make the atmosphere truly risky. Most types of heaters should be safe to use in a shop as long as you collect the dust, don't allow flammable fumes to build up, and clean off the heater on a regular basis. To limit the risk, ask the manufacturer if the surface temperature of the heater

LOCATING YOUR HEAT SOURCE

A heater must be safe, unobtrusive, close enough to warm you, but not so close as to roast you. Locating it between you and a door or window often works, because the heater can warm the cold air these openings admit.



Photo, this page: Michael Pekovich



will exceed 500°F or if there's an open flame. It's a good idea to check with your building inspector and your property-insurance agent before you install heat in a shop.

Although their simplicity may be tempting, avoid any unvented fuel-burning appliance in the shop. Unvented kerosene heaters in particular don't work well when their wicks become contaminated with wood dust. And when they aren't burning efficiently, kerosene heaters produce carbon monoxide, which can cause health problems even at low concentrations. Lacking a wick, gas burners aren't as sensitive to dust as kerosene heaters. Both types produce water as a by-product, which means an unvented fuel-burning heater will increase the moisture in your shop. If the heater stays off in your absence, this moisture is likely to condense, and no doubt will rust the costliest tool in your arsenal.

Buy insulation once, save fuel forever

The first step to heating a shop is matching the insulation level to the climate. Remember, you buy insulation once, but fuel costs go on forever. Do it right. That said, the details of shop insulation are beyond the scope of this article. Your local building code will specify the minimum insulation values for residential construction, and these are a good place to start. You can always add more insulation than code requires; doing so will increase your

Drawings: Brian Jensen

Fuel for thought

The type of fuel that's most convenient is a big factor in choosing a heater. Fuel prices are volatile, so the discussion of price here, although based on history, is quite general.

NATURAL GAS

Natural gas, piped under city streets, is a good choice, particularly if your house is hooked up already. Gas is usually moderately priced, although it's a commodity, so the price fluctuates with demand. You buy it as you use it, so you can't stockpile fuel in the summer, when prices tend to drop. Because gas burns very cleanly, heater maintenance is minimal. And because it's supplied from a pipeline, you never run out.

PROPANE

Propane burns in the same appliances as natural gas. However, because propane contains more Btu per given volume, it's critical that your heater is set up to burn it. With most heaters, that's a simple matter. Propane is delivered to a tank outside that you either buy or rent from the supplier. It's generally more expensive per Btu than natural gas, and rarely is used where natural gas is available. Filling up at cheaper summer prices can save money. Propane heaters are also low maintenance.

KEROSENE AND FUEL OIL

Kerosene and #1 and #2 fuel oil are readily available in the Northeast and Northwest, less so in other parts of the country. Their cost per Btu generally ends up the cheapest. Like propane, they're stored on site in a tank that you own. Prices are often lower in the summer. Unlike gas, kerosene- and oil-burning heaters need a cleaning and a tune-up every year or so, a cost that should be factored in. In a cold climate, oil may still be cheapest. In more moderate climates, this cost might give gas the edge.

ELECTRICITY

Electricity is simple: Pay the bill every month and it keeps on coming. With no flue or piping to run, electric heaters are cheap to install and don't require regular maintenance. Depending on your electricity rates, however, they can be the most expensive to run.

WOOD

Wood is tempting. After all, most of us have scrap that sure looks like free heat. The amount of wood it takes to get through a winter can be surprising, though. If you spend any serious time in the shop, you likely will need to lay in some cordwood. And if you are not in the shop every day to fire it up, keeping minimal heat going with a woodstove is dicey.

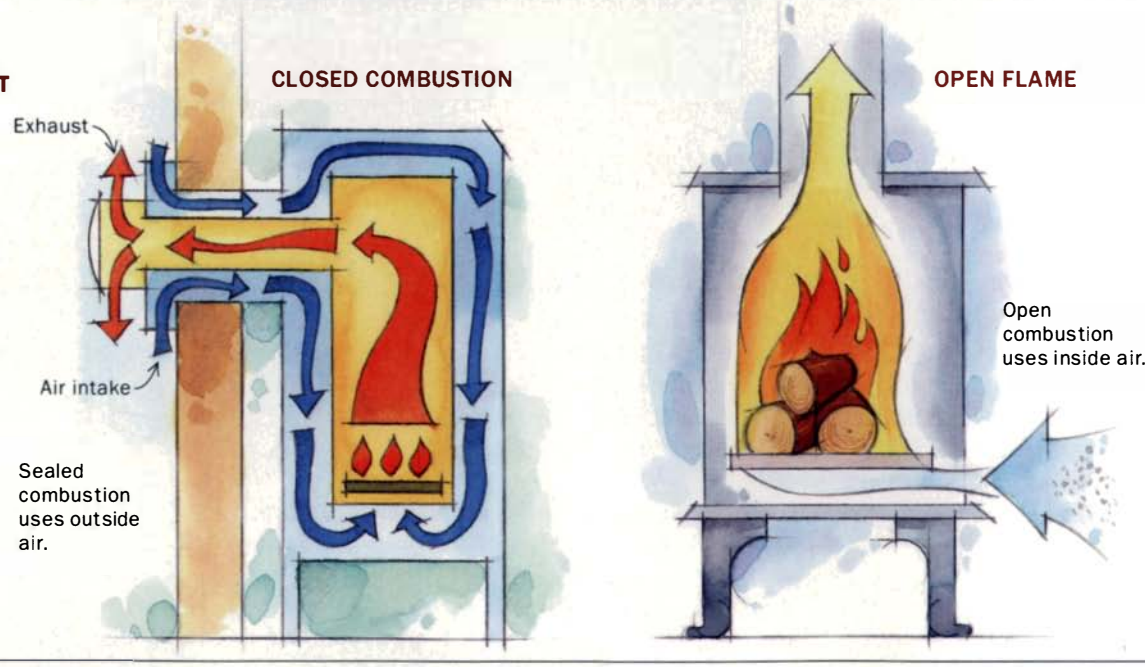
comfort and decrease your energy usage. However, it will probably take a long time to recoup the cost of extra insulation if you go far beyond the code requirements.

Air sealing is at least as important as the R-value (resistance to heat flow) of your insulation. In a drafty cavity, most insulation has an R-value of close to zero. Any breach in the building envelope—be it a door without weatherstripping, a leaky attic hatch, or a hole in a wall—will cost you heat and money all out of proportion to the hole size. Pay particular attention to the ceiling and the tops of the wall framing. Because warm air rises, you can almost watch the dollar bills floating out of the smallest holes in these areas. Garage doors need close attention as well.

After insulating your shop, figure out just how much heat you need. Here's where a knowledgeable supplier can be a great help. Heater size depends on the climate, the size and insulation level of the shop, and how warm you want to be. For example, a two-car garage shop insulated to residential standards in southern Connecticut

CLOSED COMBUSTION IS SAFE AND EFFICIENT

In a closed-combustion heater, air for combustion is drawn in from the outside, rather than from the heated space. This offers several advantages, the first of which is safety. Because there is no flame exposed to the shop air, the chance of flammable vapors, say from a lacquer-thinner spill, encountering an ignition source is greatly reduced.



would require about 30,000 Btu of heat per hour on an average winter day.

The downside of an undersize heating system is obvious—you'll be cold. Oversize systems aren't good, either, because they don't deliver consistent heat. They kick on at the right temperature, but quickly make it hotter than the thermostat setting, causing big swings in temperature. This is called short cycling, and it's not only uncomfortable, but the constant starts and stops are bad for the equipment's longevity and efficiency. And bigger equipment costs more. Forced to choose between undersizing and oversizing, I'd undersize, and get through the coldest days with a portable electric heater.

Two ways to feel warm: convection vs. radiant heat

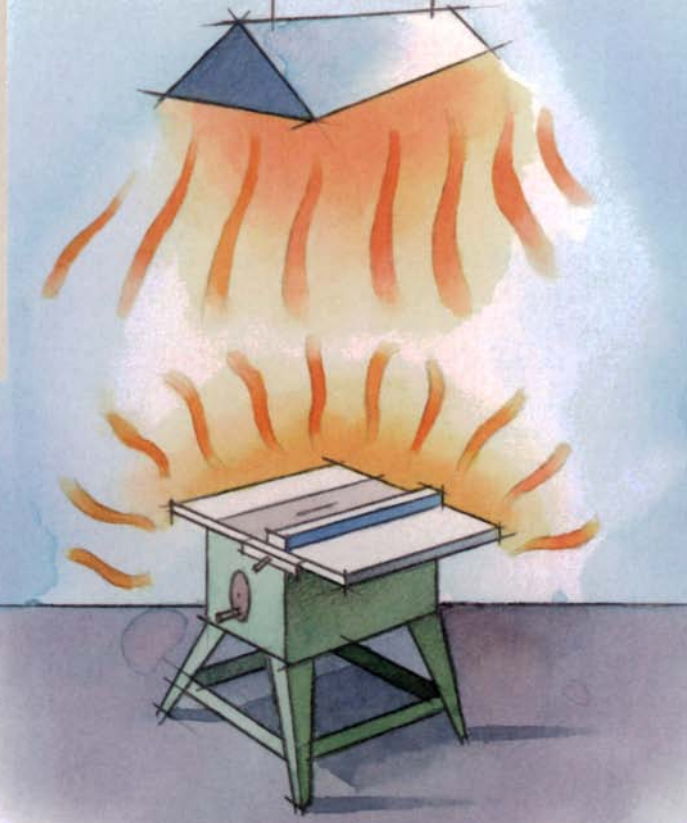
Heat reaches the occupants of a building in one of two main ways: convection, which for this purpose is the movement of warm air; or radiation, the kind of heat you feel when standing next to a campfire. Forced-air heaters work by convection. Most other heaters work mainly by radiation or a combination of the two mechanisms.

Forced-air heat warms a space quickly, but because it warms the entire space, it might cost more to run. Radiant heaters can be set up to warm specific areas, such as your workbench, leaving the rest of your shop cooler. That said, as the radiant heat warms solid objects such as your bench and tablesaw, they in turn warm the air. The effectiveness of radiant heat varies with the surface area of the radiant source, the temperature of the source, and the distance from the source.

Andy Engel is a senior editor.

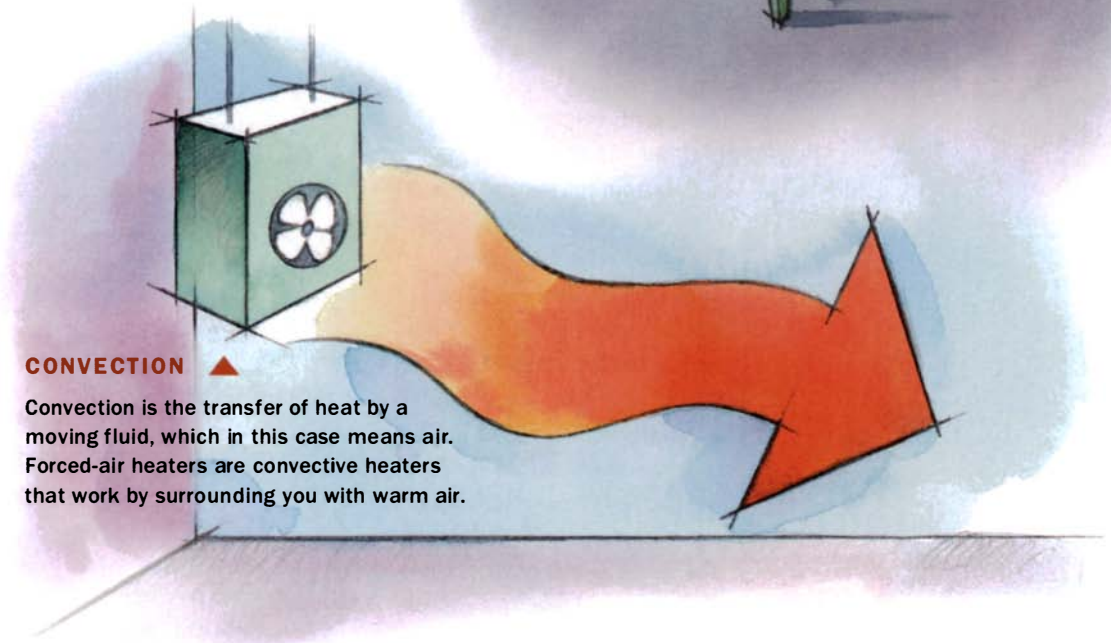
How heat moves

Heat warms a building by radiation and convection. Neither is inherently better, and neither works alone. Convection heaters radiate some heat, and radiant heaters create convective loops.



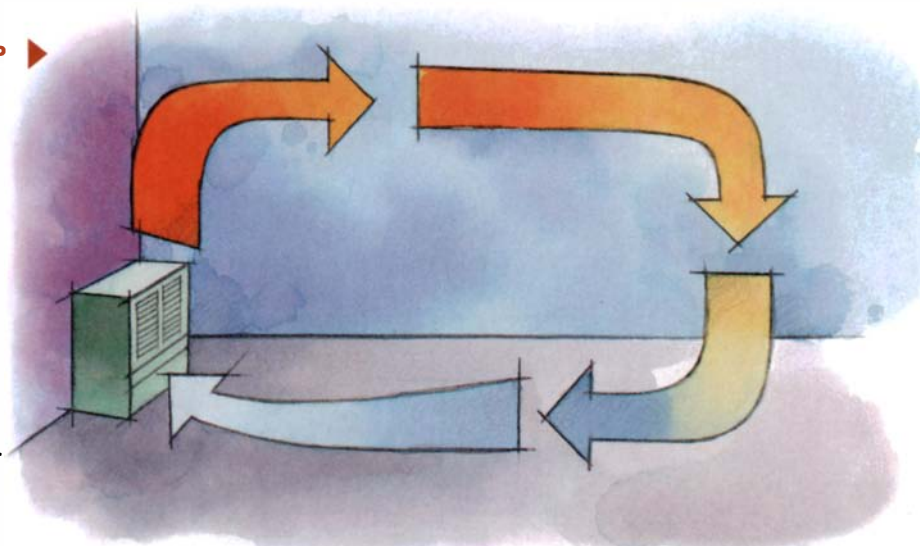
RADIANT HEAT

Radiation is the transfer of heat via electromagnetic waves, such as the infrared waves radiated by a woodstove. Radiation travels through the air, but doesn't warm it much. Rather, it transfers its heat to solid bodies, such as you or your tablesaw. As these solid bodies warm, they will heat the surrounding air, creating some convection. However, most of the warmth you feel from a radiant source is infrared, and has nothing to do with air temperature.



CONVECTION

Convection is the transfer of heat by a moving fluid, which in this case means air. Forced-air heaters are convective heaters that work by surrounding you with warm air.



CONVECTIVE LOOP

As air warmed by a heat source rises, it sucks in cool air from below to replace it, forming a loop of gently moving air. To heat a large area, the heater needs a big surface area, such as a baseboard. Where space is tight, passive radiant heaters may not be the best choice.

A shopper's guide

The heater you choose will be determined by some combination of where you can put it, the fuel, and how the heat moves. Shown here are some common types with their pros, cons, and costs. When considering cost, don't forget installation. An extreme do-it-yourselfer could install any of these heaters, but most of us would hire a pro for at least part of the job.

GAS-FIRED HEATERS

LOCATION: wall, floor
FUEL: natural gas, propane
COMBUSTION: sealed
HEAT TYPE: convection

Most wall heaters are surface mounted, and vent outside through the wall via a horizontal flue. Gravity furnaces are one type: Tall and thin, they suck in cold air from the floor level and vent it out the top. An optional blower can improve airflow. These heaters come in sizes from 10,000 Btu to 50,000 Btu, and cost in the range of $400 to $800.

Counterflow furnaces are similar, except that an internal fan reverses the natural upward flow of heated air within the furnace, blowing warm air out of a louvre near the floor. Priced between $800 and $1,200, these are available up to 65,000 Btu.

Console-type heaters are lower and wider, similar in size to a woodstove, with an output of 20,000 to 70,000 Btu. Their price range is $500 to $900.

Manufacturers include Louisville Tin and Stove Co. (www.cozyheaters.com), Empire Comfort Systems (www.empirecomfort.com), and Rinnal (www.rinnal.us). Major furnace manufacturers such as Trane and York also make counterflow furnaces.

ELECTRIC HEATERS

LOCATION: wall
FUEL: electricty
COMBUSTION: none
HEAT TYPE: radiant, convection

Probably the simplest heater to install and the least expensive to buy is the wall-mount electric heater. There are two types: those that use a fan to force air over electric resistance coils and into the shop, and those that heat by radiation or by creating a natural convective current (think baseboard heat). They're available in small sizes (500 watts) that would easily take the chill off a Florida shop, or in larger units (8,000 watts) that would warm a small Maine shop, if Yankee parsimony didn't object to the electric bill. The small ones run on 120v, the larger on 240v. Expect to pay as little as $100 for a small heater and as much as $800 for a large one. installation is relatively simple, requiring mainly a dedicated electrical circuit. The downside is that even the larger models produce only the equivalent of about 24,000 Btu, suitable for a one-car garage in a cold climate. Manufacturers include: TPi Corp. (www.tpicorp.com), Marley Engineered Products (www.marleymeh.com), Cadet (www.cadetco.com), and Empire Comfort (www.empirecomfort.com).

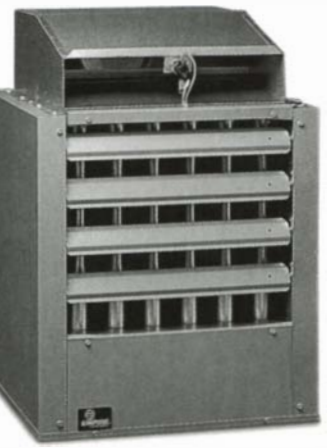
OIL-FIRED HEATERS

LOCATION: wall, floor
FUEL: kerosene, heating oil
COMBUSTION: sealed
HEAT TYPE: convection

Another through-the-wall option is a unit that burns kerosene or stove oil (#1 low-sulphur heating oil). Units that burn #2 home heating oil are available, but need more regular maintenance. Oil-fired heaters claim high efficiencies and the lowest cost per Btu, but require an outside fuel tank. Outside tanks can be problematic in really cold weather, because cold fuel oil can gel. Additives are available to prevent this problem, but you have to remember to add them. The only wall penetrations are a small hole for the flue and the outside combustion-air intake, and an even smaller hole for the fuel line. Sizes range from 15,000 Btu to 43,000 Btu, prices from $750 to $1,600.

Manufacturers include Monitor Products (www.monitorproducts.com), and Toyotomi; (www.toyostove.net).

Photos, this page: Courtesy of Louisville Tin and Stove, Empire Comfort Systems, Toyotomi



FAN-FORCED HEATERS

LOCATION: ceiling
FUEL: multi
COMBUSTION: varies
HEAT TYPE: convection

Options abound with ceiling-mounted heaters. Several manufacturers make fan-forced, gas-fired units that hang from above. The cost hovers around $500, and the Btu range is from 30,000 to 75,000. You'll need to add the cost for the flue and the electric and gas hookup.

Fan-forced hot-water (hydronic) heaters are also available. Because no part of the heater ever gets hotter than the water, there is no fire danger. The downside is the need for a hot-water source. In a shop attached to a house with hot-water heat, you might tap into the existing system. If you go this route, you'll have to keep the shop above freezing or run a special antifreeze through the heating system. These heaters start at around $350, but piping will add to the cost. If you have to add a boiler, the cost will run into the thousands. Sizes range from 18,000 Btu to close to a million Btu. Manufacturers include Modine (www.modine.com), Marley Engineered Products (www.marleymeh.com), Cadet (www.cadetco.com), and Beacon-Morris (www.beacon-morris.com).

INFRARED HEATERS

LOCATION: ceiling
FUEL: gas, electric
COMBUSTION: sealed
HEAT TYPE: radiant

Often called infrared heaters, these are either gas-fired or electric. Smaller units can provide spot heating over a workbench; several can heat an entire shop. By locating one where you usually work, you might leave the rest of the shop at a cooler temperature, saving energy.

The smallest gas-fired model is 25,000 Btu and costs about $650. Be sure you get a model certified for residential use, such as Detroit Radiant's LS or LD series (www.reverberray.com), or Schwank's STR 45-10 (www.schwankheaters.com) if you're heating an attached garage. A downside of this type of heater is the high surface temperature. You need at least an 8-ft. ceiling for a gas-fired radiant heater. And you need to maintain the clearances to combustible materials specified by the manufacturer.

Because they don't get as hot, electric radiant heaters don't suffer from the same clearance constraints as gas units. One manufacturer, Ennerjoy (www.sshcinc.com) targets the woodshop market by selling panels with slight cosmetic defects for $250 for a 1,000-watt unit, several of which would be required in a northern shop.

WOOD STOVES

LOCATION: floor
FUEL: wood, pellets
COMBUSTION: open
HEAT TYPE: radiant

Wood stoves can be the ultimate in cheap heat, or a nuisance. Because there's always an open flame, the danger of fire never really goes away. Building codes require at least 3 ft. of clearance to combustibles and a non-combustible hearth that extends at least 18 in. from the stove. Stoves require an annual chimney sweeping and regular ash cleanout. A big advantage to a woodworker is that they also get rid of scrap. And woodstoves are the only option mentioned here that don't release greenhouse gases. They can emit substantial particulate matter, however. Check if your town regulates such emissions before installation. Pellet stoves are a costlier option. A thermostatically controlled hopper feeds cellulose pellets into the stove as needed. Pellets aren't free, but the convenience is a valuable consideration.

HEAT PUMPS

LOCATION: wall
FUEL: electric
COMBUSTION: none
HEAT TYPE: convection

A through-the-wall heat pump is another electrically powered option. Commonly used in hotel rooms, heat pumps work like refrigerators or air conditioners, extracting the heat from the air and moving it somewhere else. The chief advantage of heat pumps is that they can be set to cool the air as well. (The industry name for these units is PTAC, or packaged terminal air conditioner.) They're available in sizes from about 7,000 Btu to 15,000 Btu, and are best suited to moderate climates. For cold weather, many heat pumps have auxiliary electric colis that kick in and produce heat. Costs run from $500 to $1,000. Manufacturers include most major HVAC suppliers.

Photos, this page: Courtesy of Empire Comfort Systems, Vermont Castings, Schwank Heaters, Friedrich

Tool Cabinet for a Workbench

Keep hand tools close at hand but out of harm's way

BY LON SCHLEINING

It's exasperating when I can't find a tool. Usually I know it's in a pile somewhere, or on a shelf, or over there where I think I saw it last…

Well, all that frustration is behind me now. After 27 years as a professional woodworker, I finally have a real tool chest.

When the editors and I designed "The Essential Workbench" featured in *Tools & Shops*, Winter 2003/2004 (*FWW* #167, pp. 38-45), we deliberately positioned the stretchers to accommodate a tool cabinet as large as 24 in. deep by 44 in. wide by 16 in. tall. The idea was to follow up the bench article with this article on how to build a complementary tool cabinet.

As with all of my projects, I first drew the cabinet full scale in three views, including all the construction details I could think of.

Two boxes are easier to build and move

I like the look of mitered corners and made that basic decision early on. Then I realized I wasn't very comfortable mitering an edge on a plywood panel nearly 4 ft. wide by only about 2 ft. long, so I decided to break the cabinet into two separate boxes. This makes the parts smaller and easier to handle, especially on the tablesaw. I also like the idea that if you have to break down your bench to move your shop, the two boxes will be manageable.

The workbench is maple, with walnut wedges in the trestle joinery. I like the visual contrast between these two woods, so I chose maple plywood for the carcases, and solid walnut for the drawer fronts.

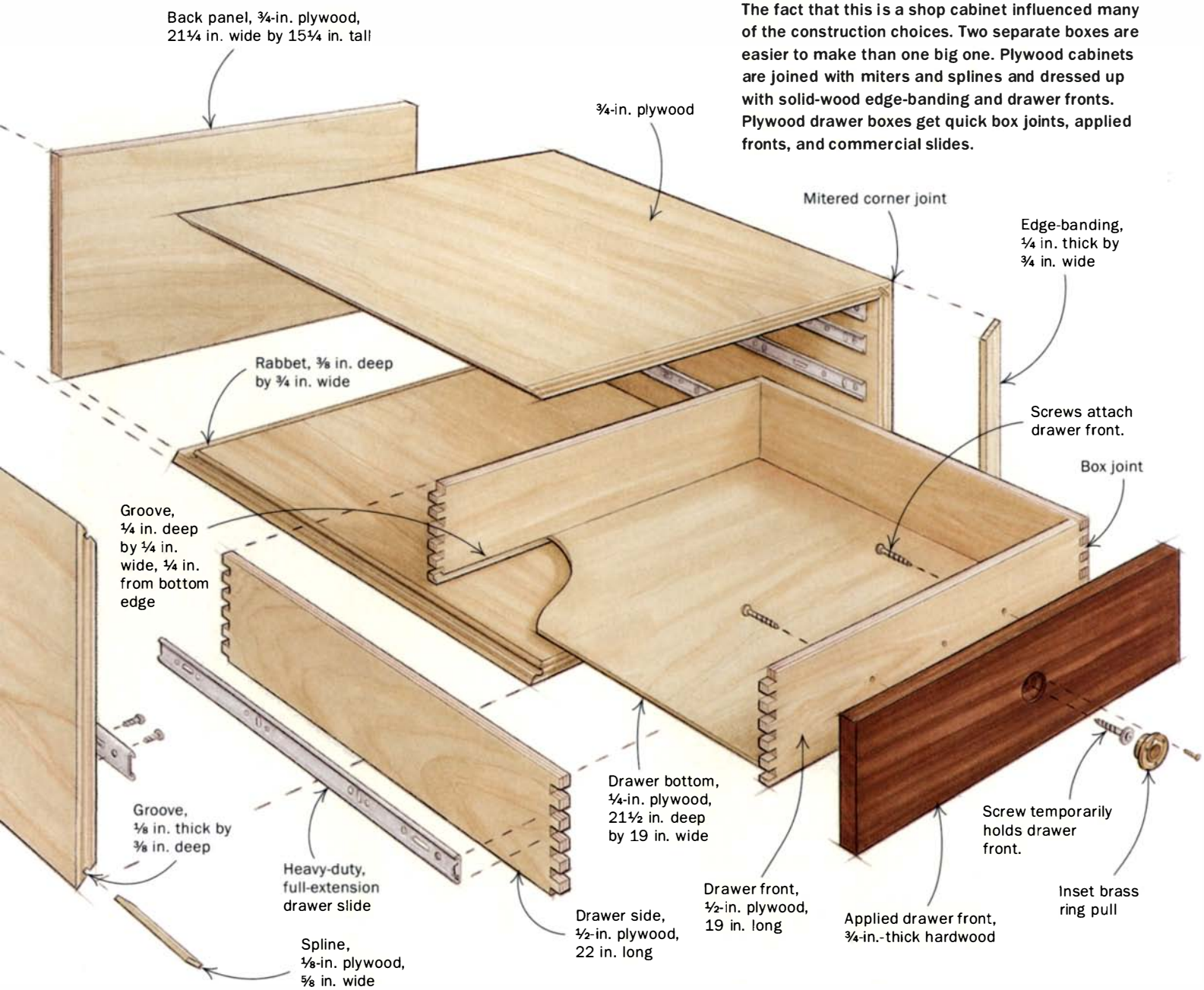
To make sure the carcases would stand up to heavy use, I splined the miter joints and glued a full ¾-in.-thick panel into a rabbet in the back of each carcase. On the front and back edges of each box, I glued solid edge-banding to cover the plywood edges and splines.

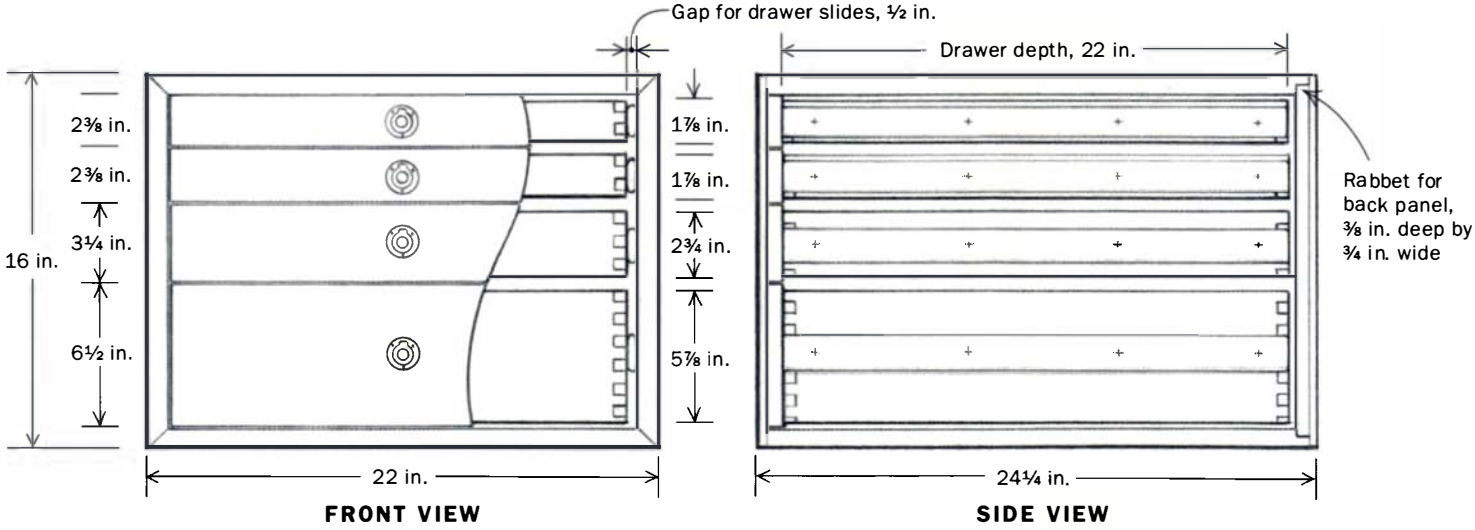
I measured the heights of the tools I wanted to keep in the cabinet and discovered I needed more small drawers than large ones. I standardized the drawer

Photos: Asa Christiana

BUILD TWO OF THESE

The fact that this is a shop cabinet influenced many of the construction choices. Two separate boxes are easier to make than one big one. Plywood cabinets are joined with miters and splines and dressed up with solid-wood edge-banding and drawer fronts. Plywood drawer boxes get quick box joints, applied fronts, and commercial slides.





FRONT VIEW **SIDE VIEW**

Drawings: Bob La Pointe

MITERED PLYWOOD MAKES FOR QUICK CONSTRUCTION

The joinery is cut on the tablesaw, and packing tape draws the joints together tightly. For a utility cabinet like this, it is quicker to apply edge-banding after assembly.

Miter the edges of the panels. *Angle the sawblade just beyond 45° to ensure tight corners. Sneak up on the final width, and then cut the rest of the parts to size.*

sizes as much as I could so that I could make several parts of the same size. Your tools differ from mine, so size the drawers accordingly.

One sheet of ¾-in. maple plywood is plenty for the carcases. I used three 5x5 sheets of Baltic-birch plywood for the drawers, one ½ in. thick for the drawer sides and two ¼ in. thick for the bottoms.

Heavy-duty, ball-bearing drawer slides offer smooth action and full extension, so they were an easy choice. I used Accuride 3832 slides rated at 100 lb., which should be plenty strong, even when I pull out a drawer slightly to help support a wide board or panel held on edge in the front vise.

For drawer pulls, I chose inset brass ring pulls, which match the brass benchdogs and won't catch on cords.

Miter and spline the cabinet parts

Some folks might prefer to edge-band the plywood before cutting the miters and assembling the boxes, but I chose to do the edging afterward. This let me cut rabbets and spline slots all the way through on the tablesaw, because the front and back edges would be covered later. Also, the long miters had to be perfect only at their outermost edges.

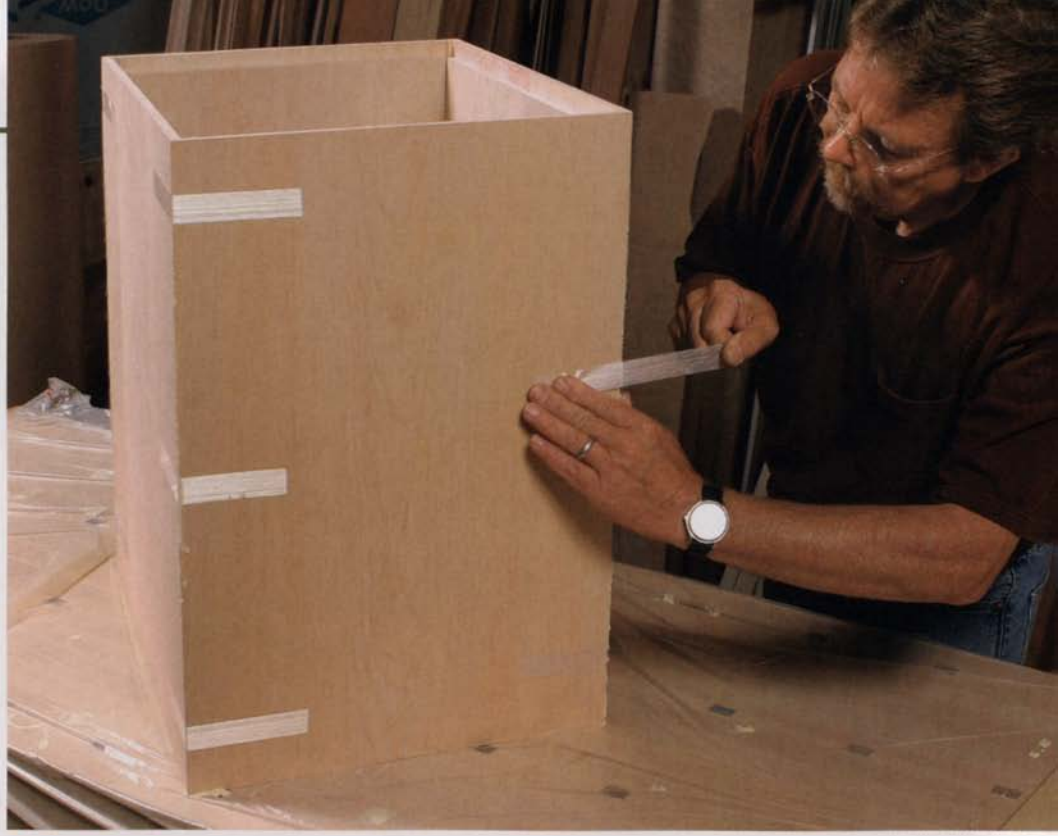
The first step is to cut all the carcase pieces about 1 in. oversize, making sure the pieces are perfectly square. Next, mark the edges that get the miter cuts and rabbets: It is awfully easy to miter or rabbet the wrong edges.

Angle the tablesaw blade just a bit beyond 45° to ensure that the outside, visible edges will be tight. If you cut four small sample pieces, you can use tape to wrap them into a box to check your miter angles. Use very flat plywood for all of the cabinet parts; if it is bowed it might lift off the saw's table near the blade and the miters won't be accurate. Last, cut the rabbets for the backs.

Splines reinforce the miters—I used ⅛-in. plywood for the spline material, as it fits loosely into a single blade kerf. A loose fit, with glue, is enough to provide some insurance for the miter joints. If the fit is too tight, the splines will bind when inserted in the already-assembled box (see photo, facing page). Angle the tablesaw blade at exactly 45° for the spline cuts. When ripping the spline material to width, leave plenty of clearance in the slots.

Slot the edges for splines. *Angle the sawblade at exactly 45° and locate the grooves toward the fat corner of the edge.*

Packing tape will be your clamps. *For these large boxes, it is easiest to tape up pairs of panels at a time. To close the joints, pull on the tape as you apply it.*



Tape is a great clamp for mitered boxes

You will insert the splines from the front and back after the boxes have been taped up, so cut the spline stock into halves lengthwise. A benefit of inserting the splines this way is that they force the excess glue into the center of the joint instead of out the front and back.

I assemble mitered boxes with stranded packing tape. Normally, I lay down the pieces in a line, outside face up, and run continuous strips of tape across all four sides, leaving a 4-in. or 5-in. tab at the end. When glue is applied and the pieces are wrapped up into a box, the tape puts firm, equalized pressure at the joints. In this case, however, I found the pieces too large to handle all at once, so I taped two panels at a time and assembled the box from there.

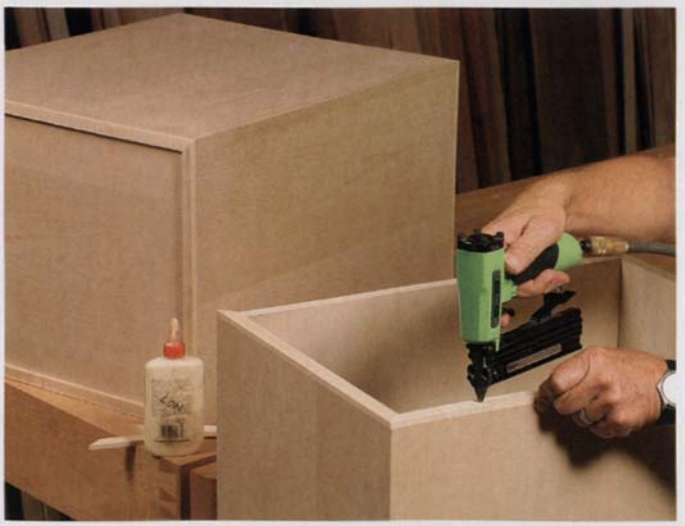
While the glue is wet, insert the splines and the back panels, which will square up the assemblies.

Edge-band the cases

Because you will apply the banding after these utility cabinets have been assembled, the easiest method is to make the edge-banding exactly as wide as the plywood is thick. It's not hard to apply it perfectly aligned with the edges.

Use the surface planer to bring the banding down to a final thickness of ¼ in. Take some pressure off yourself by making extra pieces. I used a nail gun to apply

Two pairs of panels make a box. *After spreading glue on the miters, stand up the panel assemblies and draw the last two joints together with more tape (above). Apply glue to the spline stock and insert pieces roughly halfway into the joint (left), working from both ends. Nail and glue the back panel into its rabbet, and trim the splines flush.*

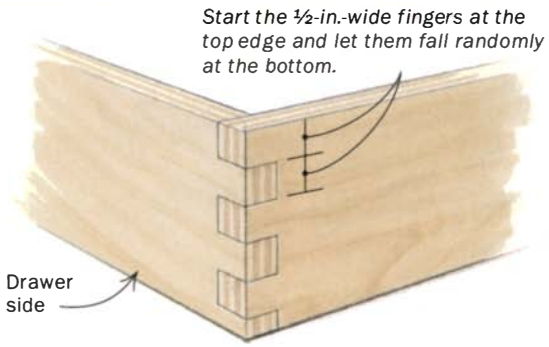


Apply thin banding cut to exact width, using your fingers to align it. *Dry-fit each piece first to fit the mitered ends. A 23-ga. micro-pinner leaves almost invisible holes.*

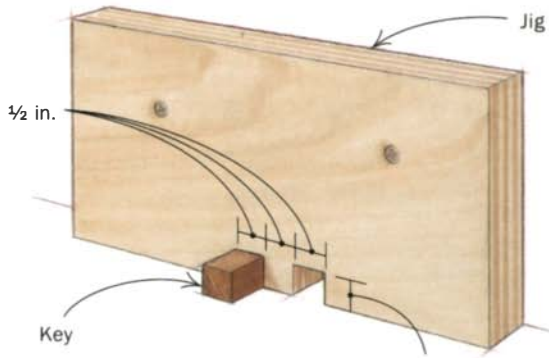
Drawer boxes

A LESSON IN BOX JOINTS

Made quickly on the tablesaw using a dado blade and crosscut jig, these finger joints create quick and sturdy drawer boxes. The drawer slides require an exact ½-in. gap on each side, so build a test drawer to dial in the final dimensions.



SIZING THE FINGERS



SUB-FENCE/JIG

Blade height equals thickness of drawer sides + 1/16 in.

The ends of each piece are identical. *For the first cut, butt the top edge of the workpiece against the key.*

the edge-banding, using my fingertips to align it flush with the sides as I glued each piece. A 23-ga. micro-pinner leaves almost invisible holes. Clamps or strips of masking tape can replace the nails, but you will need lots of them. Work your way around the edges of the cabinets, fitting and mitering each piece as you attach it.

Size the drawers carefully

In keeping with the practical nature of this project, I chose box-jointed (also called finger-jointed) drawer boxes with applied fronts. Box joints are strong, attractive, and easy to cut using a sled on the tablesaw. (For more information on cutting these joints, see photos, above, and *FWW* #148 pp. 60-63).

The applied drawer fronts go on after the boxes are in place, making the fitting process much easier. In order for the drawer slides to work properly, it's important to have exactly ½ in. of space on either side of the drawer box. That's one reason to build the cabinet boxes first. Then, when cutting the drawer box joints, you must realize that raising or lowering the dado blade on the tablesaw will affect the size of the finished drawer box. Once you have set the blade height correctly, don't move it.

I run the box-joint fingers 1/16 in. extralong so that I can sand them flush after the drawer box is glued up. This means cutting the box parts ⅛ in. longer than I need them and carefully adjusting the blade height 1/16 in. above the thickness of the parts.

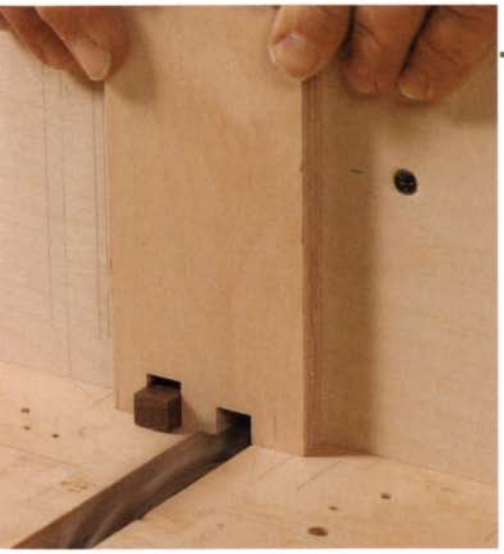
Install the drawer slides

Because these heavy-duty slides can be mounted anywhere on the drawer side, I was able to place them at the center and work from centerlines, which is my preference. After attaching the drawer slides to the drawer boxes, align and mount the other half of the slides inside the cases. To align the slides front to back, use a scrap of material equal to the thickness of the drawer fronts plus the recommended offset. To align the slides top to bottom, use a spacer panel placed under the slides, inside the cases, to be sure they are installed uniformly.

Initially, I installed the slides with only two screws. I got all the drawers installed and adjusted so that they worked properly, and then I inserted the rest of the screws.

Applied drawer fronts are easier to fit

Now comes the fun part: installing the solid-wood drawer fronts. The challenge is to have as fine and even a gap as possible around each drawer front, while allowing for some shrinking and swelling with



Make the second cut. *To cut the second notch, just place the first notch on the key. The final notch on this drawer will be partial.*

Locating the mating side. *Flip the first side, put its first notch on the key, and clamp it. Butt the mating side against the first side (above). Cut the first notch on the mating side (right). The dado blade should just clear the first side.*

changes in humidity. First, cut the drawer fronts to length and width so that they all fit together into the opening, with no gaps. With all of them in place, mark a centerline for the finger pulls, remove the fronts, and mortise for the pulls. All of the mortising is done easily on the drill press, with just a bit of chisel work afterward.

The mortises for these pulls allow a neat trick for attaching the fronts. Drill a clearance hole in the recess, through which you can loosely insert a pan-head screw. Now you can fit the drawer fronts one at a time, with the pan-head screws allowing some adjustment in all directions as you take light trimming cuts from the edges.

Once the fronts are in position, drive some screws into them from inside the drawer boxes to lock them in place. Then remove the pan-head screws and install the finger pulls.

Finishing up

For these cabinets I applied the same finish I used on the bench: a few coats of varnish thinned about 50% with turpentine, applied with a rag and rubbed off before it dried. Last, I added a few thin cleats to the bottoms of the boxes, to keep them in place on the lower stretchers of the workbench.

Now everything is in its place. Sure, I can't remember which drawer my mortising chisel is in, but I know it's in there somewhere. □

Lon Schleining makes furniture and stairs in Long Beach, Calif., and teaches woodworking throughout the United States.

INSTALL THE DRAWERS

The drawer fronts are fit and applied after the slides and boxes are in place, making it easier to achieve fine, uniform gaps and a neat appearance.

HARDWARE SOURCES

ACCURIDE FULL EXTENSION BOX DRAWER SLIDE
Series 3832
www.rockler.com

LEE VALLEY 1½-IN. ROUND RING PULL
Product #00L01.01
www.leevalley.com

A trick for installing slides. *Working off the centerlines of the drawers and slides, Schleining uses a spacer panel to set the distance between the slides and the cabinet bottom. A small block sets the distance from the front edge.*

Fit and attach the drawer fronts. *Drill a slightly oversize hole in the round mortise for a pan-head screw. Use credit cards to set the gaps, and use the screw to lock the drawer front in place. Then screw the front permanently from the inside, remove the temporary screw, and install the pull.*

readers gallery

DOUG STOWE
Eureka Springs, Ark.

The free-flowing, irregularly shaped top on Stowe's planing bench (20¾ in. deep by 67 in. long by 37¼ in. tall) was salvaged from an 8/4 walnut plank resting in his barn. Choked with wandering pith and pocked with checks and decay, the plank was unsuitable for fine furniture, so Stowe cut away the defects and retained the irregular edges created in that process. The gaps in the assembled top are handy spots to locate clamps. After applying the finish (linseed oil, Danish oil, and paste wax), Stowe and his wife christened the bench with a candlelight dinner, complete with fine wine, fancy tableware, and good friends.

ADRIAN C. VAN DRAANEN
Richmond, Ont., Canada

While helping to restore the furnishings in Canada's parliament buildings in Ottawa, van Draanen replicated the existing moldings using his own molding planes custom-made for the job. This chamfer plane was used extensively on a new fireplace surround and mantel in the office of the governor general. The plane is 1⅞ in. wide by 6⅛ in. long by 2⅛ in. tall and is made of padauk, with brass wear strips and hardware. The finish is linseed oil.

MICHAEL GUY
Dallas, Texas

Guy made a version of this heirloom marking gauge for each of his children. What's amazing is that he crafted each one in about four hours. The 3-in.-dia. body is made from scraps of cocobolo and has wear strips made from bronze tubing. The scale is dovetailed into the bronze beam, and the cutters are made from high-speed steel. The finish is Watco Danish Oil and beeswax.

WILLIAM MARTLEY
Mystic, Conn.

Originally made as a prototype for a tool dealer, this shoulder plane (1¼ in. wide by 8 in. long by 3 in. tall) has found a home in Martley's shop, where "it works like a dream." A pattern maker, Martley made the wood mold and poured the castings for the gunmetal bronze sides. The plane has a steel sole and ebony infill, and the finish is Butcher's wax.

BRIAN BUCKNER
Tallahassee, Fla.

With this marking gauge and infill miter plane, Buckner demonstrates his mastery of both wood- and metalworking skills. Several years ago, while browsing the tables at a local flea market, he came across a marking gauge with a threaded post. The thrifty maker of that tool, which Buckner assumed was salvaged from an old screw-arm plow plane, realized the precision offered by the threaded post. Buckner's threaded marking gauge (2½ in. wide by 7⅜ in. long with a ¾-in.-dia. post), made of highly figured cocobolo, is surprisingly sensitive: One-eighth turn of the fence equals 0.02 in. of travel. Buckner's infill miter plane (2 in. wide by 8 in. long by 2⅝ in. tall) is based on one of Stewart Spiers' early "improved pattern" miter planes. The sides of the plane, made from patterned steel (two dissimilar steels forged together), were acid-etched to create the striking grainlike appearance. The sole is made from O1 tool steel, the lever cap is hand-filed from naval brass bar stock, and the infill wood is Nigerian ebony. The wood finish on both tools is French polish.

JOHN E. DEGIROLAMO
Paulden, Ariz.

In making this left-handed veneer saw, DeGirolamo's first obstacle was the blade design. A standard veneer-saw blade has two holes, countersunk on one side, to accommodate the screws that secure it to the handle. To use these holes yet make the blade suitable for his lefty saw, he had to recut the teeth in the opposite direction—a straightforward but laborious task. For a comfortable grip, he made the hard-maple handle 1¼ in. dia. and carved an indentation for his index finger. The saw, which is 9 in. long, is finished with lacquer.

DAVID O'LEARY
Macon, Ga.

O'Leary wanted a workbench with a heavy, substantial look. With the massive top, beefy legs and feet, and extra-thick stretcher on this bench, he met his goal. Made of oak and other hardwood, much of which was resawn from logs cut on O'Leary's property 10 years ago, the bench stands 32 in. deep by 78 in. long by 35 in. tall. To draw the leg assemblies tightly together, O'Leary threaded a 4-ft.-long bolt through the stretcher. The finish is water-based polyurethane.


ON
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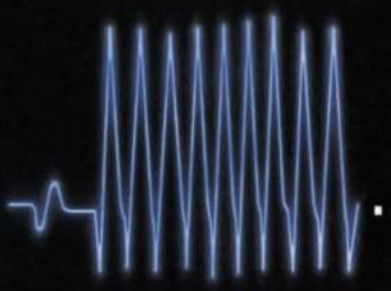
The American Woodshop
THE NEW YANKEE WORKSHOP



DELTA's new hybrid saws are designed to make your heart race. Their powerful 1 3/4 HP motors are enclosed in full-size cabinets for enhanced stability and space-saving footprints. Additional features include a left tilting blade, fully integrated dust port, large table surface and your choice of three fences including Biesemeyer® or DELTA® UNIFENCE®. This is the saw to get your blood pumping. For more information about DELTA's complete hybrid saw line-up, visit deltamachinery.com/hybrid.

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Use test cuts for accurate machine setups

BY DAVID HYATT

Building furniture or other projects with strong, square-fitting joints requires woodworking machines that are set up to make accurate 90° cuts. Checking with an accurate square might seem like all that's needed, but it's really just a starting place.

A square won't register some factors such as variations in the flatness of a tabletop. Some squares aren't as square as they should be. And, using a square alone, very small errors can be hard to see. The following test cuts can finish the job that the square started, making errors more visible by multiplying them.

Tablesaw: Square the blade and miter gauge

1 ***Start with a square.*** *An accurate square can help set the sawblade at a 90° angle, but this is only the start of a precise setup. Very small errors can be hard to see with a square alone.*

2 ***A test cut is more revealing.*** *Use two pieces of lumber or medium-density fiberboard (MDF). Stand the pieces on edge and cut them in the same pass.*

3 ***The moment of truth.*** *Butt the two cut ends together. Any error will reveal itself as a tapered gap between the two ends.*

4 ***A similar test for crosscuts.*** *Lay the boards flat to check the 90° stop on the miter gauge.*

A very reliable way to check a tablesaw blade for an accurate 90° angle is to cut two test strips and then check the squareness of the cut by placing them end to end.

Raise the blade to maximum height. Use two strips of sheet goods (I prefer ½-in.-thick melamine) that are slightly narrower than the height of the blade and 18 in. to 20 in. long. Hold the two strips together on edge and trim one end of them using a miter gauge. Open the two strips in a book-match (like opening a book) and place them on a known flat surface. Any deviation from 90° will show up as a tapered gap between the ends as they touch. Once the blade has been adjusted to 90°, the 90° stop can be set and locked in place. Lay the same two strips flat, trim, and mate the ends again to check the 90° stop on the miter gauge. If the miter gauge is set at exactly 90°, there will be no gap between the ends of the test strips as they meet.

Photos: Mark Schofield

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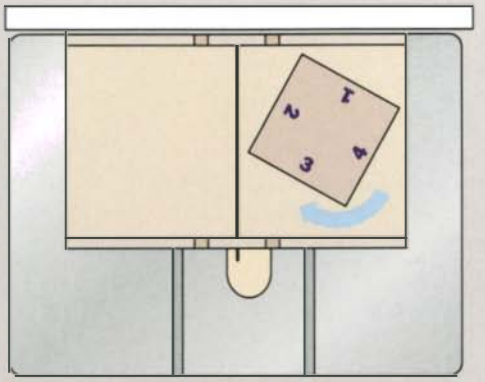
Tablesaw: Square your crosscut sled



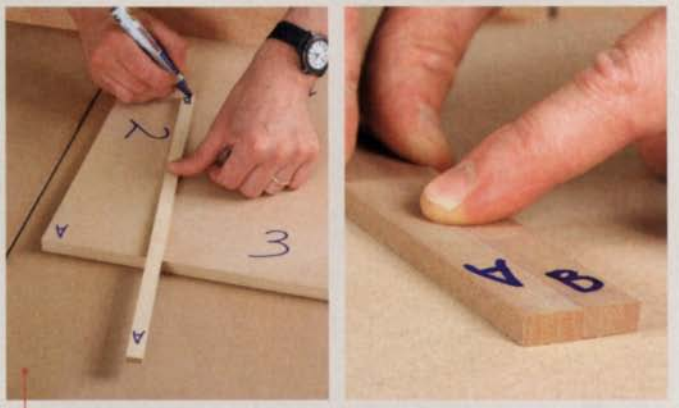
1 Make a test piece. *Number the edges on a square of MDF. With edge 1 against the sled fence, trim each side in turn, rotating the piece clockwise between cuts.*

2 Make five cuts in all. *Finish the sequence by taking a second, wider strip from edge 2.*

Larger pieces such as panels are usually crosscut on the tablesaw with a shopmade crosscut sled. The accuracy of these cuts can be checked with a large square, but a better and more accurate method is to use the "five-sided" test cut.

Begin with a piece of sheet goods that is roughly 18 in. to 24 in. square. Number the edges 1 to 4, going counterclockwise. Place edge 1 against the fence of the sled and trim edge 2. Then place edge 2 against the fence and trim edge 3. Continue around until you have trimmed edge 1. Then place edge 1 against the fence and trim a ½-in. strip from edge 2. Label one end of the strip "A" and the other end "B." Snap the strip in half and place A and B side by side on a flat surface. If the sled is set square to the blade, then the strip will be exactly the same thickness at A and B. Even very small deviations from 90° will show up using this method.

If the sled does not produce 90° cuts, then you should adjust the fence on the sled until it cuts accurately.



3 Mark the ends of the strip. *This identifies the front and back of the final cut. Make corresponding marks on the MDF square for future reference. Snap the final strip in two, lay the pieces on their sides, and compare the thickness of the two ends. Any variation means the crosscut sled's fence needs adjustment.*

Drawings: Rodney Diaz

Tablesaw: Set up for accurate miters

1 *Make a series of cuts.* *Cut 45° miters at both ends of four pieces of stock, just as you would for a picture frame.*

A similiar set of tests can help verify the accuracy of the 45° miter-cutting setups on a tablesaw.

Cut a 45° miter at both ends of four test pieces of equal length. Tape the four pieces together to form a picture frame. Any deviation from 45° will be apparent, as the last corner will not fit together tightly. Adjust your setup, and recut the four test strips until they form a frame with no gaps at the corners.

For standing miters, cut with the blade set at a 45° angle. For flat miters, cut with the blade set at 90° and the miter gauge set at 45°.

2 *Tape the corners.* *This helps hold the pieces in place as you assemble the frame.*

3 *Look for the gap.* *If the final corner doesn't fit snugly, it means the miter gauge isn't set at precisely 45° to the blade.*

Jointer: Check the fence

Prepare test pieces. *Joint the face and edge of two pieces of stock, checking them on a flat surface. Place the jointed edges down and jointed faces together. A gap shows adjustment is needed.*

The fence on a jointer also can be set to 90° by using test cuts.

Take two 16-In. to 18-in. lengths of 8/4 stock and joint a face and then an edge of each piece. Set the two pieces on a flat surface with the jointed edges down and the jointed faces together. If the jointer fence is not set at 90°, then a tapered gap will be visible between the two faces. Another check can be made by clamping the two pieces with the jointed edges together. Place a straightedge across the two jointed faces. If the jointer fence is not at 90°, then the straightedge will rock when placed across the jointed faces or it will show a gap where the two pieces touch.

These methods will work only if the jointer is producing a smooth cut. If the jointer blades have been nicked and are leaving small ridges, the test pieces will not sit flat. You might solve this problem by moving one jointer blade slightly to one side.

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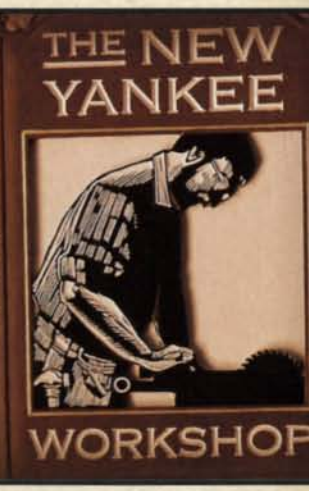

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Q&A

What to check when buying a used cabinet saw

Q: I've found a used Powermatic 66 in my neck of the woods that I'm interested in buying. What should I be looking for when I give this machine a once-over?

—JAMES ASHBURN, Bartonville, Texas

A: WHEN BUYING A USED TABLESAW, THERE ARE MANY THINGS you need to inspect. First, turn it on to see how (and whether) it runs. Next, ask a few questions of the owner to find out how much use/abuse the saw withstood. A saw used in a professional shop will have seen a lot more wear and tear than one in a hobbyist shop.

Make sure all of the parts are still intact, and check out all the moving parts: Move the fence back and forth to see how well it slides and locks; turn the handwheels; check to see that the blade can be adjusted to both 90° and 45° (this test also will tell you if the saw is right- or left-tilting). Check the exterior for excessive rust, giving the tabletop extra scrutiny for cracks, rust pitting, and other signs of neglect or abuse.

It's also a good idea to look under the hood to evaluate the condition of the internal castings. If the current owner allows, remove the top to look inside. If that's not possible, look through the throat-plate opening or access doors, using a flashlight to help you inspect the interior. The trunnions and trunnion supports, the arbor housing, and the motor mount should have no cracks. If you see damage, don't buy the saw. Remove the belts, if possible, and rotate the arbor shaft by hand. It should roll smoothly, without any grinding noises. If you hear noises or the shaft feels stiff, it could mean the bearings are bad. Arbor bearings can be replaced (see *FWW* #179, p. 50), but if they are in very bad condition, there could be damage to the arbor shaft.

You also should take a close look at the asking price and compare it with new models and with other used models sold on the online auction site eBay, for instance.

—Roland Johnson, contributing editor

Use a flashlight to look at internal parts. *Check the trunnions and trunnion supports, the arbor housing, and the motor mount for damage (top). Turn the wheels (above) and make sure all moving parts work smoothly. Look through the throat-plate opening (right) to examine the arbor and bearings.*

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.

Photos, this page: Thomas McKenna

Dust collection in a radiant-heated floor

Q: I'm hoping to build an 800-sq.-ft. shop as an addition to my house. I want to install radiant-floor heating. Is it possible to run some dust-collection ducts and electrical lines through the floor?

—KEVIN MILLER, Saline, Mich.

A: IT IS ABSOLUTELY POSSIBLE, and it would be the route I'd take if I were building my dream shop.

You need to know exactly where your major machines will be so that you can lay out the dust-collection and electrical outlets. And because you get to do this only once, be certain that your dust-collection system is well designed and constructed.

Level and compact the underlying ground, then put down a layer of stone for drainage. Next, add a layer of EPS (extruded polystyrene) foam insulation, topped with a vapor barrier.

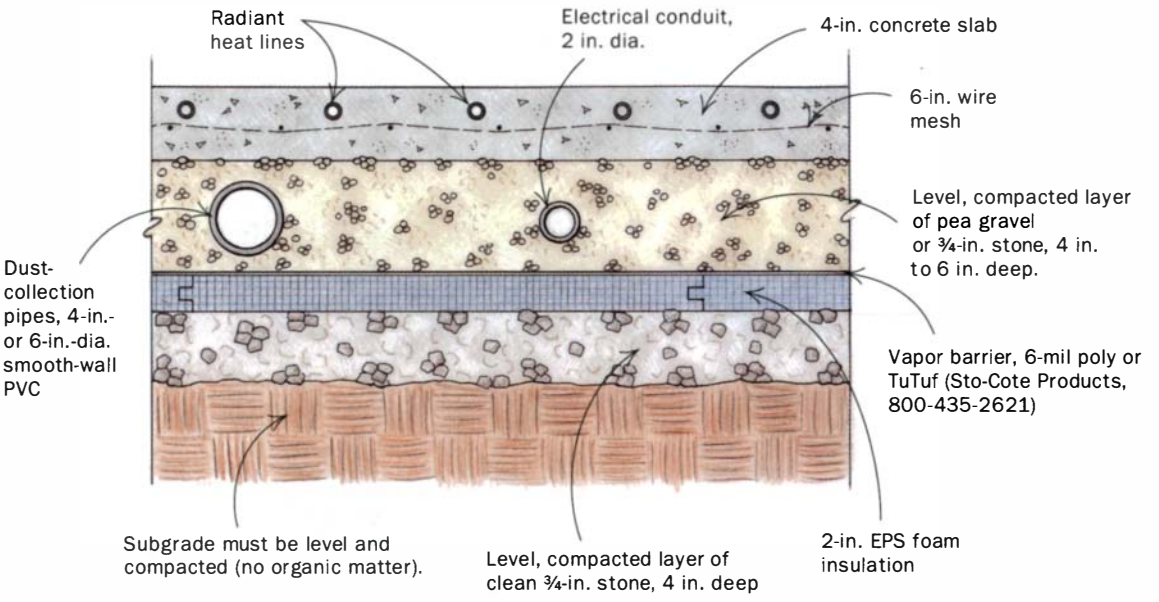
Next, install the dust-collection lines and the conduit and boxes for the wiring. I'd recommend smooth-wall PVC drainage pipe (4 in. or 6 in. dia.), which, unlike metal, won't corrode if it becomes damp. For long runs, you may want to include cleanouts, so you can remove clogs. For the wiring, use larger conduit than you think you'll need: The stuff is cheap, and it's far easier to pull wire through bigger conduit.

Fill in around the pipe with pea gravel or ¾-in. stone (pea gravel is a bit easier to pack around the tubing). Finally, pour the concrete slab and install the radiant-heat lines.

—Andy Engel, senior editor and former builder

A GOOD PLAN IS KEY TO THE DESIGN

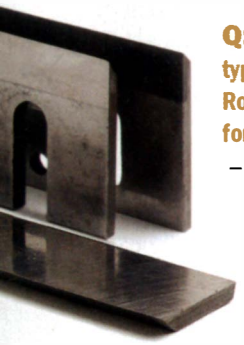
If you're building a new floor with a radiant-heat system, you need to know exactly where your major machines will be so that you can accurately place the dust-collection and electrical outlets. Locating dust collection above the insulation is less likely to foster condensation.



Steel for replacement jointer blades

Q: What is the best type of steel and Rockwell hardness for jointer blades?

—DOUGLAS STRONG, Fishers, Ind.



Tough vs. sharp. *Carbide blades (top) are tough, but high-speed-steel blades (bottom) take a sharper edge.*

A: FOR REPLACEMENT JOINTER blades you have two choices: carbide or steel.

Carbide blades, in general, are not as sharp as steel blades, but they are tough and will hold an edge longer before they need sharpening. Carbide is a good choice for woodworkers in an industrial setting and for craftsmen who work frequently with tropical hardwoods, which tend to contain high levels of natural silicates (also known as dirt). They're also good for folks who joint used lumber that is dirty or may contain hidden nails.

Steel jointer knives can be honed to a sharper edge than carbide, which results in cleaner cuts for finished edges. The disadvantage of steel is that you will need to resharpen the blades more frequently.

As far as Rockwell hardness on steel knives, let the manufacturers worry about that call; just be sure that you buy good-quality knives from a reputable dealer.

—Roland Johnson, contributing editor

Photo, this page: Kelly J. Dunton; drawing: Vince Babak

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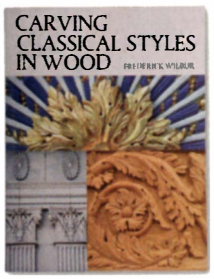
book reviews



Carving Classical Styles in Wood
by Frederick Wilbur. Guild of Master Craftsman Publications, 2004. Distributed in North America by Sterling Publications. $19.95 paperback; 176 pp.

THIS BOOK—THE AUTHOR'S SECOND—PRESENTS a wealth of information about carving wood, and it is both scholarly and practical in scope. Newcomers to wood carving might be intimidated by Wilbur's exhaustive review of details found in furniture and architectural work: relief carving, cartouches, fans and shells, keystones, finials, and pineapples, to name a few. But a closer look at the well-written text and color photos likely will persuade hesitant would-be carvers to take the plunge.

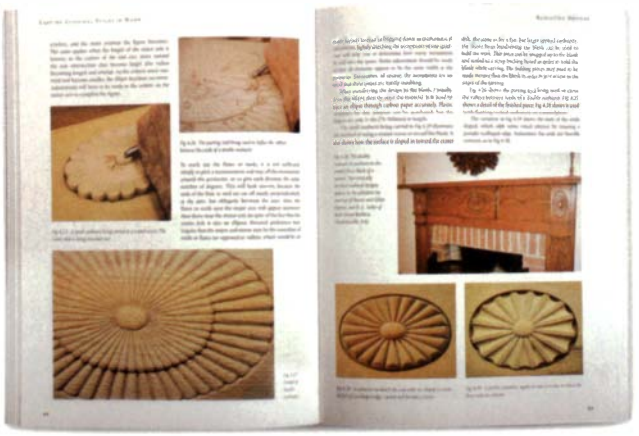
Wilbur is one of North America's finest wood-carvers, and woodworkers are fortunate that he's decided to share his knowledge. See his Web site at www.frederickwilbur-woodcarver.com.

—William Duckworth, contributing editor

Furniture Studio 3: Furniture Makers Exploring Digital Technologies
by various authors. The Furniture Society, www.furnituresociety.org, 2005. $30 paperback; 128 pp.

FURNITURE STUDIO IS THE ANNUAL JOURNAL of The Furniture Society. Though many of the authors are professional designer-makers, these essays will be useful and inspiring to hobbyists and prospective pros. Author Rich Tannen speaks with experience about the vast powers and potential dangers of digital tools for designing and making studio furniture. More than 300 color photos richly illustrate essays on topics such as working with clients, the state of studio furniture making today, and surveys of the field in the United States, England, and Scandinavia. My favorite essay chronicles a 2004 class taught by Curtis Buchanan in which he challenged students to reinvent traditional chairs such as the Windsor as more ergonomic designs.

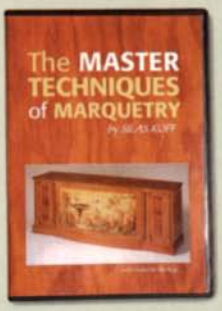
—Asa Christiana, executive editor



A thorough review. *Modern master Frederick Wilbur offers a comprehensive survey of traditional carving patterns.*

Studio views. *The Furniture Society's annual publication explores digital woodworking technology and offers inspiration for fans of contemporary furniture.*

DVD Review



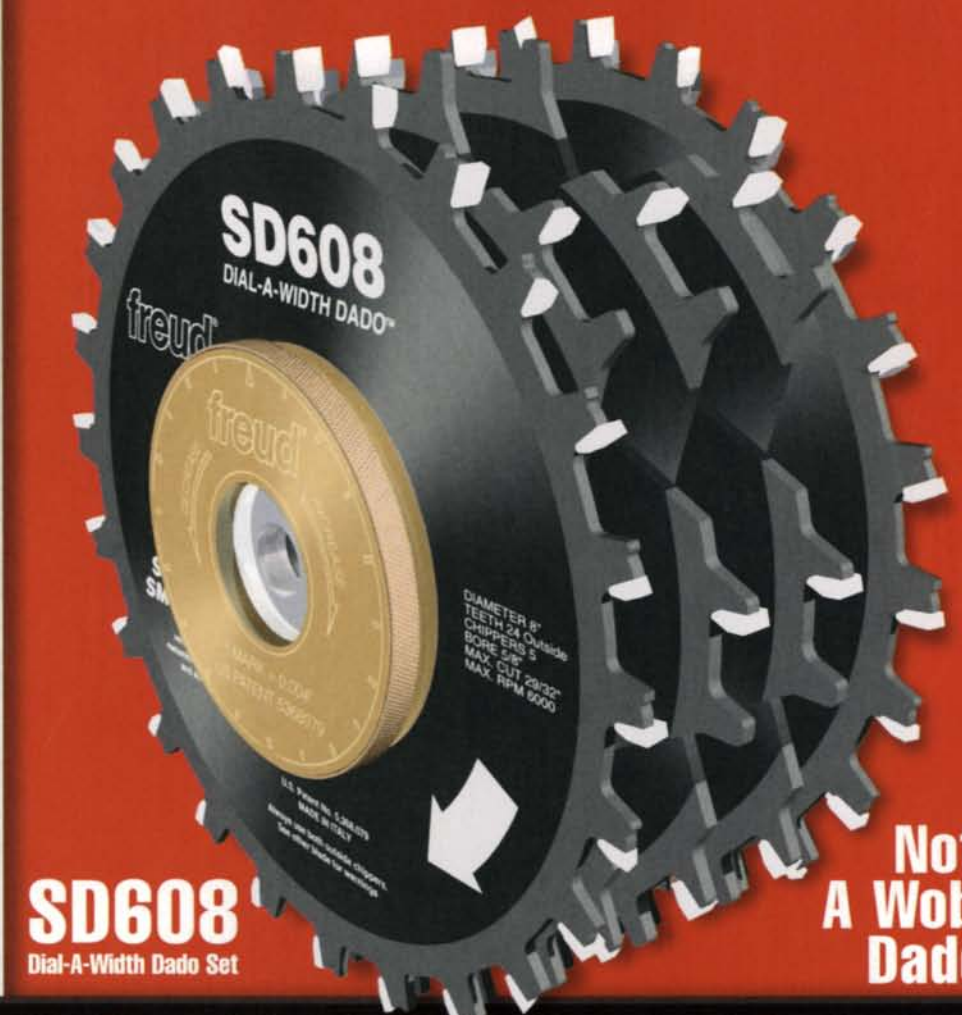
The Master Techniques of Marquetry
(DVD) by Silas Kopf. www.silaskopf.com, 2004. $25 plus $3 shipping; one hour, 25 min.

SILAS KOPF IS A MASTER OF MARQUETRY, THE practice of using wood veneer to create decorative patterns or pictures on furniture. He starts this DVD by illustrating the simplest of inlay techniques, then guides the viewer methodically through more intricate veneering skills: bandings, geometric parquetry patterns, the Boulle process, packet cutting, and double-bevel sawing. In the final segment, Kopf demonstrates how he made an incredibly complex and beautiful floral pattern for a freestanding, curved cabinet.

You can buy the DVD directly from the author by visiting his Web site, www.silaskopf.com, or by writing to him at 20 Stearns Court, Northampton, MA 01060.

—W.D.

A Stacked Dado Set With No Shims Needed?



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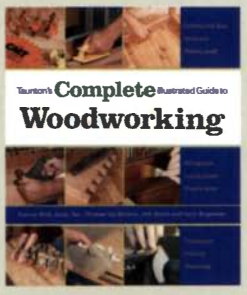
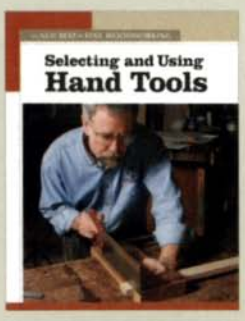


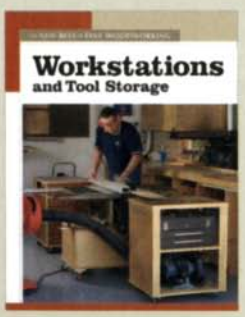
Taunton's Complete Illustrated Guide to Woodworking by Lonnie Bird, Jeff Jewitt, Thomas Lie-Nielsen, Andy Rae, and Gary Rogowski. $29.95 hardcover; 320 pp. **This overview of the tools and techniques of woodworking collects essential information from the previous books in Taunton's Complete Illustrated Guide series.**

Woodworking for the Home: Storage Projects for All Around the House by Paul Anthony, Niall Barrett, and Jeff Miller. $21.95 paperback; 288 pp. **This collection presents 22 furnishings in a variety of styles. The work is simple enough for beginners, but the finished pieces are practical enough to appeal to anyone.**

Projects For Your Shop by Matthew Teague. $19.95 paperback; 176 pp. **This book offers practical, easy-to-build projects such as a workbench, router table, and sawhorses to help get your shop up and running. Each project includes detailed plans and step-by-step instructions.**



Selecting and Using Hand Tools $17.95 paperback; 160 pp. **The articles in this book aid in choosing and using the right hand tools. The book offers a survey of the most essential tools and instruction in basic hand-tool techniques.**



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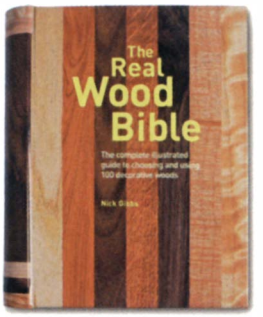
Traditional Projects $17.95 paperback; 160 pp. **This volume features period-furniture projects in a variety of styles. Pieces include a tilt-top table, a sleigh bed, a blanket chest, and a corner cupboard.**

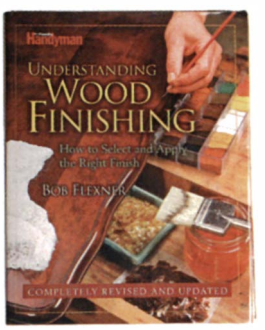
The Real Wood Bible
by Nick Gibbs.
Firefly Books, 2005.
$29.95 hardcover; 256 pp.



WITH 100 SOFTWOODS AND hardwoods described in two-page spreads, this spiral-bound guidebook provides basic information such as the strengths and weaknesses of common species and tips on milling, assembly, and finish. Of particular note is a full-page photo of each species showing the wood in two states: bare and with a clear finish. Although most of the photos are high quality, there are some odd choices, such as the example of white oak, which is photographed plainsawn rather than in its more attractive form---quartersawn with ray fleck. (An example of English oak, however, is shown quartersawn.) The book also includes tips on buying lumber, information on grading and storing, and a discussion of certified lumber. This is a valuable, useful guide, but not the only book about wood you'll need.

—Anatole Burkin, editor-in-chief

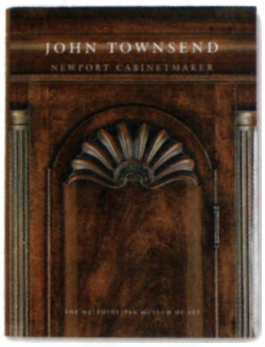
Understanding Wood Finishing
by Bob Flexner. Reader's Digest Books, New York, 2005.
$29.95 hardcover; 320 pp.



ALTHOUGH COMPLETELY REVISED and updated from the title originally published in 1994, the book has lost none of Flexner's hard-hitting, opinionated style: "The success of the furniture polish industry in convincing millions of consumers that there's oil in wood that needs replacing has to rank among the great scams of American marketing." The book covers all aspects of finishing from sanding to rubbing out a finish, and is particularly good at explaining technical matters in simple terms.

Another example of Flexner's no-nonsense style are the frequent boxes at the side of the text stating a popular finishing myth and a debunking fact from Flexner. The author has covered much of the information in the articles he writes for woodworking magazines, but even a woodworker who has seem these columns would benefit from this compilation of finishing knowledge.

—Mark Schofield, senior editor



John Townsend: Newport Cabinetmaker
by Morrison Heckscher.
Metropolitan Museum of Art, New York, 2005.
$75 hardcover; 240 pp.

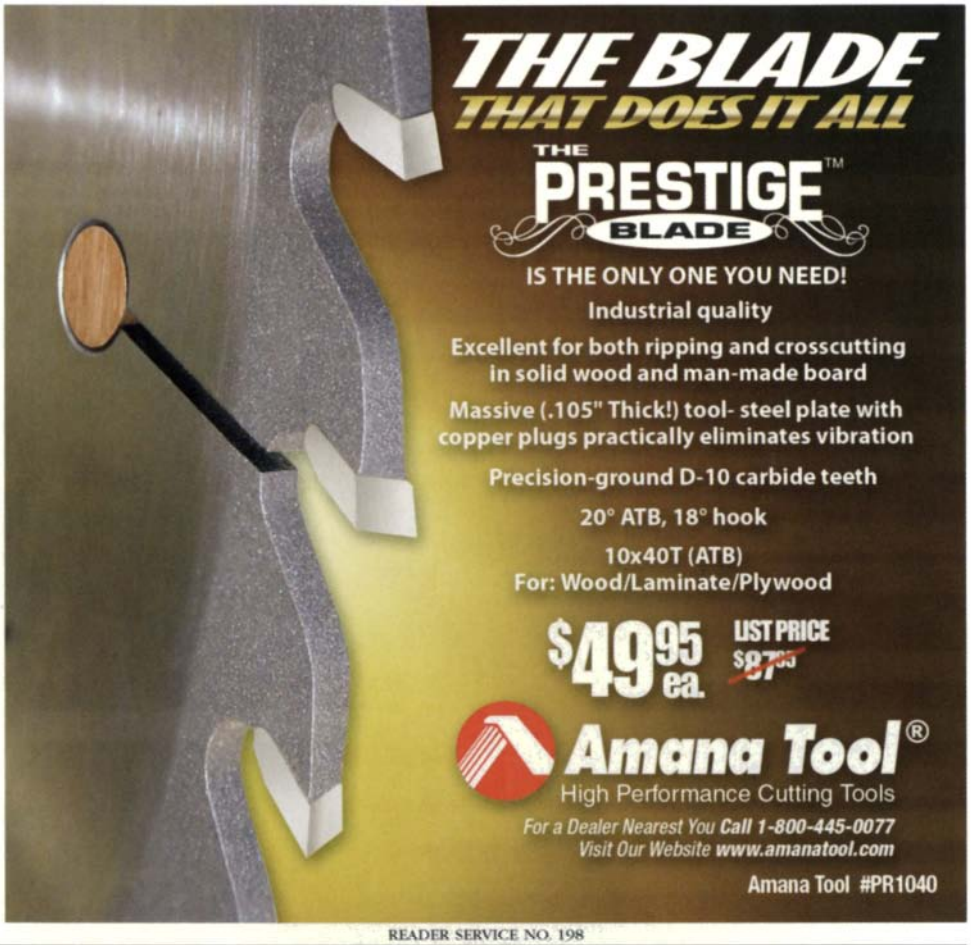
THE HEART OF THIS BOOK, published to accompany a recent exhibition of Townsend's work at the Metropolitan Museum of Art in New York, is the photographs and details of the 48 pieces that were on display. These include Townsend's signature block-front pieces (including the document cabinet featured in *FWW* #178), as well as less familiar stop-fluted pieces and Federal-style designs.

American artistry. *John Townsend's mastery of design and craftsmanship is on ample display in this volume, published in conjunction with an exhibit at the Metropolitan Museum of Art in New York City.*

The book also covers life in 18th-century Newport, R.I., and gives a family tree of the many generations of woodworking Townsends and Goddards. Woodworkers hoping for plans of the furniture will be disappointed, but the pictures of the beautifully figured Cuban mahogany are some compensation.

In case you think that this wood has become valuable only recently, Townsend's father specified in his will that "all my mahogany and other shop joiner stock" be left to his son. Think about that the next time you choke on the price of mahogany.

—*M.S.*



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Protecting your tools against theft

BY JIM WEINMAN

Compile a visual record. *Having photographs of your valuable tools can help document your loss should you ever have to file an insurance claim.*

I'm guessing it happened around 2 a.m., when the night was dark and I was sleeping. I'm also guessing they were kids, but maybe they were professional thieves with bad backs, since they didn't take anything over 50 lb.

But no matter who did it, or why, or when, someone broke into my shop and stole everything they could carry. Six months later I'm still reaching for tools that aren't there. Handsaws, routers, circular saws, sanders, drills, Dremel tools, drill bits, paddle bits, vises, files, awls, chisels, levels, my lucky hammer, my tape measure, and even my push-in earplugs—all gone. What had taken me 10 years to accumulate was stolen in probably less than 10 minutes. In all likelihood, police told me, my tools wound up on a pawnshop shelf.

Even though the incident is well behind me, I still dream of catching the thief or thieves in the act. But since I slept through the whole thing and my beloved tools are gone forever, there were only two things I could do: make a claim on my homeowner's insurance and take the necessary precautions so that it wouldn't happen again.

Insurance is important

Aside from security in your shop, which I will cover shortly, the most important thing you can do to protect your investment in your tools is to keep a detailed inventory and insure them. The second most important thing is to insure your tools at "replacement value."

Insuring tools at replacement value, sometimes called replacement cost, is a matter of making sure you have enough insurance to cover the cost of replacing your stolen tools with new ones. If you have $5,000 worth of tools and only $2,500 worth of insurance, that's a problem. To avoid any discrepancy between your level of insurance and the replacement value of your personal belongings, some insurers recommend updating your insurance policy annually.

My shop is located on the same property as my home, and because I am primarily a hobbyist woodworker, I added the shop and its contents to my homeowner's policy. If your tools are your living, you may have to insure them under a different policy where you can write off your insurance expense against your income.

Although all insurance companies handle customers differently, state governments regulate the insurance industry. All 50 states have insurance departments, and many states' Web sites allow you to find out which insurance companies have had

Insure your tools for all they're worth

- Tell your agent you want your tools insured at replacement value. This type of coverage is more expensive, but it means the insurance company will pay the full cost of replacing stolen items with new ones.
- Make a thorough inventory of your tools. Save your purchase receipts and add to the inventory as you buy new equipment.
- Photograph your tools and keep the photos in a safe place.
- Be sure to update your insurance policy regularly so that new tools are covered.

Photos: Steve Scott

the most or least consumer complaints. Along with price, this information should help you choose an insurance company.

The general rule on saving money with insurance is to get the highest deductible you can comfortably afford. Typically, the higher the deductible, the lower the premium. The disadvantage is that a higher deductible will increase your out-of-pocket expenses if you have to make a claim against the policy.

After my tools were stolen, I reported the theft to the police and then made my claim by faxing a list of the missing tools to my insurance agent.

Keep your tools out of the wrong hands

- **Light deters thieves. Install motion-sensor lights or other security lighting.**
- **Keep your shop windows covered to avoid luring thieves in.**
- **Make your tools hard to see and hard to get by placing them in a locking cabinet.**
- **Consider an alarm or monitored security system.**

Secure tools out of view. *A locking cabinet, whether store-bought or shop-made, adds another barrier between a thief and your tools.*

Because I had collected my tools over time, I didn't have many of the original receipts to prove that I actually owned them. Nor did I have photographs or even a list of what I owned. I was lucky in this regard, as I have a long-standing relationship with my insurance agent and he trusted that I was telling him the truth.

Although my claim went through the system smoothly, it is a very good idea to have a detailed list, receipts, and photos of your tools in case you ever need to make a claim.

The insurance company promptly sent me a check for what it determined was the depreciated value of each tool on my list. My 1993 Makita 10-in. compound-miter saw, for instance, was valued at $231. That tool costs $500 new. In order for me to get the replacement value, the insurance company gave me 180 days to buy the tool and submit a receipt, after which I received a check for the difference. Don't forget the blades and accessories on your tools when you make a claim. I had a $100 finish-cut blade on that saw and was sure to list that as stolen, too.

Prevention is the key

I live in Hood River, Ore., a rural county of 21,000 people that's known for its small-town vibe and its 14,000 acres of commercial fruit orchards. I feel safe there. I do not lock my doors, I leave my keys in my car, and generally I do not worry about crime. Before the theft, my shop had no security. It was naive on my part but convenient for me and, in the end, for whoever stole my tools.

Since the theft, I have installed motion-sensor floodlights outside my shop and motion-sensor switches to activate the interior lights. According to my local police department, light seems to be the number-one deterrent to theft. I also have installed heavy padlocks on the doors and heavy curtains on the windows.

Before the thieves broke into my place, I left many tools on my workbench or on an open shelf. Whoever walked off with my tools had an easy time of seeing and grabbing what they wanted. Since then, I have bought a mechanic's metal toolbox and have locked my tools inside it. The idea is to keep all of your tools in one lockable place and make them difficult to access and move.

I had placed my name and phone number on most of my tools before the theft. The thieves didn't seem to mind taking personalized tools, but I still think it's a good idea to mark each tool with your name and phone number. A heavy black marker is good; engraving is better.

I've also considered an electronic security system, but so far have decided against it. I can't justify paying an alarm company $40 every month because my tools were stolen once. It's a judgment you must make depending on the value of your tools and where you live. If you are a professional and have $50,000 worth of high-end tools to protect, it's something to consider.

The whole idea behind these security measures is to make potential thieves move on. If stealing your gear looks like work, chances are they won't be interested.

Having your tools stolen is an awful experience, and there's no way to make it completely right. But there are ways to keep it from happening, and if you have the proper insurance, there is at least a way to get the tools replaced. □

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Heavy-Duty Beauty

For a quarter century, David Lamb has made elegant furniture in Canterbury N.H. Over the same span, he's collected old woodworking machines at the rate of roughly one per year. As a furniture maker, Lamb is comfortable in a range of period styles. When it comes to machines, he's more of a monogamist. The only ones he buys these days are those made by the John A. White Co. of nearby Concord (and later Dover), N.H.

Built between about 1870 and 1910, the machines were designed by Edward F. Gordon. Lamb typically parts with only a few hundred dollars to get his machines, but they often require extensive restoration. He hopes eventually to have one of every model the White company made and to have some of them powered by belts connected to a line shaft. How to drive the shaft? Well, Lamb does have an old steam engine that needs only minor repairs...

—Jonathan Binzen

Photos: Jonathan Binzen