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Photo: Michael Pekovich

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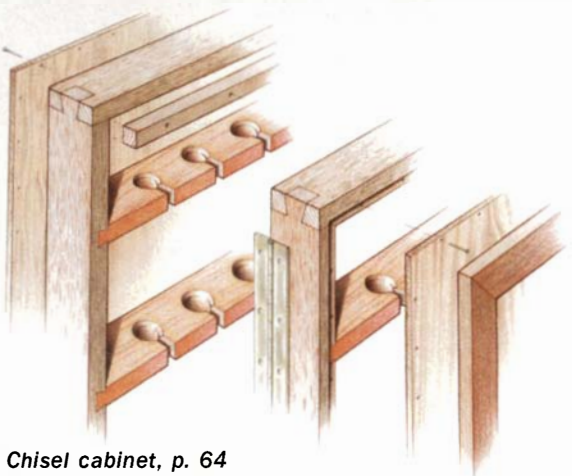

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Eric Keil ("An Arts and Crafts Library Table") took up woodworking 18 years ago as a way to supplement his first love, playing bass. Trained by a number of Manhattan shops—where his work varied from plastic laminates to antique reproductions—he now works wood from an old stone building that was once his great-grandfather's dairy barn. Keil and his wife, Kim, live on the old family farm outside Wilkes-Barre, Pa., where they raise two kids, Travis and Louisa.

Jon Siegel ("Basic Guide to Buying a Lathe") was introduced to turning at his father's architectural millwork shop while growing up in Chicago. He moved to New Hampshire in 1978 to teach industrial arts at a private secondary school. After 10 years, he started a full-time wood-turning business, specializing in turnings for furniture and architectural applications. He has also patented a new type of spur center. A member of the Guild of New Hampshire Woodworkers and the New Hampshire Furniture Masters Association, he relaxes by playing pool with one of his shopmade cues.

Like many others of his generation, **Fred Wilbur** ("A Chisel Cabinet") prepared for a career in woodworking by taking academic degrees in English literature. After working at a variety of jobs—house framing, trim carpentry and sign making, to name a few—he settled comfortably into his own niche as an architectural carver. Wilbur has been working steadily as a carver for more than 25 years, and he's now starting to share with others what he's learned. He recently wrote a book, *Carving Architectural Detail in Wood: The Classical Tradition*, which was published by The Guild of Master Craftsman and distributed in the United States by Sterling Publishing.

Teri Masaschi (Finish Line) was a professional furniture maker and finisher in New Hampshire for many years. In 1995 she moved to New Mexico to become finishing specialist/product manager for Woodworker's Supply. Currently Masaschi is a restoration specialist for Santa Fe Fine Finishing and also writes and lectures on finishing.

After college and a nine-year Army career, **Dick McDonough** ("A Bench Built To Last") settled in Flint, Mich., where he works as a finish carpenter, specializing in restoring and remodeling antique houses. He occasionally teaches woodworking at

Delta College in Midland, Mich., and also at a local woodworking retail store. When time permits, he offers individual and small-group classes in his own shop, where his workbench immediately becomes the envy of every new student.

After an earlier career as a sales engineer, **Tom Begnal** ("Midsized Plunge Routers") traded his slide rule for a smoothing plane and spent a year building custom furniture in northwestern Connecticut. When *The Woodworker's Journal* needed someone to build furniture and write copy for the fledgling magazine, Begnal signed on as an editor and remained there for more than 15 years. After that, Begnal was a freelance book editor and then an associate editor for *ShopNotes* magazine. He joined *Fine Woodworking* in 2000 where, among other duties, he edits the Tools and Materials department for each issue.

Darryl Keil (Master Class) lives and works in Brunswick, Maine. He and his wife, Annie, homeschool their two boys, Peter and Ben. Keil also keeps bees, tends a vegetable garden and raises cashmere goats, which, he says, are the best lawn mowers and shrub cutters money can buy. Once a furniture maker, Keil now operates Vacuum Pressing Systems and teaches seminars on veneering.

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Letters

Bandsaw blade tensioning redux— There are a number of questionable statements in John White's "Shopmade Tension Gauge" article (*FWW* #147, pp. 80-83). "Bandsaw tension gauges are notoriously inaccurate" ... "the springs on these smaller machines go soft quickly, and a fatigued spring exerts far less force than it was originally designed to apply, no matter how far it is compressed."

From my experience, neither statement is correct. Contrary to some misconceptions, that type of spring will not degrade over time unless it is abused. In *The Bandsaw Book*, *Mastering Woodworking Machines* and the Taunton video *Mastering Your Bandsaw*, I recommend using the saw's tension gauge. If you are resawing with a dull blade or if you have an older saw, you may want to tension your saw to the next higher setting.

Over the last 12 years, I have done seminars with a hundred 14-in. bandsaws of different makes and models using the saw's built-in tension gauge with good results. The gauge on my grandfather's 50-year-old Delta works fine. It is simple, easy to use and doesn't cost anything in time, effort or money. Tension is only part of tuning up your bandsaw. Wheel alignment, guide setup and blade choice are other factors.

The tension spring also functions as a shock absorber. Replacing the standard spring can make tensioning much more complicated and possibly void your warranty. About 12 years ago, Jim Cummins wrote a similar article for *Fine Woodworking* advocating increased tension and replacing the spring. Some readers damaged their saws, including shearing off the wheel shafts.

Increasing the tension creates a number of problems including difficulty in tracking the blade, decreased tire and bearing life, increased vibration and, in some situations, shorter blade life. Blade technology has come a long way in the past 10 years. These new blades actually require less tension for good performance.

There is a tendency by some catalog companies to bad-mouth standard equipment in an effort to sell expensive replacement parts that you really don't need. That is capitalism. The job of a responsible magazine is to sort out fact from fiction. "Don't fix it if it isn't broken" and "keep it simple" are always good advice for your readers. There is enough confusion and hype these days, don't add to it.

—Mark Duginske, Merrill, Wis.

JOHN WHITE REPLIES: Several readers took issue with my statement that bandsaw springs go soft over time, and as a result, the built-in tension gauges on these saws are far from accurate. In the face of such expert criticism, I did some additional research and testing.

At room temperature the springs should be able to survive thousands of normal compressions without experiencing fatigue or going soft. Soft or not, I've observed that many 14-in. bandsaw springs can't tension blades to 15,000 psi, the setting blade manufacturers recommend for resawing.

I'm indebted to Sam Carrozza of Sterling

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June 9: Editor-in-Chief Tim Schreiner will judge Best in Show from among the more than 300 entries at the Del Mar Fair's Design in Wood exhibition near San Diego. The show runs from June 15 to July 4.

Aug. 2-5: *FWW* editors will be in our booth at the giant AWFS show in Anaheim, Calif. The show will fill six halls at the Anaheim Convention Center with woodworking tools and related materials. It is the biggest woodworking show of 2001.

All summer: If you weren't able to attend our January conference on 18th-century chairs at Colonial Williamsburg, our web site, finewoodworking.com, contains reports on most of the presentations by distinguished researchers, woodworkers and chair makers.

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Spring Corp. in Chicago for an explanation. Using a computer program for designing and analyzing springs, he ran a simulation of the spring supplied on the Delta bandsaws.

The simulation revealed that the original equipment spring would become permanently crushed to a shorter length if the spring were fully compressed, even if this only happens a few times. In technical terms the spring takes a "set."

The analysis further revealed that the spring would take a set even if it is only compressed to the ¾-in. setting on the saw's built-in gauge. Once the spring has taken a set, the saw's tension gauge will no longer read correctly, and the spring will close up completely before reaching the proper tension needed for wider blades. Taking a set doesn't weaken the metal in the spring. Rather, the spring's shorter length prevents it from performing as designed.

As a follow-up, I tested three used Delta springs ranging from 1 to 30 years old. The three springs varied in length by ⅜ in. I used each of them in the same saw and adjusted the saw to the ½-in. setting on the saw's gauge.

Then I used a new Starrett gauge to measure the blade tension. The readings varied from 2,000 psi to 6,000 psi. Then I cranked the tension up to the ¾-in. mark. None of the springs was able to tension the blade beyond 10,000 psi.

And in regards to Duginske's comment about a reader whose bandsaw was damaged several years ago: Our records indicate that after an investigation, it was determined that the machine's failure was most likely caused by a faulty part.

I may have gotten the physics wrong, but my original observation and recommendation still stand. Because they can take a set, stock springs may not give you the performance you need. For resawing, get an aftermarket spring.

Time is not right for certification—I was surprised to see the letter from Scott Landis in the April issue (*FWW* #148), regarding our joint essays about certification (that originally appeared in *FWW* #146). Apparently, he must have wanted another chance to make his case. Frankly, I don't think the arguments presented in his letter are any more effective in masking the facts as stated in the original article.

For example, he states that certification is "entirely voluntary." Really? As all of the major retailers, such as The Home Depot and Lowes are coerced into adopting policies whereby they refuse to buy uncertified wood products, selling certified wood will hardly be voluntary. For both loggers who would like to freely sell their products and wood users who would like the freedom of choice in what they buy, certified wood will be about as voluntary as a bayonet in the back.

In an attempt to suggest that the certification movement embodies some semblance of science, Landis goes on to state that their sustainable-yield methods are based on "more than 40 active regional standards." In other words, he is aware that the rain forests constitute a multitude of unique ecosystems, which is, of course, true. But the point he misses or evades here is that, given our current state-of-the-art in forestry, we still do not know in detail how the symbiotic relationships in any of these complex ecosystems actually work.

Landis further suggests that certification programs and complete set-aside strategies work hand in hand, but in reality they don't. Set-asides (as practiced by The Nature Conservancy) presently offer the only workable means of preserving biodiversity. Certification simply excuses abuse. Landis says he has "visited certified tropical forests where old-growth trees are being harvested according to management plans that allow for their eventual replacement." To me, this merely underscores the insidious hypocrisy behind certification programs that suggest to the general public that—if logging occurs in keeping with their management plans—all is okay with the world. Well, all is not okay: If these fragile ecosystems are disturbed, they do not regenerate with the full range of their previous biodiversity, regardless of who is blessing the carnage.

One final point Landis makes, correctly, is that in my original essay, I did not address certification programs as they relate to temperate forests. The reason I did not is simple: While I don't think certification is of any real benefit in the temperate zone either, it is at least not a serious threat to biodiversity. All but a very small fraction of the world's temperate forests have already been altered by human activity. Also, even if they were still undisturbed, temperate forests do not contain the great, unexplored biodiversity that is the key, irreplaceable worth of the rain forests. If the pseudo-conservationists that support certification feel compelled to muck around on the assumption that they can manage natural processes that are still beyond our understanding, I suppose that it's better that they do it up here in our own hemisphere where their efforts will not further damage the rain forests.

I am content to stand by the points I expressed in the original article. The facts simply do not support certification. We must set aside representative samples of our remaining rain forests, and we must recognize that we do not yet have the scientific skills to exploitively manage these ecosystems. To suggest that we do is the real disservice in this debate.

—Jon Arno, Troy, Mich.

Upper and lower rails were switched—Your editorial staff made a mistake in the article by Steve Latta, "Fast

Writing an article

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return those we can't publish. Send your contributions to *Fine Woodworking*, P.O. Box 5506, Newtown, CT 06470-5506.

and Accurate Table Joinery" (*FWW* #148, pp. 50-55). Unless I miss my guess, the last two sentences in paragraph two on p. 53 should read: "Even though the upper dovetailed rail is shorter, cut it to the same length as the lower rail and rear apron. Keeping that upper rail long at this stage will help keep the distance between shoulders identical to that of the lower rail." *–Abram Loft, Rochester, N.Y.*

EDITOR REPLIES: Mr. Loft is absolutely correct. We transposed the upper and lower rails in the wording.

Woodworkers, beware—A word to the wise from the stupid: No matter how smart, careful, experienced and good-looking you think you are, you can still do something stupid.

I found this out the hard way last week while cutting a new insert for my tablesaw. I very carefully reached around the back of the blade to pull the piece out so that I wouldn't be risking the fingers I was feeding the piece in with. Normally I use a push stick for this, but the insert was so thin I was afraid a push stick wouldn't hold the piece up out of the blade path.

Even though I'm usually very careful and I've had my saw for about seven years without an accident, I got complacent, the most dangerous thing one can do. You guessed it; I stuck my finger into the blade because I forgot you can't see the very tip of the blade when it's rotating. I've worked around rotating machinery in an industrial plant for 20 years, and I've never had an accident.

All I felt was a simple "thump" against my finger, but I instantly knew what had happened. I let out a loud exclamation neither in pain nor in fear, but in rage that I would have allowed myself to do something so stupid. I shut the saw off before I dared to have a look at my finger and was absolutely stunned and amazed to see that it was complete and almost undamaged, but for the very tip and part of the nail. In a month or two there may not even be a scar. I've been thanking the Man upstairs every day for my great good luck!

Let this be a lesson to any who will heed it: We are most dangerous to ourselves when we get complacent—no matter how careful we otherwise are.

Thanks for the opportunity to sound a warning.

–Philip Wilson, Lubbock, Texas

About your safety:
Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, don't do it. Look for another way. We want you to enjoy the craft, so please keep safety foremost in your mind whenever you're in the shop.
–Timothy D. Schreiner, editor-in-chief

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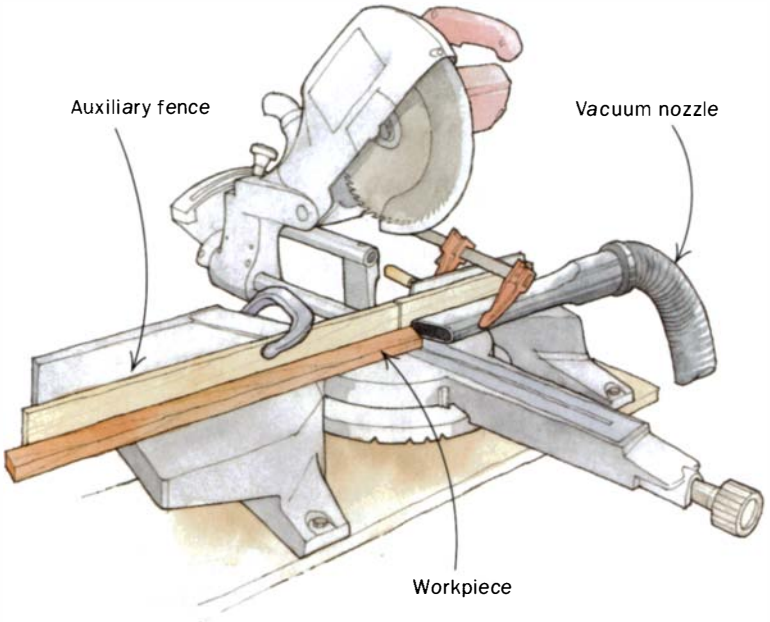
Methods of Work

EDITED AND DRAWN BY JIM RICHEY

A safer stop block



I enjoy turning bowls from segmented blanks that are glued up from many small identical pieces of wood. The problem with cutting these small segments on a chopsaw is that many of the pieces will vibrate into the blade where they are either damaged or sent flying across the shop as dangerous projectiles.

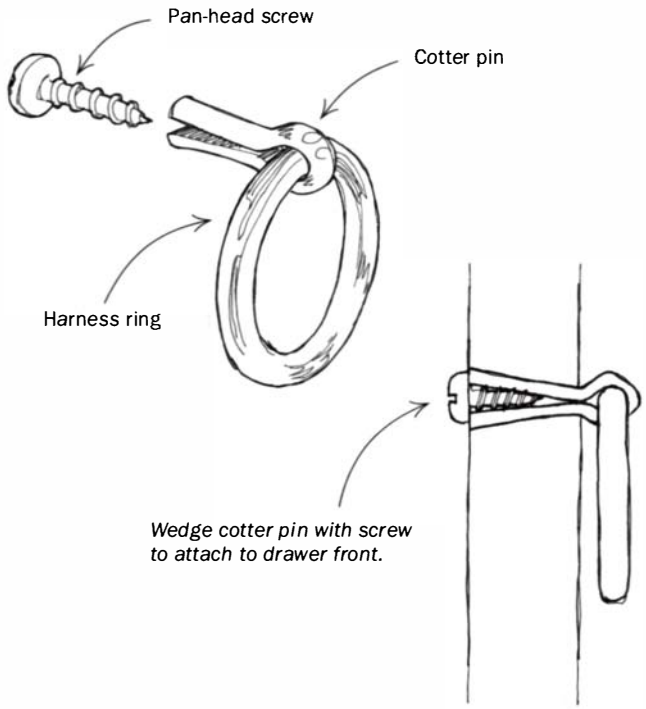
My solution is to use the nozzle of a shop vacuum as a stop block. First, I clamp a ½-in.-thick auxiliary fence to the fence of my chopsaw to create a zero-clearance fence. Then I tune the angled end of my vacuum nozzle on a belt sander to make the edges sharp and crisp. Next, I clamp the nozzle to the chopsaw's fence at the correct distance from the blade, as shown above. After each cut the nozzle sucks up the potentially errant missile before it becomes airborne. Don't forget to empty the vacuum's dust bin before you begin, unless you enjoy looking for a wooden needle in a huge haystack of sawdust. *—Jim Vasi, Williamsville, N.Y.*

Making ring pulls

Here's how to make a trendy-looking ring pull from a harness ring and a cotter pin. Steel harness rings, sold at most hardware or farm-supply stores, are used for hitching lengths of rope and come in a variety of sizes. I use a #7, 1-in. ring for the pulls I make. This ring fits neatly within the eye of a 5⁄32-in. cotter pin.

I usually start by tarnishing the shiny finish to a gunmetal gray in a 24-hr. vinegar bath. You can add a bit of surface pitting to the metal with a 24-hr. bath in household bleach prior to the vinegar bath, if that's the effect you want.

To make the pull, simply open the legs of the cotter pin, slip in the ring and squeeze the legs closed. You can attach the pull by pushing the pin through a hole, bending the protruding portion of the legs into an L-shape and then hammering the legs, staplelike, into the back of the drawer front. But this looks pretty crude.



A more elegant way to fasten the pull is to cut off the legs ⅛ in. shy of protruding through the back. After drilling the hole for the pull, use the next-larger drill-bit size from the back to enlarge the back half of the hole into an oval shape from top to bottom. Insert the cotter pin into the hole and spread apart the legs. Then screw in a #6 pan-head sheet-metal screw between the two legs to wedge them apart and secure the pull.

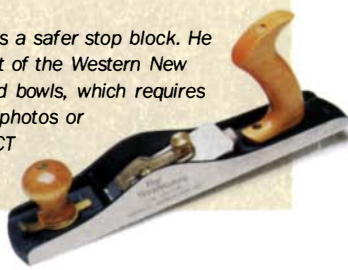
—David Gilmore, Maple Ridge, B.C., Canada

Zero-clearance router-table fence

This zero-clearance fence is an easy project that improves the performance of almost any router bit. The fence is made of ½-in.-thick medium-density fiberboard (MDF). Construction details are shown in the drawing on p. 16. To use this setup with a new router bit, screw a new replaceable insert into the rabbeted recess in the

A reward for the best tip

Jim Vasi won an engraved Lie-Nielsen handplane for his winning tip on using a vacuum nozzle as a safer stop block. He recently retired after 36 years of teaching woodworking to high-school students. Vasi is president of the Western New York Woodturners, an organization consisting of 80 members. His specialty is making segmented bowls, which requires cutting and laminating hundreds of small pieces of wood. Send us your best tip, along with any photos or sketches (we'll redraw them) to Methods of Work, Fine Woodworking, *P.O. Box 5506, Newtown, CT 06470-5506.*



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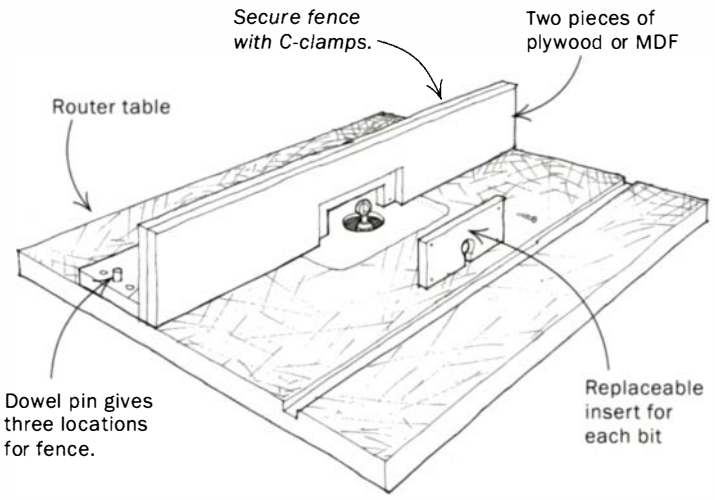
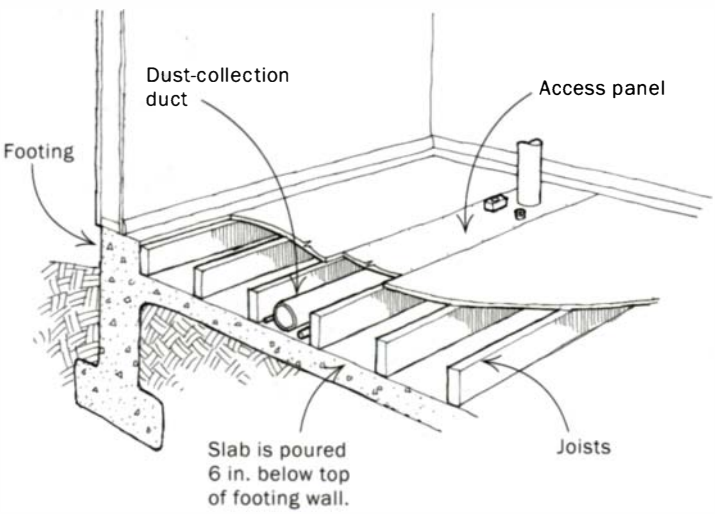


fence. Place the pivoting end of the fence over a dowel in the router-table top, turn on the router and swing the fence slowly through the bit to cut a reverse opening in the insert. The final placement of the fence is secured with two C-clamps. When you change the bit, you will need to install a new insert and repeat the operation. *—Ernie Conover, Parkman, Ohio*

Quick tip: When using a scraper, swipe the edge of it along a block of paraffin after every few strokes. The paraffin lubricates the cutting edge, reducing chatter and preserving the sharp edge.
—Mike Zaslav, Cherry Hill, N. J.

In-floor dust-collection systems

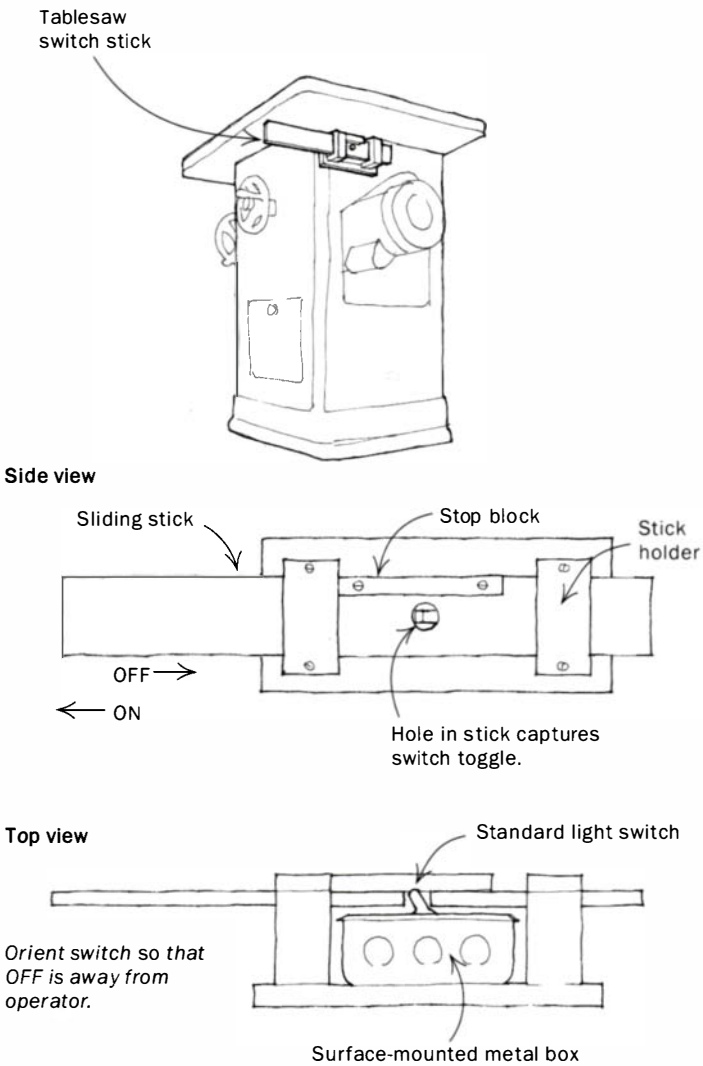
Editor's note: *Both of the following submissions are in response to a Method of Work by Bob Chandler (*FWW *#140, p. 24).*



When I built my shop several years ago, I too didn't want to stumble over air hoses, dust-collection ducts or electrical cables on the floor. My solution was to have the contractor drop the cement floor 6 in. below the top of the footings. I then put in 2x6 joists and ¾-in. flooring to bring up the floor to the top of the footings. This allowed me to put all of the hoses, wires and ducts under the floor between the joists. In addition, this also gave me a wood floor to work on, which is much easier on legs and dropped tools.
—Howard L. Althouse, St. George, Utah

For our new shop we designed a dust-collection system that rests on top of the concrete pad and between the 2x6 floor joists that support a ¾-in. plywood floor. The floor joists are 12 in. o.c., creating a channel that is deep and wide enough to house a 4-in.-dia. PVC dust-collection pipe, a compressed-air hose and electrical cables for floor outlets. The channel is topped off with an access panel. We also ran dust collection to the workbench, a very practical added feature. *—Julie Whittaker, Charlevoix, Mich.*

Tablesaw switch stick



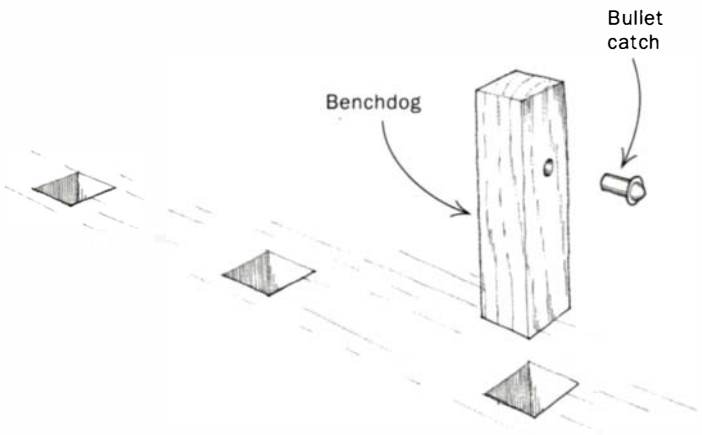
Jamie Buxton's safer tablesaw switch (*FWW* #139, p. 18) is an excellent innovation. But for those of us who are puzzled and discouraged by the gizmos and circuitry, here is a simpler option that has performed well on my tablesaw for several years.

Mount a scrap of plywood to your saw in a location that is convenient to access by hand or a bump with your body. To the

plywood mount a common light switch in a metal surface box, oriented with the *on* toward the operator and the *off* away from the operator. Make a stick with a hole in it to fit over the toggle and extend the switch stick forward of the table. Pull the stick to start, push the stick to stop. Construct a simple stick holder that not only allows free back-and-forth movement but that also keeps your switch stick in place. *—Steven Stroh, Indianola, Iowa*

Quick tip: Compact discs make excellent shims for setting up dado blades. Simply enlarge the hole to your arbor size and insert the discs between the blades to the required thickness. If a disc breaks, take heart: A replacement will arrive shortly in the mail from an Internet service provider. *—Tom Carpenter, Vernon, B.C., Canada*

Bullet catch improves benchdogs



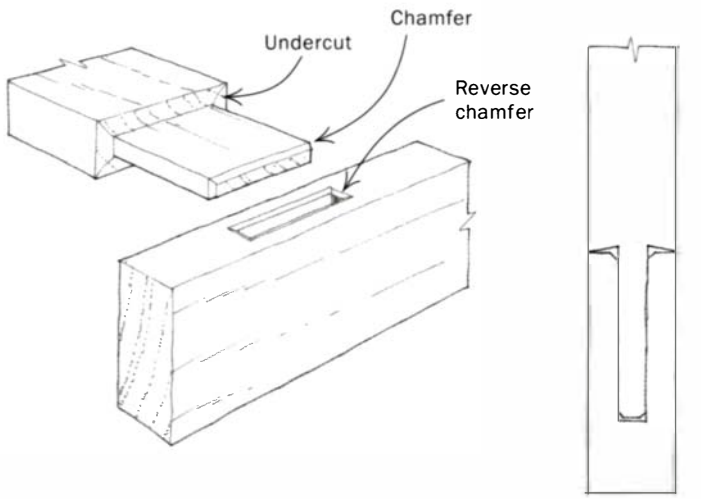
I install a small bullet catch in all of my wood benchdogs. The spring-loaded pin provides enough friction to hold the benchdog at just about any desired height. Just push or pull it into place, and it will stay put. I have used bullet-catch pins in several types of benchdogs, both square and round. It's a simple idea that works very well. *—Mike Griffin, Indianapolis, Ind.*

Quick tip: To locate the correct Allen wrenches quickly and easily, wrap a different color of electrical tape around the handle of each wrench. Also, paint a dab of paint on each tool with a color that matches the tape on the Allen wrench used to adjust that tool.
—Jim Wheeler, Plainfield, Ind.

Mortise-and-tenon tips

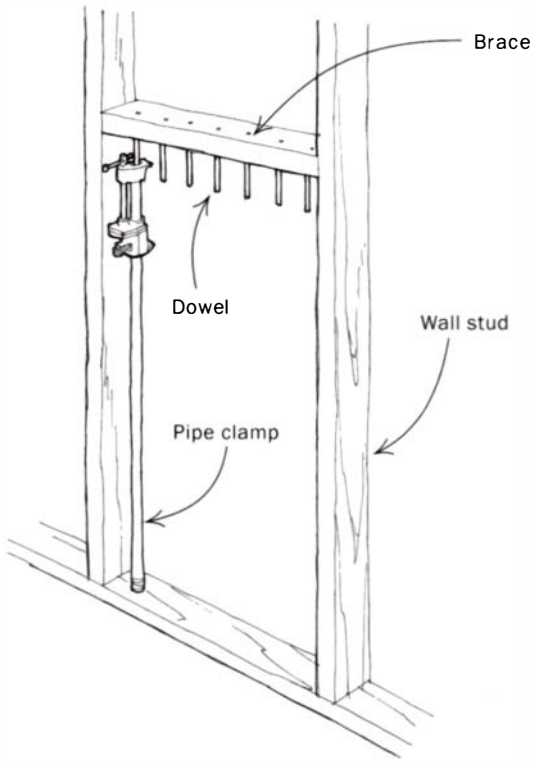
Here are three techniques I use to improve mortise-and-tenon joints. First of all, pare out a slight reverse chamfer on the lip of the mortise before the first fitting. This prevents tearing out a chip of wood when a too-tight tenon is pulled back out of the mortise. The chamfer also creates a well for excess glue to prevent squeeze-out during glue-up.

Second, chamfer the end of the tenon. This makes the tenon easier to start into the mortise and also forms a well for excess glue at the bottom of the mortise. Third, undercut each shoulder of the



tenon slightly. This ensures a tight-fitting, no-gap joint and also helps—you guessed it—reduce glue squeeze-out.
—Michael Bakken, Fresno, Calif.

Pipe-clamp rack



This pipe-clamp storage rack is a simple and easy answer for woodworkers with open stud walls in their shop. Make a horizontal brace to fit between two studs. Drill holes every 3 in. or so, and glue 2-in. long, ¼-in.-dia. dowels into the holes. Attach the brace at the right height for your length of clamps. To store a clamp, simply slip the top end of the pipe onto a dowel and rest the bottom of the pipe on the floor plate. To remove a clamp, lift the pipe slightly and pull out the bottom at an angle.
—Chris DiCiaccio, Gastonia, N.C.

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Notes & Comment

Furniture from Down Under

An American in Australia. *The Wood Works Gallery in Bungendore, NSW, is owned by David MacLaren, a transplanted New Yorker. The works are made primarily from woods native to Australia.*

It's easy for an American to get comfortable in Australia. There's the obvious comfort of a shared language, the food served in restaurants is recognizable, and it isn't too hard to find people who are passionate about woodworking.

David MacLaren, a former New Yorker, found refuge Down Under and built an impressive custom furniture and craft gallery. MacLaren left the United States in 1983 and opened shop in Bungendore, New South Wales, a bucolic town between the country's capital, Canberra, and the southeastern coast, to show off his own work and that of others.

The sprawling gallery displays some of the best that Australia has to offer, from furniture to turned work, sculpture and artwork. The pieces lean toward the contemporary, with a strong Arts and Crafts influence. Much of the work would look comfortable in classic American woods, such as walnut and cherry, but Down Under furniture makers have their own special stock from which to choose. Native species such as blackwood, jarrah, myrtle, Tasmanian oak, huon pine and sassafras imbue the pieces with an exotic character.

MacLaren doesn't have enough time to spend in the workshop, but he keeps his hands involved by designing furniture that another maker brings to fruition. For a peek at some of the work being done in Australia, check out the following web sites:

—www.naturallyaust.com.au
—www.bwoodworks.com.au
—www.craftaus.com.au

—Anatole Burkin, executive editor

Wood webs

www.tropicalhardwoods.com

Feeling guilty about using tropical hardwoods for your furniture making? Here is a way to assuage those feelings and, hopefully, turn a profit at the same time.

Since 1991, Tropical American Tree Farms in Costa Rica has planted more than one million hardwood trees from 45 different species, with the help of outside investors. Trees destined for harvest are grown on land that was previously farmed. Areas subject to erosion, such as steep slopes and watershed land, are planted to be forest in perpetuity.

The trees experience a remarkable rate of growth. At the IWF show last year, the company displayed a section of a 7-year-old teak tree already nearly a foot in diameter. Although the growth rings were widely spaced, the heartwood was already assuming the dark color so prized by furniture makers.

The web site contains financial projections of owning trees that compare favorably with the past performance of other investments. The minimum investment is about $3,000, and tree owners receive regular updates on their investment's growth. I am looking forward to spending my retirement on a garden bench made with my own teak.

—Mark Schofield, assistant editor

Photo, this page: Courtesy of Wood Works Gallery

Wood-visored cap

Love wood? Now you can wear it on your head. The visor is finished with polyurethane to withstand the elements.

The Woodie Cap Factory has brought headwear to a new and unique level with its wood-visored baseball caps. The visor is made of five layers of laminated oak. Finished with clear polyurethane, the visor can withstand the elements and is even machine washable. The caps are available in either corporate (a conservative, slightly curved visor) or college style (a contemporary, tightly curved visor). They come in eight different colors and sell for $49.99. The caps can be ordered with or without the company's slogan embroidered on the back. Granted, $50 is a lot to pay for a cap, but they are kind of cool. For more information contact the company at (888) 966-3430 (www.woodiecapfactory.com). *–Christopher Xavier Baumann, editorial assistant*

Woodworking exhibitions

We frequently receive information regarding upcoming woodworking exhibitions. We publish such time-sensitive information in the Events section of our web site, www.finewoodworking.com. Please send information to fw@taunton.com for the attention of the web editor, or mail to *Fine Woodworking* Web Editor, 63 S. Main St., Newtown, CT 06470. Stories and photos concerning shows that have already taken place should be sent to Mark Schofield, either by mail at the above address or by e-mail (mschofield@taunton.com).

Notes & Comment

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Gauge measures blade tension. *A new gauge from Iturra makes it easy to apply just the right amount of tension to a bandsaw blade.*

Bandsaw-blade tension gauge

If you use a bandsaw for tough jobs, such as resawing or cutting thick stock, the blade tension must be set just right. But on most saws, adjusting the built-in tension gauge to the recommended setting results in a blade that's undertensioned. Generally, an undertensioned blade tends to wander, cut slowly and burn the stock. And when resawing, it often results in a barrel-shaped cut. But if you ignore the gauge and try to correct the problem by cranking down on the tensioning screw, you risk putting too much tension on the blade. And that can damage the blade, the saw frame or both.

Industrial operators set the correct tension with a special gauge. But with a cost of more than $300, this type of gauge isn't cheap. Now, however, Iturra Designs has begun selling a bandsaw-blade tension gauge at a more affordable price. The Iturra, like the higher priced gauges, measures the amount a blade stretches when tension is applied. The gauge is easy to set up and read. A dial indicator provides a readout in pounds per square inch (psi) of blade cross section, the standard measure of blade tension. Instructions suggest the best blade tensions based on the size of the saw and the type of cutting that's being done.

I used the gauge to tension a 1½-in.-wide blade on a 20-in. bandsaw and a ¼-in.-wide blade on a 14-in. bandsaw. As a test for accuracy, using the big bandsaw, I positioned the gauge directly above one of the high-priced gauges, so I could read them both simultaneously. In several tests, the two gauges read within a few percent of each other.

This is a high-quality tool that's carefully made and nicely finished, and it should last a lifetime. It would be a good investment for anyone using a bandsaw to do heavy cutting or resawing. The Iturra gauge sells for $129.95 (888-722-7078). *—John White*

Sander Sitter for random-orbit sanders

I have just enough impatience to welcome a product that promises to let me put down my random-orbit sander without having to shut it off and wait for the disc to stop spinning.

So I looked forward to trying the Sander Sitter. With this new tool, there's no need to turn off the sander as you work. Simply place the sander on the Sitter and pick it up when you're ready to continue sanding. The Sitter also promises to clean the sanding disc in the process.

But after giving it a workout in my shop, the Sander Sitter didn't sit so well with me. First of all, the shallow circular tray that accepts the sander is only slightly bigger than the sanding disc itself. That means I have to concentrate to make sure the sander ends up in the tray. And when all I'm doing is putting down a sander on my bench, I don't want to have to think about it, even for an instant.

The Sitter also makes a surprisingly nasty racket. A thin, rubber disc that goes on top of the tray did help clean my sanding disc as the sander ran in the Sitter. But I gladly would have replaced the sanding disc with a new one just to give my ears a break.

In short, although the Sander Sitter performed as promised, I found it a long way from user-friendly. The Sander Sitter is available for $22.99 from Rockler Woodworking and Hardware (800-279-4441). *—Tom Begnal*

Landing pad for random-orbit sander. Good idea but a not-so-good design.

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Easy-mount zero-clearance insert

Improved tablesaw insert. *A groove on the bottom makes it safer to cut the saw kerf. And set screws make it easy to adjust the insert flush to the tabletop.*

A zero-clearance insert offers several advantages over the inserts with wide clearances included on most tablesaws. The kerf in a zero-clearance insert is no wider than the blade, which helps reduce splintering. When ripping, a zero-clearance insert prevents thin offcuts from becoming trapped between the blade and the insert, an event that can send the offcut rocketing back at the operator. A zero-clearance insert also cuts down on the amount of sawdust that gets blown out of the throat of the saw. And it helps reduce noise.

You'll find zero-clearance inserts at most woodworking-supply outfits, or you can make your own, but I especially like the ones marketed by Veritas. They're made from ½-in.-thick high-density phenolic laminate, a material that's stiff and durable. To help workpieces slide easier, the inserts are coated with melamine.

Adjustment screws on one end and side of the insert ensure a perfect fit in the throat. And four leveling screws, accessible from the top, allow you to adjust the insert so that it's dead flat. An end pin helps keep the back edge of the plate from lifting during a cut.

On many saws the blade won't lower more than about ⅜ in. below the tabletop. So a new ½-in.-thick insert can't be fully inserted in the throat. And with the blade touching the underside of the insert, there is no safe or easy way to make the kerf cut. But a shallow groove on the bottom of the Veritas insert provides clearance for the blade, so you can start the blade before slowly raising it up into the insert.

I encountered only one problem along the way. When the insert was first added to my tablesaw, the end pin butted against the radius on the underside of the throat. The interference was less than 1/16 in. but just enough to keep the insert from sitting perfectly flat. A Dremel tool with a grinder provided the needed clearance.

Veritas carries zero-clearance inserts, priced at $21.95 each, for many of the Craftsman, Delta, General and Powermatic tablesaws. To find out if there's one for your saw, contact Veritas at (800) 871-8158.

—Michael Standish

Drill-press hold-down engages automatically

When using large-diameter bits in the drill press, stock should always be clamped to avoid the risk of it going into orbit and smacking you upside the head. A new accessory, the Drill Sargent, eliminates the need to fiddle with clamps yet doesn't compromise safety.

The Drill Sargent, odd spelling aside, is well-thought-out and very sturdy. It's basically an adjustable spring-loaded hold-down device that mounts to the quill of many common drill presses. When the quill is lowered, the hold-down's foot contacts the workpiece. The deeper the hole, the greater the pressure. The foot won't mar the workpiece, unless perhaps, you set it for too much pressure when drilling into exceptionally soft material.

If you wish to tilt the table for angled drilling, the device won't work unless you make up a properly angled caul and attach it to the foot. Also, if your drill press has a depth-adjusting mechanism on the left-hand side, it will have to be removed to install the Drill Sargent. But that's okay because the unit has a built-in depth adjuster. The Drill Sargent costs $89.99, reasonable considering the quality of its manufacturing and ease of use. It's available from Woodcraft (800-225-1153).

—Anatole Burkin

Yes, sir, it works. *The Drill Sargent automatically exerts pressure upon the workpiece as the quill is lowered.*

Photos, except where noted: Erika Marks; this page (bottom right): Anatole Burkin

Broomless sweeper. *Brooms and brushes get a lot of rest when this tool is at work.*

Cordless blower for the workshop

The Makita model No. UB181DZ cordless blower has become a sort of guilty pleasure for me. At first, I couldn't see the point of using what appeared to be a miniature leaf blower in the shop. But after trying it for a week, I didn't want to give it up.

The dust-collection system in my shop consists of a broom, a dustpan and a vacuum. I don't own an air compressor and blow gun, but with this gadget, I was able to blow out the entire shop and actually have fun doing it. A variable-velocity trigger allowed the blower to clear a benchtop of sawdust without disturbing any tools that were lying around.

The blower was especially good at clearing out hard-to-reach nooks and crannies. Plus the blower quickly removed fine dust from my rough concrete floor, a surface that's always been a nightmare to sweep.

A point to keep in mind, however: At full blast, the blower can throw a lot of dust in the air. So a dust mask is a must.

The blower can also be configured to work as a small vacuum, but I found it limited in this function. It collected fine dust okay, but large chips tended to clog the turbine. And the dust bag is small.

The blower uses Makita's 18-volt rechargeable battery system, although the battery and charger are not included. This battery system can be used with a number of other Makita cordless tools. Expect to pay around $115 for the blower, $59 for the model BC1801 charger and $90 for the top-of-the-line model 1931519-1 battery. For more information, contact Makita (800-462-5482).

—Michael Pekovich

John White is a contributing editor; Tom Begnal is an associate editor; Michael Standish works wood and writes about woodworking in West Roxbury, Mass.; Anatole Burkin is executive editor; Michael Pekovich is art director.

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The 10"x40T earned the Editor's Choice for the best performance regardless of price. *American Woodworker April 1998, pp 68-69.*

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READER SERVICE NO. 155

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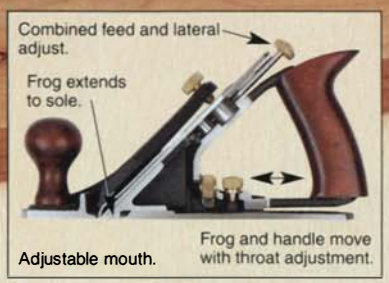
Veritas® #4½ Smoothing Plane



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READER SERVICE NO. 126

A Bench Built to Last

This workbench has a wide top and a sturdy base that provides solid footing and plenty of storage space

BY DICK McDONOUGH

If this workbench played football, I'm certain it would be a lineman. Because, like the guards and tackles found on the gridiron, my bench is big and solid. And I wouldn't have it any other way.

Most of my work involves the fabrication of large case goods—entertainment centers, bookcases and other types of storage furniture. And although much of the machine work gets done using a tablesaw and router, I still do a good deal of work at the bench. So when it was time to replace my older, smallish and somewhat rickety workbench, I opted to make a new one with all the bells and whistles. The bench would provide plenty of size and sturdiness. Sturdiness is the operative word here. Indeed, no matter how aggressive I get with a saw, a handplane or a mallet and chisel, the bench doesn't wobble. The result is a workbench that has just about everything I need.

The supersized top is another important feature. With about 22 sq. ft. of surface area, the top is great for supporting long boards and wide sheet goods. Two end vises, a front vise and a shoulder vise, along with a small army of benchdog holes, make it easy to secure almost any size stock to the bench.

My bench is considered left-handed, based on the location of the shoulder vise. If you prefer a right-handed bench, just build the shoulder vise on the right side.

The base creates a sturdy foundation

The bench owes much of its sturdiness to the design of the base. Yet its construction is pretty straightforward. It has just five main parts: three support frames and a pair of boxes. Screwing the frames and boxes together creates a single, rock-solid unit that can accept almost any kind of top. And the two boxes provide a ton of space for adding cabinets or drawers.

The center and right-side support frames are identical. But to provide additional support for the shoulder vise, the left-side support frame is longer and has an extra leg. I added seven heavy-duty levelers—one under each leg of the support frame.

To simplify the construction of the base, I made both plywood boxes the same size. They fit snugly between the top rail and the foot of the frames, which adds rigidity to the base.

If you include drawers in one of the boxes, as I did, cut the dadoes for the drawer-support cleats, then glue the cleats into the dadoes before the box is assembled.

Once the support frames and boxes were put together, I was able to assemble the base without much fuss. The boxes butt against the legs, with the bottom of the boxes simply resting on the narrow lip along the length of the foot. Attaching the boxes to the frames was a matter of driving five wood screws through the inside of the box and into each of the legs.

Once the base was built, I moved it to its final location. Next I leveled the top surface using winding sticks and the seven levelers. Then I was ready to build the top right on the base.

The top is flat and durable

The top has three main parts. There's a center section made from veneered particleboard. Attached to the center section are two

A variety of vises and ample storage

Shoulder vise adds clamping options. *The lack of a vise screw between the jaw surfaces makes the shoulder vise (above) especially handy when a board must be clamped vertically.*

Front vise is nice. *Used in conjunction with round benchdogs, the front vise (left) lets the author work comfortably from the end of the bench.*

Drawers galore. *The shallow top drawer provides a perfect place for the author to store his favorite chisels.*

Photos, except where noted: Tom Begnal

6-in.-wide edgings—one in front, the other in back—and both made from glued-up solid maple.

Start with the center section—To help keep costs under control, I face-glued three pieces of particleboard together—a ⅝-in.-thick piece sandwiched between two ¾-in.-thick pieces.

First, I joined one of the ¾-in.-thick pieces to the ⅝-in.-thick piece, making sure all of the edges were flush. Then, I used a ⅝-in.-dia. core-box bit to cut three ⅝-in.-deep grooves across the underside of the ⅝-in.-thick particleboard. When the remaining piece of particleboard was added, the groove produced a ⅝-in. semicircular hole, which accommodated a threaded rod that helps secure the solid-maple edgings.

A workbench top gets a lot of wear and tear, so I used a 3/16-in.-thick veneer on top. And to make sure any movement stresses would be equal, I also veneered the bottom.

To make the veneer, I resawed maple to about a 5/16-in. thickness on the bandsaw. I used a thickness planer to bring the material to final thickness. Then I jointed one edge of each piece of veneer and ripped the other edge parallel on the tablesaw.

At this point, the veneer was ready to be applied to the particleboard. But faced with having to veneer such a large surface with thick veneer and without a lot of clamps, I used a somewhat unusual gluing-and-clamping technique (see p. 41).

Wide edgings accept benchdogs—The wide edgings that run along the front and back of the bench are made of solid maple. That way the benchdogs have plenty of support when in use.

I routed the dadoes that create the openings for the rectangular-shaped benchdogs before the pieces were glued together.

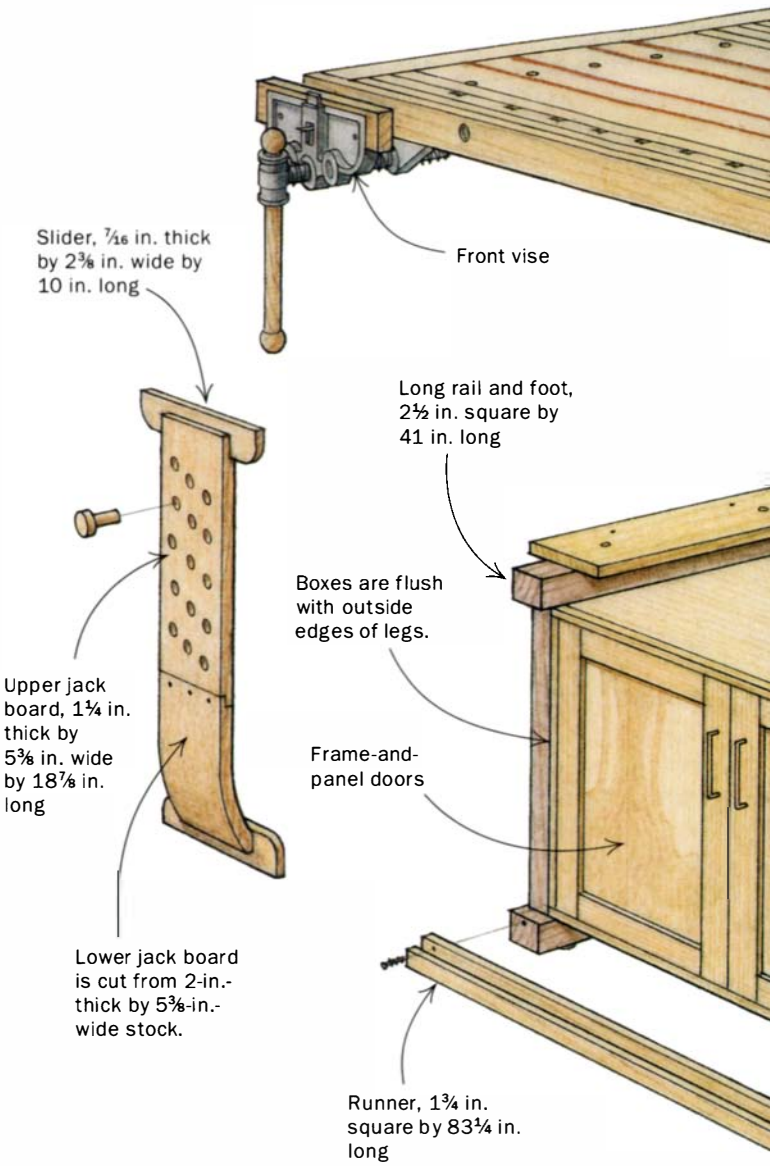
I also wanted benchdogs to work with the front vise. But it was going to be a hassle to chop out all of those square mortises with a chisel. Plus, the particleboard wouldn't hold up well when the dogs got squeezed. So I opted to use round benchdogs. That way I simply had to bore a hole to accept it. And to reinforce the particleboard, I glued a short length of ¾-in. copper water pipe into the hole.

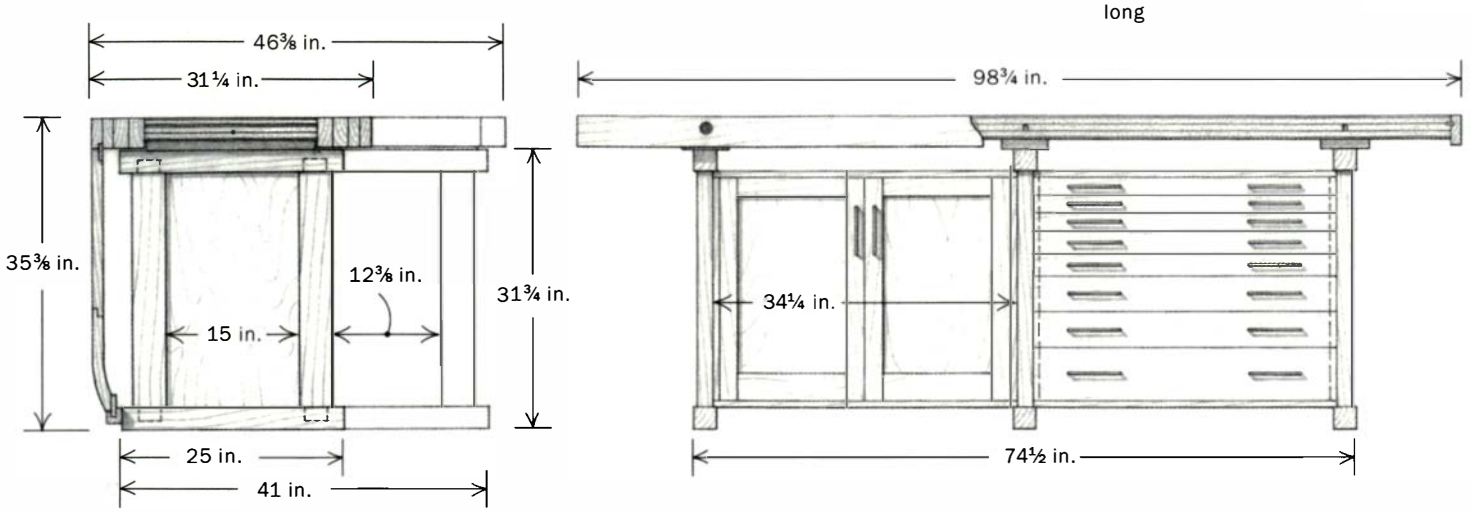
Three lengths of ½-in.-dia. threaded rod, with a washer and nut on each end, secure the wide, solid-maple edgings to the veneered center section. The rods extend through the "holes" in the particleboard and into through-holes in the edgings.

To drill the through-holes, I first cut each piece of edging to

A massive top on a sturdy modular base

To help keep costs under control, the top is a hybrid, a mix of solid maple, thick veneer and particleboard. The base construction is surprisingly simple—a pair of plywood boxes sandwiched between three frames—yet the single unit that results is as solid as a '72 Buick.





Drawings: Vince Babak

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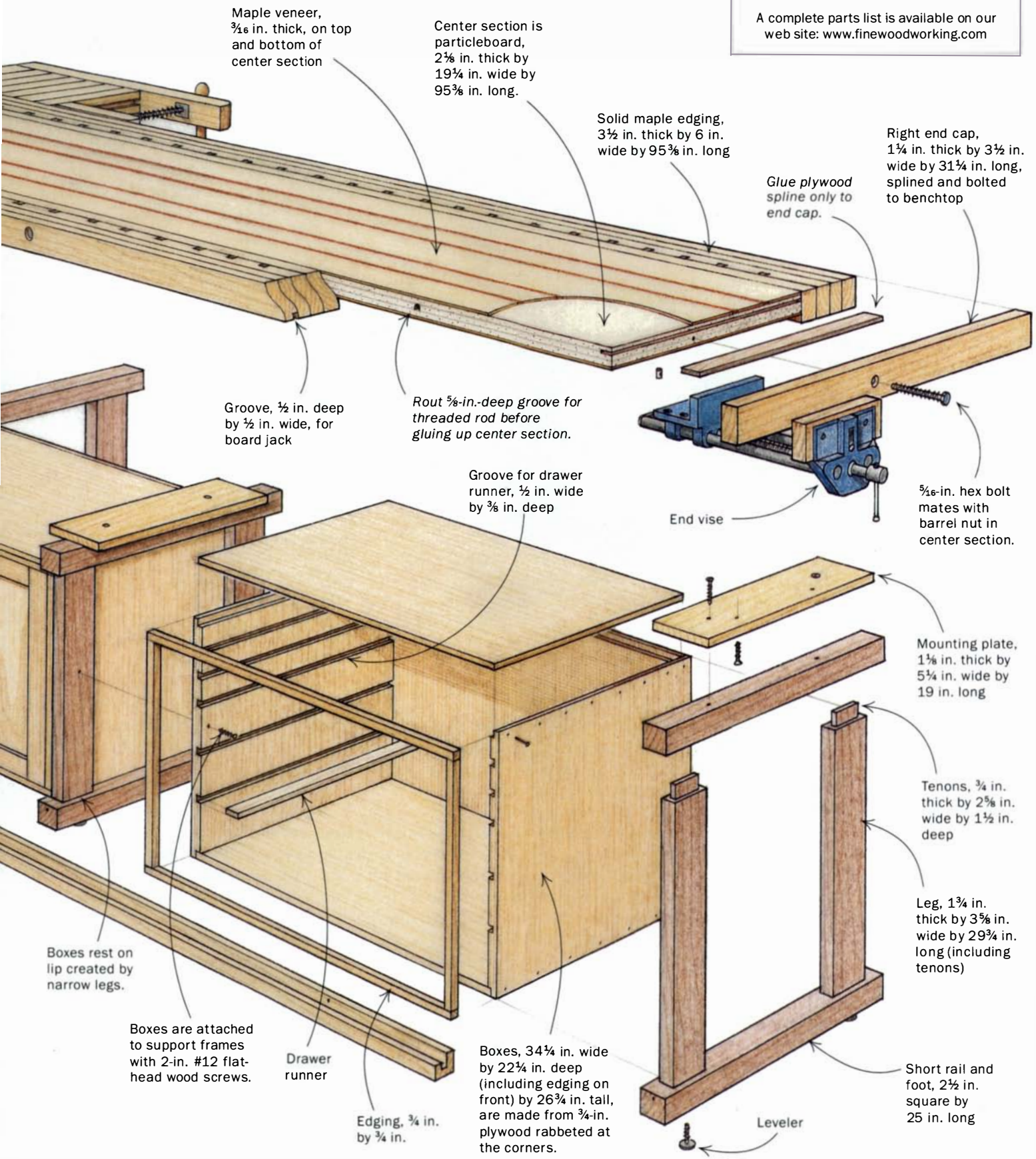
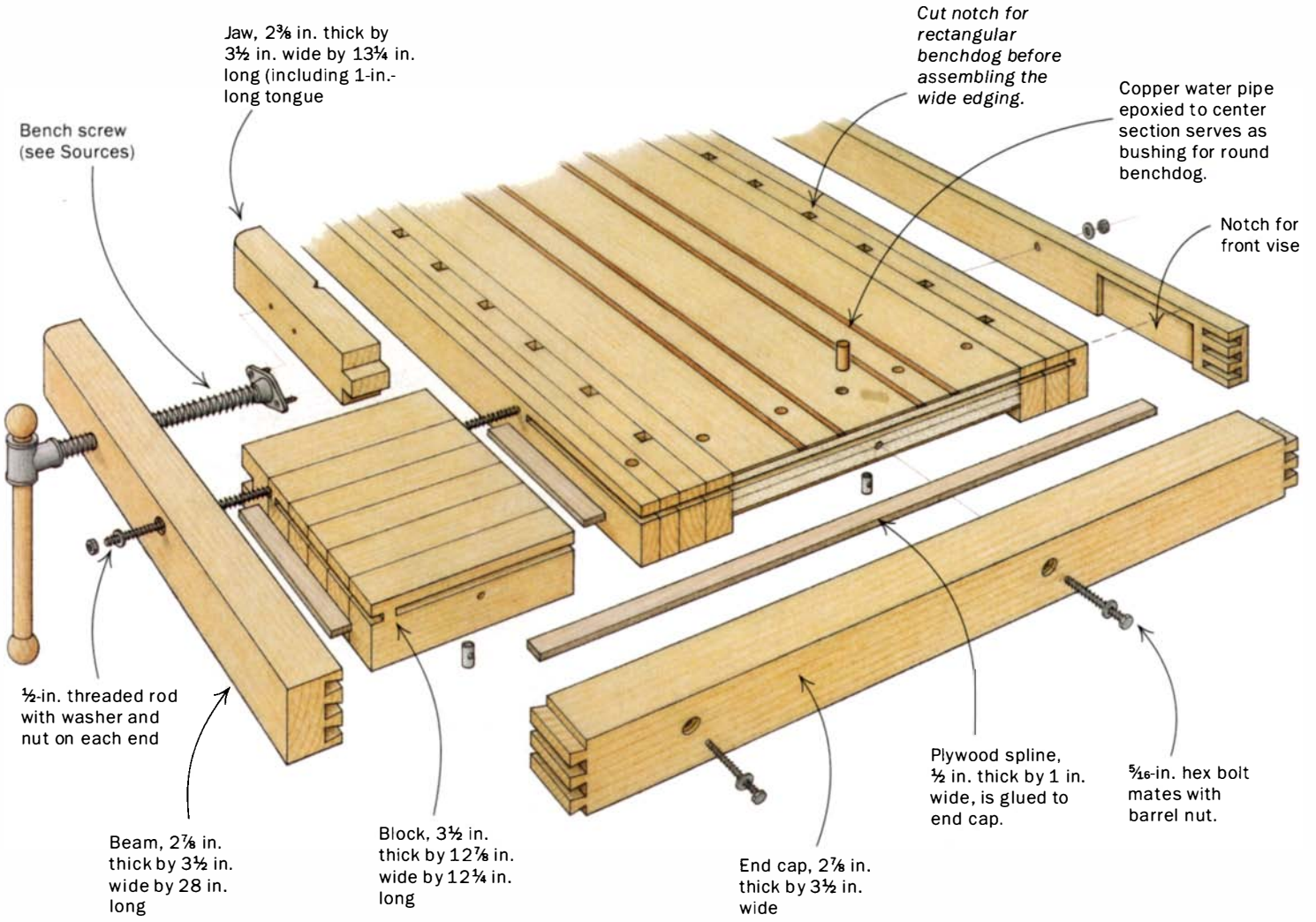


Shoulder vise and end cap



final length. Then to mark the location of the holes in the edgings, I clamped one piece to the center section. I made a center-point marker by driving a finish nail in the end of a long, ½-in.-dia. dowel. The nail must be centered in the end. I ran the dowel through the holes in the particleboard and used the nail to mark the center point of the hole in the edging. Once all of the points were marked, I drilled all of the holes through each piece of edging.

The threaded rod closest to the left end is longer than the other two rods because it extends all the way through the shoulder-vise parts. I used the same technique to mark the center points on the shoulder-vise parts.

I then face-glued the edgings and glued and clamped them to the front and back of the bench.

The space under the bench is put to use—Those big boxes in the base provide plenty of storage space. I placed eight drawers in the right-hand box. Plus, to take advantage of the space between the top of the box and the underside of the benchtop, I added a shallow through-drawer that extends from front to back, with a face on each end of the drawer, so it can be accessed from both sides of the workbench.

The left-hand box holds the parts of a project I'm building. The box includes a hinged shelf that pivots up and out of the way when it's not needed. The frame-and-panel doors keep dust from filling up the box.

Board jacks support long stock—The board jacks (one in front and one in back) are handy additions to the bench. When a board is clamped in the front, or shoulder, vise, the jack holds up the unsupported end. To accommodate boards of varying length, the jack is able to slide along the full length of the bench.

Power strips bring the juice—Because my bench is several feet from a wall, I added power strips along the front and back edges, making it easier to use power tools at the bench.

The bench has been serving me well for several years now. During that time, it has picked up plenty of scratches and dents, but it's as solid as ever. And I expect it's going to stay that way for many years to come. □

Dick McDonough lives in Flint, Mich., where he's a full-time finish carpenter and part-time woodworking teacher.

GLUING THICK VENEER TO A LARGE SURFACE

Large surfaces, like the top of my bench, are a challenge to veneer because it's difficult to get good clamping pressure over the entire surface. I have enough clamps for most jobs but nowhere near the number I'd need for my jumbo-sized benchtop. And new clamps don't come cheap.

The answer proved to be a set of 10 shop-made clamping cauls. And because I was able to use mostly scrapwood, the total cost was under $12—less than I'd pay for a single commercial clamp.

It's easy to make these clamps. The top "jaw" is a 24-in. length of 4¾-in.-wide medium-density fiberboard (MDF) screwed to a 24-in.-long 2x3. The bottom jaw is a 24-in.-long 2x4. To prevent the MDF surfaces from ending up glued to the veneer, add a healthy coat of paste wax to each one. The ends of the jaws accept a 9-in.-long, ⅜-in.-dia. threaded rod that is fitted with a washer and nut on both ends.

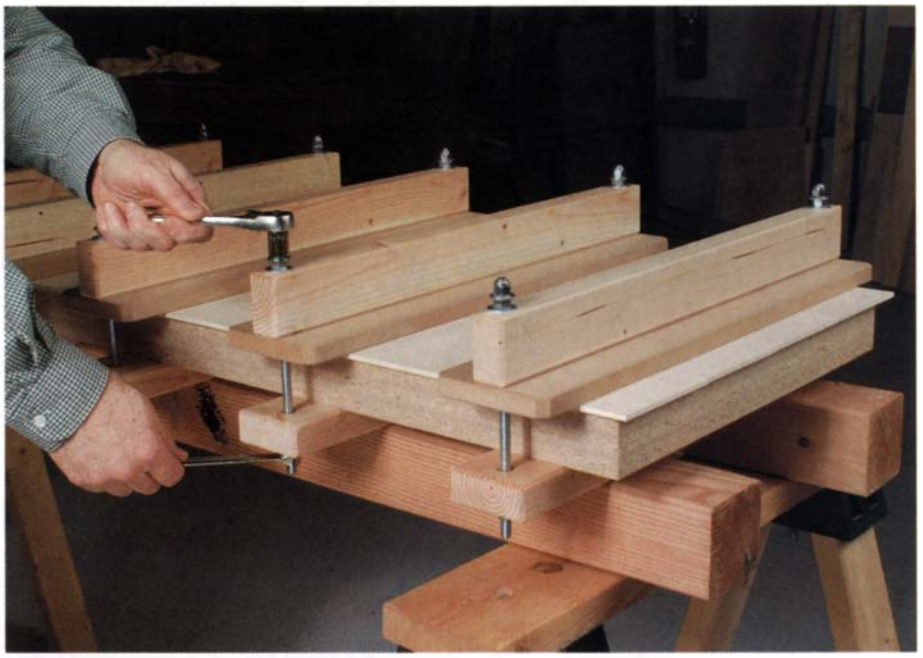
To begin veneering, spread a generous coat of yellow glue on the mating surfaces of the veneer and particleboard. A short painter's roller allows you to spread the glue easily and quickly. When working with a large surface area, it's important to have a good assembly game-plan worked out because yellow glue can start to tack up in less than 10 minutes. You need to get the glue down and the clamps tightened up without delay.

Place the veneer glue-side down on the particleboard. Butt the pieces together, but don't add glue to the edges or worry about a perfect joint quite yet. Let the veneer overhang the particleboard all around.

Then start clamping down the veneer. To help avoid lengthwise buckling, tighten the clamps at one end and work toward the other.

Both the top and bottom surfaces of the particleboard must be veneered; if only the top is veneered, it can create uneven stresses that can cause the top to cup.

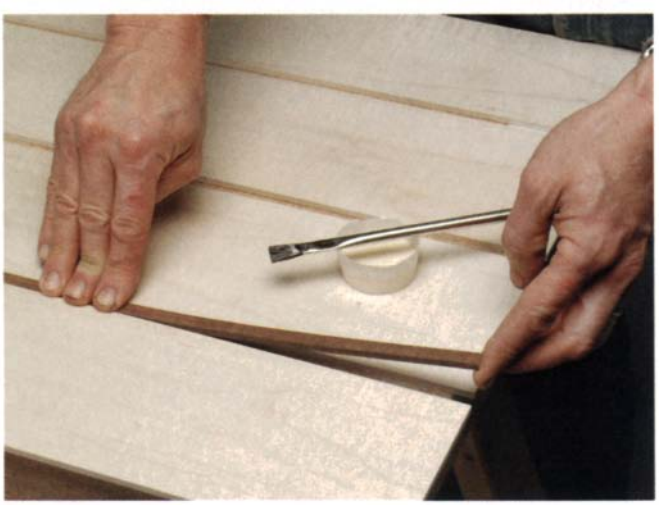
Once both sides have been veneered, true up the edge joints with a router equipped with a ⅜-in.-dia. straight bit. Use a long piece of stock as a straightedge and rout a 3/16-in.-deep groove centered along the entire length of each joint line. Then use the clamping cauls to glue ⅜-in.-wide by 3/16-in.-thick inlays into the grooves. This technique results in near-perfect edge joints.



Clamp the veneer to the particleboard with clamping cauls. *No need to have a small fortune in clamps to do this glue-up. Shopmade clamping cauls get the job done for pennies.*

INLAYS CONCEAL IMPERFECT VENEER JOINTS

Rout the joint. *To clean up any gaps, a router and edge guide are used to cut a shallow groove centered on the long joint.*



Add the inlay. *Thin strips of cherry fill in the grooves, producing tight joint lines along the full length of the bench.*

Photos, this page: Erika Marks

Double Mortise and Tenon Improves Joint Strength

Add structural integrity to delicate furniture parts

BY CRAIG VANDALL STEVENS

The mortise-and-tenon joint and its many variations have long been a preferred method for joining two pieces of wood at a right angle or close to it. One of my favorite versions is the double mortise and tenon. I use it to increase the strength of a joint on relatively small furniture parts, such as those on the free-standing room screen I built last year (see *FWW* #141, pp. 70-73). I knew the screen frame would be subject to some flexing in daily use, and I wanted to be certain that it would hold up to the stresses.

You'll often find the double mortise-and-tenon joint on chairs and window sashes—projects in which structural integrity on visually delicate pieces of wood is essential. By doubling the surface within a wood joint, you can greatly improve the joint's strength without increasing the size of its parts. What follows is an account of how I design and execute this joint. To cut the mortises I use a simple plywood jig and a plunge router equipped with an end-mill bit. For the tenons I use a combination of tablesaw, bandsaw and chisels. Others may prefer another technique, such as doing the job entirely by hand or using a mortiser or drill-press setup. Any way you choose to cut it, the benefits of employing a double mortise and tenon in your work are worth the extra effort required.

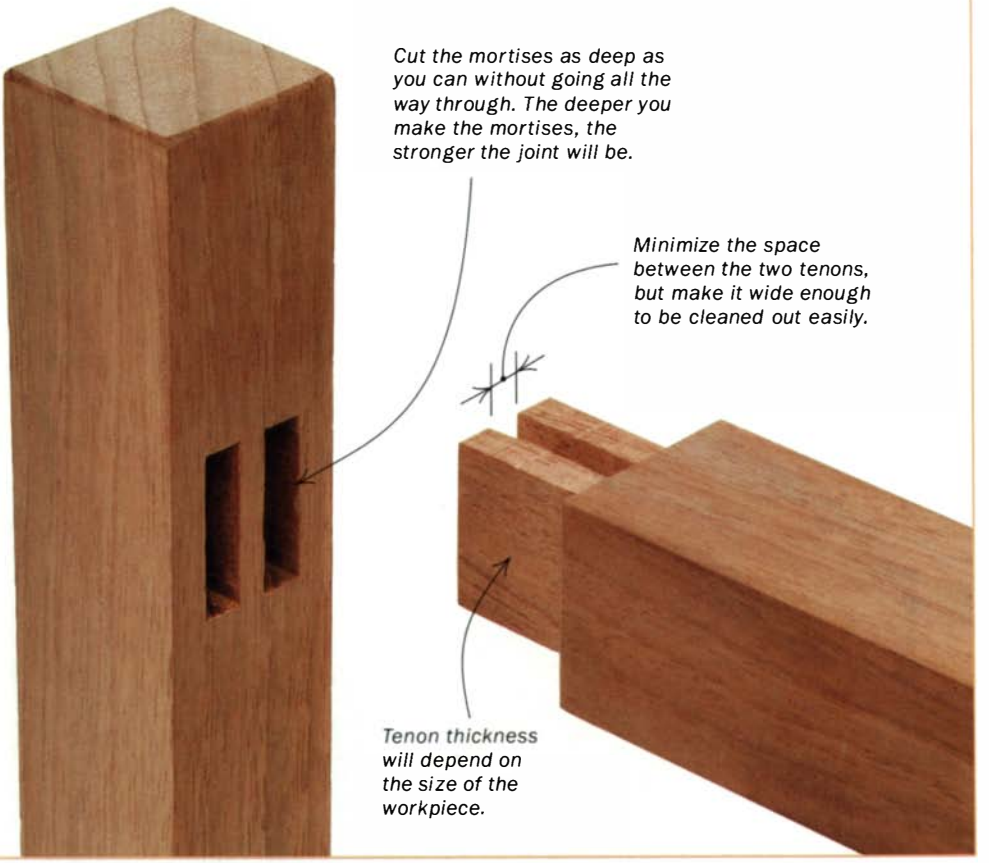
Prepare the stock with the end use in mind

I always start milling the lumber for a project several days ahead of time, then set it aside to stabilize. Initially, I flatten stock with a jointer and rip the individual pieces a bit oversized with the bandsaw. (I use a bandsaw rather than a tablesaw most of the

Photos, except where noted: Jonathan Binzen

DESIGNING WITH DOUBLE-TENON JOINERY

Use a double mortise-and-tenon joint when strength is an issue, as it is in the freestanding room screen shown above. By doubling the surface area of a glue joint, you can greatly improve its ability to hold together and to withstand stress.



time because it's a safer and quieter machine, and it produces less waste.) When the wood has stabilized, all of the pieces can be rejointed on two adjoining faces to flatten out any springback that has occurred and then brought down to their final thicknesses with a planer. It's always a good idea to mill some extra stock for setting up the joinery and to use as backups if you make a mistake along the way.

With furniture parts that will eventually be sized differently, I prefer to mill all of the stock to the same thickness, complete the joinery and then bring the thinner pieces down to their final sizes with the thickness planer or a handplane. For example, on a conventional table, you can mill the legs and rails first to an equal thickness, then cut your mortises and tenons. After that, send the rail pieces through the planer again to make them thinner and provide a step-back from the surface of the legs when they're joined together.

Think through the layout first—I lay out the joinery dimensions for the tenons first. The tenons need to be as long as possible to maintain a strong joint. At this stage, having in hand a good sketch of the joinery detail is especially helpful.

Estimate the amount that each face will be stepped down and then experiment with different tenon sizes until you have a layout that will be strong without creating any weak areas in the joint. I leave the space between the tenons at least a little wider than the narrow ⅛-in. chisel that I use to clean up that area. On the outside of both tenons, I'll often leave only a narrow shoulder, about ⅛ in. wide, which allows some leeway in deciding the thickness and spacing of the tenons.

Mark and cut the joinery, starting with the mortises

After layout, transfer the width and length of the tenons to the mortise workpieces using a marking knife. If you have to cut more than a few mortises, make a story

Tools for multiple marking. *A story stick and a marking knife add accuracy and reliability to a repetitive process.*

Photos, this page: Stephen Webster (top left); Michael Pekovich (top right)

A SIMPLE JIG FOR ROUTING MORTISES

This jig has an Important feature. *Adjustable stops on this mortising jig limit the distance the router can travel and keep the length of all of the mortises consistent.*

Steady as she goes. *The router base sits firmly on the top of this jig as the router fence indexes the location of the mortise.*

Help with the handwork. *A thick block of wood clamped firmly to the workpiece serves as a guide to chisel the ends of the mortises true and square.*

stick from a straight scrap of wood and tack a cleat onto one end. Hook the cleat over the appropriate end of each workpiece, then transfer the mortise locations with the marking knife.

As I mentioned before, I lay out the tenons first, but when it comes time to cut the joints, the mortises come before the tenons. It's important that the two mortises line up with each other and be cut squarely. To cut mortises, I use a simple plywood-jig design based on one that Tage Frid used (see *FWW* #82, pp. 52-55).

The jig holds the workpiece in place while a four-flute center-cutting end mill mounted in a plunge router accurately cuts the mortise. The router fence simply rides against the outside of the jig. Clamp stop blocks to the jig to create mortises of identical length, and use a chisel to square up the ends of the mortises.

To fit a double mortise-and-tenon joint successfully, focus on properly fitting the outside cheeks of the tenons before dealing with the inner cheeks. Think of the first setup as fitting an extrathick tenon into an extrawide mortise. Chop away the wood separating the two mortises on one of the practice pieces and use this practice mortise later when you're setting up the tablesaw to cut the tenons.

Two tenons are not twice the work—A tablesaw will cut the two tenons very accurately, and you can use a test piece with the tenons marked and drawn on the end of it to set up the cut.

A sliding cutoff box really helps achieve consistent results in crosscut work, and a shoulder cut along the cheeks is a good place to start. Raise the blade so that it's slightly below the pencil line representing the tenon cheek. A marking-knife tick on the side of the workpiece indicates the length of the tenon, based on the depth of the mortise. The length of the tenon should be 1/16 in. or so shorter than the depth of the mortise to ensure a snug fit and to allow room for excess glue that gets pushed into the mortise during assembly.

A stop block keeps the shoulder cut consistent as you rotate the workpiece. After you cut the first two cheek shoulders, the blade height will probably need to be changed to cut the other two sides. And here's another secret: Before cutting these two adjacent faces, put a piece of masking tape on the end of the stop block to bump

away the workpiece slightly. This will keep the sawblade from nicking the previously cut shoulders.

With all four shoulders cut, clamp a straight piece of wood to the tablesaw fence. This auxiliary fence should be around 5 in. high or higher; check it with a square to ensure that it is 90° to the saw table. With this setup, one hand slides along the top of the auxiliary fence, holding the workpiece firmly in position, while the other hand helps push the workpiece through the cut. Both hands are kept safely away from the blade. Set up a clean, sharp, ripping blade to cut just below the shoulder cuts. Adjust the fence to cut the practice workpiece a little proud of the outside of the tenons.

When you use this method, the waste piece falls away from the action rather than being trapped against the fence. Use a steady feed rate to move the workpiece through the cut, then rotate and cut the opposite side. Ideally, with the first pass, the tenon will be too fat to fit into the practice mortise you prepared earlier. Readjust the fence and repeat the cuts until the practice pieces go together with no sloppiness, using only hand pressure.

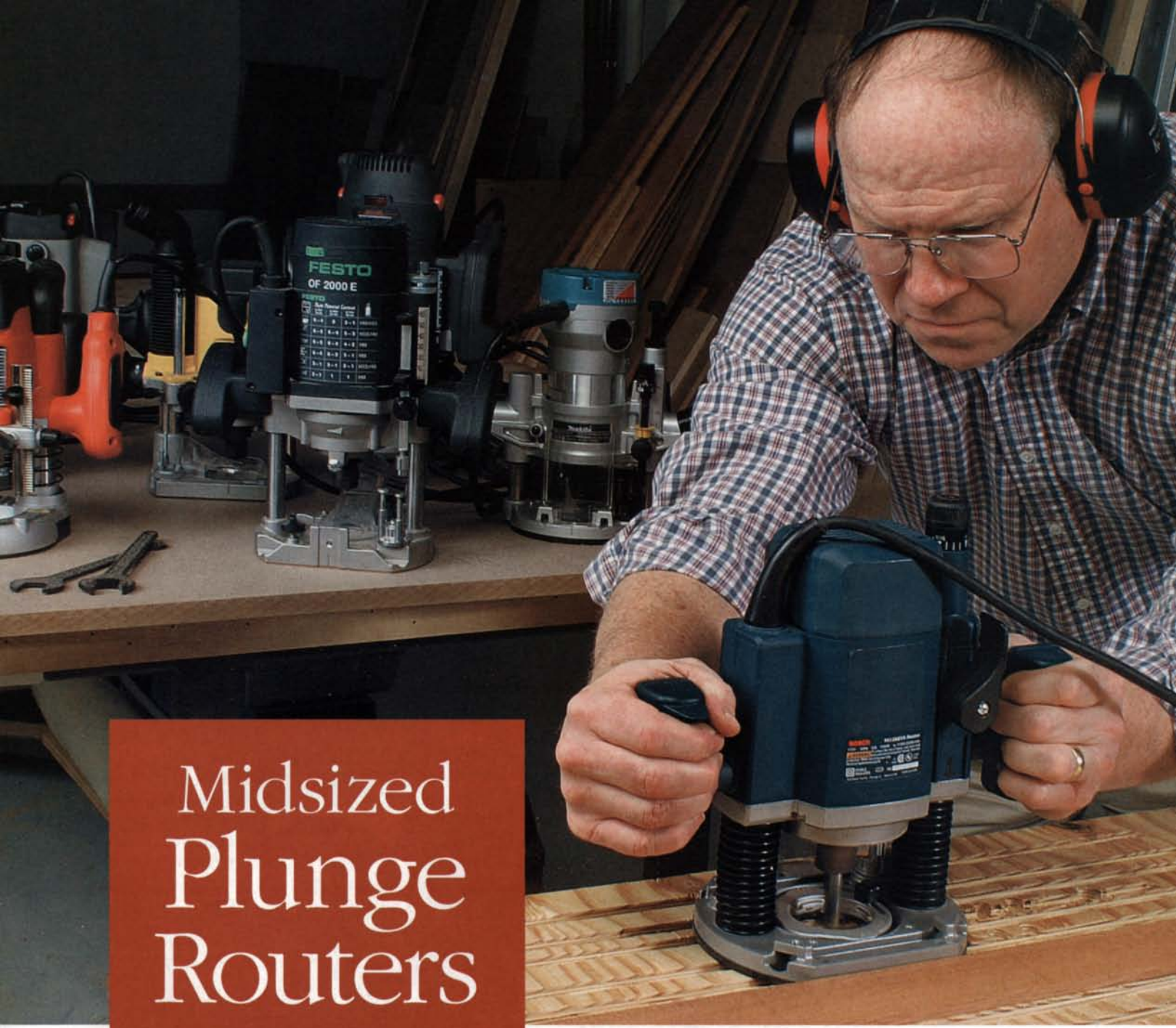
By fitting the outer cheeks first, there's no guessing whether it's the outer or inner cheeks that are preventing a nice fit. After you cut all the outer tenon cheeks, you can reset the fence to cut away the space between the double tenons. Sneak up on the final fit, readjusting the fence until the tenons fit nicely into a pair of mortises.

The bandsaw makes short work of cutting the tenons to their proper width. Again, use the layout marks on your set-up pieces to determine the location of the bandsaw fence, and clamp a stop block to the fence to prevent the blade from cutting into the shoulders. Start a little wide, bumping the fence until the tenon is the same width as the squared-off mortises. Use a chisel to clean up the corners of the shoulders, and take care to avoid damaging the adjacent shoulders. You'll need a narrow chisel to fit between the tenons and pare away the waste. To make the final assembly go more smoothly, you can use a file or a knife to cut a slight chamfer on the ends of the tenons. □

Craig Vandall Stevens studied woodworking at the College of the Redwoods. Today he makes custom furniture in Sunbury, Ohio.

A higher fence for safety and stability. *The extra height of the auxiliary fence provides a firm surface to press the workpiece against and helps keep hands away from the blade. Using scraps for testing the fit, make sure the two outside cheeks fit snugly into a mortise before proceeding with the cuts for the inside cheeks.*

Almost there. *Tweaking the final fit requires frequent checks with the set-up scraps before you can complete the final cuts on the workpieces. A snugly fit joint will go together smoothly with moderate hand pressure.*



Midsized Plunge Routers

A hands-on review of eight routers in the 2-hp class

BY TOM BEGNAL

Some woodworkers run a router every day, using bits nearly as big as a fist and hogging out enough material in a morning to cover a shop floor in thick sawdust. Others rarely use a router, perhaps once a month or less, and use it only to do light-duty work. Then there are those many woodworkers, me included, whose needs fall somewhere between those extremes.

We middle-of-the-road woodworkers are likely to use a router once or twice a week. Our routers are used for a little of everything—from shaping profiles to cutting joinery. So choosing from among the many machines on the market can be daunting.

A router on the low end of the horsepower scale isn't an answer, because it's going to struggle when called on to make occasional heavy cuts. Granted, you can solve that by making a series of lighter cuts, but that can quickly become a nuisance, especially when there's a lot of machining to do.

On the other hand, one of the big 3½-hp routers can handle almost any task. But those wide-bodies are a bit awkward to use when you're simply cutting a ⅛-in.-radius roundover on a small tabletop. Plus, your wallet usually has to open a lot wider when it comes time to buy one.

That's why midsized plunge routers, those in the 2-hp class, appeal to me. They have enough muscle to tackle most tasks, yet they're relatively easy to handle. Unlike a fixed-base router, a plunge router lets you lower the spinning bit straight down into a workpiece. That makes it a good choice for those who cut a lot of stopped grooves, dadoes and mortises.

So with that in mind, I gathered all eight of the midsized plunge routers currently available: the Black & Decker RP400, Bosch 1613AEVS, DeWalt DW621, Festool (formerly Festo) OF 2000 E-Plus, Makita RP1101, Porter-Cable 7529, Craftsman 27510 and Skil 1845-02. And with the routers side by side in the *Fine Woodworking* shop, I was able to give each one a close look and a test drive.

Several of these routers are new in one form or another. For example, the Makita is new to the plunge-router market. Another, the Bosch 1613AEVS, is just now replacing an earlier model, the 1613EVS (it has several new features, including a larger base opening and an upgraded depth adjuster). And Festool, a longtime German tool manufacturer, has recently started to market its plunge router, along with a number of other products, to the U.S. market.

By the way, I had some doubts about including the Festool. With an 1,800-watt motor, it has 15 amps and about 2½ hp, putting it in a class by itself. And there's nothing midrange about the $636 price tag. But because the router is new to the U.S. market, I thought this was a good opportunity to check it out.

One other point. Plunge routers sometimes are used in router tables. They work in a table but rarely better than a fixed-base router. A plunge router is designed to plunge down into a workpiece, not up into one. So because a plunge router isn't the best choice for a router table, I didn't use any of the routers in one.

Taking a test drive

I gave each router a thorough going-over, checking to see how fussy it was to turn the machine on and off, to change router bits and to set the plunge depth. I looked at how much finger contortion it took to set the switch locks and the plunge-lock mechanisms. I also wanted to see how well the multiple-stop systems worked. I checked the handles for comfort, then measured each router for noise, vibration and collet runout. And after all of that, I tested each router by running it through a sheet of plywood.

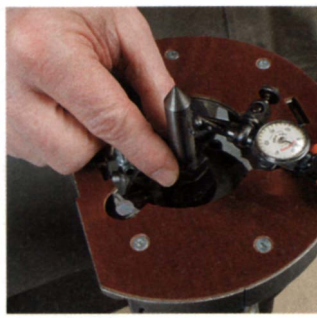
It's important to note, though, that a number of the evaluations are purely subjective. What feels right to me, based on the size, shape and flexibility of my hands, might not seem quite as good to you. So before going out and buying one of these routers, it makes sense to get your own hands on it and try the various controls.

Turning on the router shouldn't be a turn-off

Most routers in this group are turned on simply by squeezing a trigger switch built into one of the handles. The trigger switches are easy to work. But as a precaution, the DeWalt and Porter-Cable tools require you to first depress a safety switch before the trigger can be squeezed. Releasing the trigger shuts off the machine.

A safety switch makes sense, but it should be easy to use. On the DeWalt, the safety switch is pressed with the thumb, then the trig-

Noise test. *To record the sound level of each router, a decibel meter was mounted in a tripod and placed in about the same height your ears would be if you were using the router.*



Runout check. *A dial indicator measured runout on each of the routers.*

Good vibrations. *With the router running, a dial indicator was used to measure the vibration at the handles.*

Photos, except where noted: Erika Marks; facing page: Michael Pekovich

SWITCH LOCKS

A finger-friendly switch lock. *The Black & Decker switch lock has a big button that the thumb easily finds.*

No pain, no gain. *It takes a mighty push from the end of a forefinger to engage the switch lock on the Craftsman router.*

ger must be squeezed to fire up the router. I found the procedure slightly awkward. To start the Porter-Cable, you must push down the safety switch with your forefinger, then squeeze the trigger. Perhaps my hands are clumsy, but I found the action annoying.

The two machines that don't employ a trigger switch are the Makita, which has a top-mounted toggle switch, and the Festool, which has a switch that is turned on and off with a flick of the thumb. When it came to turning the Makita on or off, I was not enthusiastic about having to remove one hand from the router to reach the switch on the top. Granted, this is less of concern with a plunge router, because the bit should be above the workpiece at both the beginning and end of the cut, but I always feel more comfortable with both of my hands on a router when it's running.

A switch lock is handy—When making a lengthy cut, I like to lock the on/off switch in the on position. Because the Makita and Festool have toggle switches, they stay on until you shut them off. But the other routers all have some means to lock the spring-loaded switch in the on position.

The Black & Decker, Bosch and Skil use the same system. To lock on these routers, squeeze the trigger and press your thumb against a button on the inside of the handle. The Black & Decker

BLACK & DECKER RP400

(800) 544-6986

This machine features comfortable handles, a lock-on switch that's effortless and a bargain-basement price. But it accepts only ¼-in.-shank bits and has no micro-adjust or multiple-stop systems. Consider it if you run a router only occasionally.

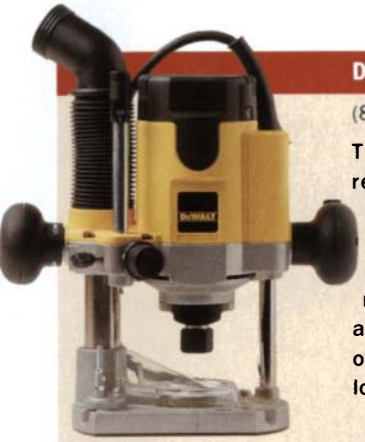
Street price	$99
Amperage	10
Horsepower	2
Collet size	¼ in.
Dust port	Yes
Size of opening in base (min.)	2⅞ in.
Maximum plunge depth	2¼ in.
Runout	0.0030 in.
No-load noise level	92 dB
Vibration rating at handles	Good

BOSCH 1613AEVS

(877) 267-2499

The Bosch has an easy-to-activate on/off switch, a switch lock that's almost effortless, a nice micro-adjustment knob and a simple multiple-stop system. Optional collets are available for ⅜-in.- and 8mm-shank bits. The machine did relatively well in the noise and vibration tests.

Street price	$199.99
Amperage	12
Horsepower	2
Collet size	¼ in., ½ in. (⅜ in. and 8mm optional)
Dust port	Yes
Size of opening in base (min.)	2 in.
Maximum plunge depth	2⅜ in.
Runout	0.0022 in.
No-load noise level	90 dB
Vibration rating at handles	Very good



DEWALT DW621

(800) 433-9258

The DeWalt has a plunge lock that releases with a simple turn of the wrist. The machine's depth-of-cut adjustment is better than that on most of the other routers. The micro-adjustment knob works well, and the router had the least amount of collet runout. However, the switch lock is awkward to use.

Street price	$199.99
Amperage	10
Horsepower	2
Collet size	¼ in., ½ in.
Dust port	Yes
Size of opening in base (min.)	2⅜ in.
Maximum plunge depth	2⅛ in.
Runout	0.0014 in.
No-load noise level	95 dB
Vibration rating at handles	Very good

FESTOOL OF 2000 E-PLUS

(888) 463-3786

The Festool (formerly Festo) has the biggest horsepower motor among the bunch and the best depth gauge. It has a hefty feel, with lots of metal, but it's noisy. The router comes with a three-year warranty and a hefty price tag. It is available in 220 volt only.

Street price	$636
Amperage	15
Horsepower	2.41
Collet size	8mm, ¼ in., ½ in. (10mm and 12mm optional)
Dust port	Yes
Size of opening in base (min.)	2⅞ in.
Maximum plunge depth	2¼ in.
Runout	0.0035 in.
No-load noise level	98 dB
Vibration rating at handles	Good

switch lock engaged almost effortlessly, and the Bosch worked almost as easily. But to push the recessed button on the Skil, my thumb had to do some uncomfortable gymnastics.

The Craftsman also was a challenge to lock. You're supposed to squeeze the trigger and then depress the locking button on the front of the handle. But it was a chore to push the locking button all the way—and downright painful on my forefinger.

The DeWalt and Porter-Cable switch locks worked okay, although it took some practice and concentration on my part to get the locking procedure down pat.

Bit changes made easy

The Black & Decker, Bosch, DeWalt, Festool, Porter-Cable and Skil all use a spring-loaded spindle-lock system to change bits. One hand engages the spindle lock, and the other hand turns the collet nut with a wrench. The spindle lock immediately disengages when your hand is removed from the lock. All of the routers using this system worked just fine.

But I liked the Craftsman system a bit more. Pushing a button on the housing locks the spindle, allowing you to use both hands: one to hold the router securely and one to turn the wrench.

The Makita employs a two-wrench system: One anchors the spindle, and the other turns the collet. Over the years I've changed a lot of bits using this method, and I've never found it user-friendly. So I was pleased to discover that the Makita worked rather well because there's plenty of access room on the side of the housing.

Setting the depth of cut shouldn't be a chore

Each of these routers can be set to a predetermined cutting depth. Mounted to the router, behind a sliding shaft, is a scale with graduations in inches or millimeters, or both. Using the scale as a guide, the shaft is adjusted to establish the depth of cut, then the shaft is locked in place. The end of the shaft butts against a stop in

SPINDLE LOCKS

Lock and load. *Most of the routers use a spring-loaded spindle lock, which makes bit-changing a one-wrench job.*

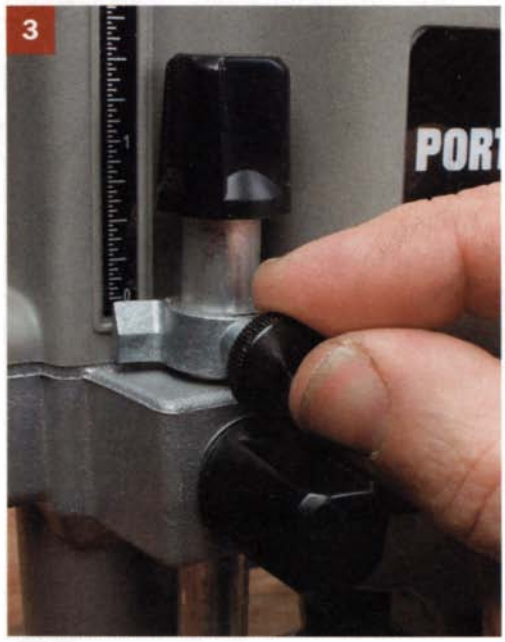
Two hands are better than one. *With the Craftsman machine, pushing a button on the housing locks the collet in place. That way, one hand can hold the router while the other turns the collet with a wrench.*

FOUR STEPS TO SETTING THE DEPTH OF CUT

Introduce the bit to the workpiece. *With the bit installed in the router, lower the housing until the bit just touches the workpiece. Secure the housing with the plunge lock.*

Lower the shaft. *Slide down the shaft until it butts against the lowest stop on the turret, then tighten the knob to lock the shaft.*

Zero-out the tab. *The shaft includes a tab that can slide up and down. After sliding the tab to the zero mark on the scale, turn the knob to secure the tab.*



Set the depth of cut. *Loosen the shaft knob and raise the shaft until the tab aligns with the desired depth of cut on the scale. Tighten the shaft in place. Now release the plunge lock, start the router and lower the housing to start cutting. When the shaft butts against the stop, you'll be at the exact depth you want.*

the base of the router, preventing the housing from lowering beyond the set depth.

To make it easier to set the depth of cut, the Black & Decker, Bosch, Festool, Makita, Porter-Cable (see above) and Craftsman routers are equipped with a tab that slides up and down on the shaft to "zero out" the shaft. The DeWalt employs a knob to do the same thing. The Skil has no such component.

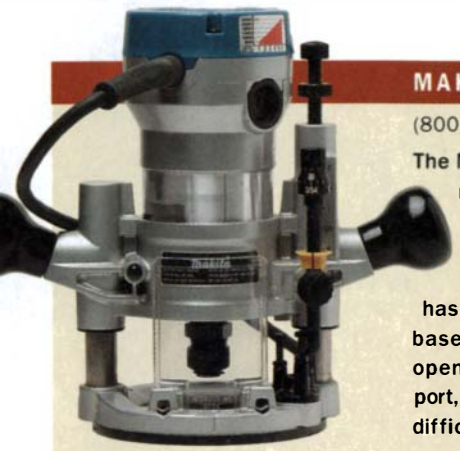
None of these adjustment systems can be mistaken for precision instruments, but the Festool is an improvement over the others, with machined parts that fit together with a minimum of play. One caveat, though: The Festool scale reads in millimeters only.

Except for the Black & Decker, each of these routers has a micro-adjustment feature. This system complements the depth adjustments, allowing you to fine-tune the setting. Of the bunch, the Bosch micro-adjust worked most effectively, with the Festool and DeWalt also featuring friendly systems. They're the only routers that immediately provide micro-adjustment once the housing has been plunged. The others required a lot of knob-turning before any fine adjustment could begin.

Plunge lock should be easy to use and within reach—Except for the DeWalt and Craftsman machines, the routers have a spring-loaded lever that locks the plunge mechanism. Press the lever with your thumb, then plunge the router into the work. Remove your thumb, and the lever snaps back into position to relock the housing. To fully lock the housing, the back of the lever needs an extra push with your thumb.

Among the routers with a locking lever, I favored the Makita. It

Photos, this page: Michael Pekovich



MAKITA RP1101

(800) 462-5482

The Makita has an easy-to-release plunge lock, the lowest noise level (tied with Porter-Cable) and lots of metal. However, it has a small opening in the base (a base with a larger opening is optional), no dust port, and the depth gauge is difficult to read.

Street price	$259 (estimate at press time)
Amperage	11
Horsepower	2¼
Collet size	¼ in., ½ in.
Dust port	No
Size of opening in base (min.)	1¼ in., 2½ in. (optional)
Maximum plunge depth	2¼ in.
Runout	0.0015 in.
No-load noise level	91 dB
Vibration rating at handles	Good

PORTER-CABLE 7529

(800) 368-1487

A large opening in the Porter-Cable's base makes for easier bit changes. It has a second on/off switch on top of the housing, low vibration and the lowest noise level (tied with Makita). On the downside, runout is higher than most of the other routers used, and the on/off switch takes some getting used to.

Street price	$205
Amperage	12
Horsepower	2
Collet size	¼ in., ⅜ in. (optional) and ½ in.
Dust port	Yes
Size of opening in base (min.)	3½ in.
Maximum plunge depth	2½ in.
Runout	0.0050 in.
No-load noise level	91 dB
Vibration rating at handles	Very good

was easy to keep my hands in position on the handles while reaching with my thumb to activate the lever. Close behind was the Bosch, which was almost as easy to use. The Porter-Cable worked okay, but I had to reposition my hand slightly to reach the lever.

The DeWalt system gives your thumbs a rest because the lock is built into one of the handles. Twist the handle about one-eighth turn one way, and it unlocks; twist the other way, and it locks.

The Craftsman takes an opposite approach. The plunge mechanism is normally in the unlocked position. After plunging the router, squeeze a trigger on one of the handles to lock the housing. Push a button on the same handle with your thumb, and the lock is released. It's the simplest to use, and it works very well.

All in all, I'd rate the DeWalt plunge lock as a slight favorite, with the Makita and Craftsman locks close behind. The other locking mechanisms worked without any big problems; they just required more reach to get them to work.

By the way, some plunge routers just won't plunge smoothly. The housing tends to stick during the plunge. Each of these routers had some stickiness but not enough to be a problem.

A multiple-stop system can be a time-saver

When making a deep plunge cut, it's often necessary to make the cut in several intermediate steps. With the exception of the Black & Decker and the Skil, these routers have a multiple-stop device that simplifies the process.

The stop systems on the DeWalt, Festool, Makita and Craftsman incorporate a rotating turret. The turret has either three or four steps, depending on the router, and the height of the steps is adjustable. The Bosch also has a turret, but with eight fixed steps, arranged like a circular staircase, with each step providing a ⅛-in. change in the depth of cut.

The Porter-Cable, using a somewhat different approach, has

PLUNGE LOCKS

It takes little effort to reach the plunge lock on the Makita. *That means your hand doesn't have to shift position or leave the handle, so you always have maximum control of the router.*

Plunge lock with a twist. *The DeWalt lets you tighten or release the plunge mechanism simply by twisting the handle a fraction of a turn.*

CRAFTSMAN 27510

(800) 697-3277

The on/off switch and plunge lock score high marks, and a collet lock simplifies bit changes. But the router has uncomfortable handles and a challenging switch lock, no variable speed and no dust port.

Street price	$199.99
Amperage	12
Horsepower	2
Collet size	¼ in., ½ in.
Dust port	No
Size of opening in base (min.)	2½ in.
Maximum plunge depth	2¼ in.
Runout	0.0053 in.
No-load noise level	95 dB
Vibration rating at handles	Fair

SKIL 1845-02

(877) 754-5999

The Skil has an easy-to-activate on/off switch and a lightweight body. However, it accepts only ¼-in.-shank bits, has no multiple-stop system and is noisy. Consider it only if you run a router occasionally.

Street price	$129
Amperage	10
Horsepower	2
Collet size	¼ in.
Dust port	No
Size of opening in base (min.)	2¾ in.
Maximum plunge depth	2 in.
Runout	0.0020 in.
No-load noise level	97 dB
Vibration rating at handles	Good

three adjustable steps mounted in the base of the router. The steps don't rotate on a turret; instead, the shaft rotates so that it can butt against each stop. It's a pretty neat way to set multiple stops, because you can use your thumb to turn the shaft while your hand remains on the handle. That way you always keep both hands on the router.

In general, all of these stop systems worked fine, although the Bosch was the simplest to use. With the Bosch, you must be able to live with the stops being in ⅛-in. increments only. But for most jobs that's not likely to be a problem.

Ergonomics and runout: important considerations

Let's face it. All routers vibrate, make a lot of noise and have a certain degree of runout (that's the amount the bit wobbles as it spins). I compared all eight routers to see which were more comfortable to use and which made the most noise. I also compared the runout.

Getting a grip—A comfortable grip on a router often translates into safer and easier cutting. But most routers don't feel all that comfortable in my mitts. So it's always a nice surprise when a router feels just right when I grip the handles.

The most comfortable router to hold was the Black & Decker, with the Skil a close second. Both tools have a handle shape that conforms to my hand. So I could wrap five fingers around each handle, holding the handles comfortably, as I would an automobile steering wheel. The DeWalt, although differently shaped, also felt pretty good.

Fine-tune the depth of cut by turning a knob or dial. The Bosch, DeWalt and Festool allow micro-adjustments immediately after the housing has been plunged.

Checking handle vibration—Vibration at the handle can quickly make a router uncomfortable to use. So we devised a somewhat unconventional method, using a dial indicator, to check the routers for the shakes.

Our rock-solid 8-in. jointer served as the work surface for the test. To allow the router to vibrate easily, a thick foam pad was placed on the jointer and a steel disc was added to the top of the pad.

To run the test, each router was placed on the disc and turned on. The amount of movement was measured with a dial indicator. The test showed that all of the routers ran pretty smoothly, with little vibration at the handles. So I ended up rating them as fair, good and very good (see the specific charts).

Measuring noise levels—Using a decibel (dB) meter, each router was checked for noise at about ear level, a point 24 in. above and 12 in. in front of the machine. The Bosch, Makita and Porter-Cable all fared well here, with the Festool and Skil recording the highest levels. Keep in mind that

the decibel level is logarithmic, so an increase of just 5 decibels represents a doubling of the noise level.

Measuring runout—A dial indicator was used to measure the runout at a point 1 in. above the collet using a test pin. All of the routers did well here, although the DeWalt and Makita stood out, with runouts of only 0.0014 in. and 0.0015 in., respectively.

Making sawdust

To get a sense of how well these routers worked, I used a ½-in.-dia. bit to make ¼-in.-deep plowing cut in fir plywood. On the Black & Decker and Skil tools, I used a ¼-in.-shank bit (the only size they accept). The other routers were equipped with a ½-in.-shank bit. The procedure was simple but well short of scientific, making the results entirely subjective.

With the router butting against a straightedge and the speed setting at its maximum, I plunged the bit into the plywood, then cut about a 3-ft.-long groove before raising the bit to complete the cut. I did this three times with each router, doing my best to maintain the same feed rate for all of the cuts.

After all of the dust had settled, I was pleased to find that not one of the routers had bogged down. Granted, this wasn't an extreme test, but it gave me a sense that these midsized machines would handle most of my cutting needs without crying "uncle" right from the start.

Choosing a favorite

All of these routers did well in at least one category. They're tough little machines, and they all did what they were supposed to do, although not always as easily as I'd have liked.

If price is a consideration, and if you need a plunge router for only a few hours of service each month, the Black & Decker or Skil just might serve your needs. Remember, though, they accept only ¼-in.-shank bits. And they don't have multiple-stop systems. Of the two, I'd lean toward the Black & Decker. It doesn't have a micro-adjustment knob. But it has a dust port and better depth-of-cut adjustment. And it ran quieter.

I particularly liked the on/off switch on the Craftsman router. And the plunge lock and collet-lock systems worked well. But compared to most of the other routers, it was uncomfortable to hold, and engaging the switch lock was a big-time pain. Also, the router lacks a dust port and variable-speed feature.

The Festool, Makita and Porter-Cable tested okay. If my choices were limited to these three, I'd go with the Porter-Cable.

The Festool is a rugged-looking tool that leads this group in both amperage and horsepower. And it offers the best warranty—three-year parts and labor if their warranty card is mailed back to them. (One year is the standard among the others.) But for me, it was not an ergonomic all-star. And with a price in the stratosphere, you'd want to be convinced it could pay for itself in the long run.

The Makita is a nicely made machine that ran pretty quietly and had little runout. But the depth-of-cut adjustment was difficult to read with any accuracy. And the opening in the base is too small to accept even a ⅜-in. bearing-guided rabbeting bit, although you can order a bigger base from Makita.

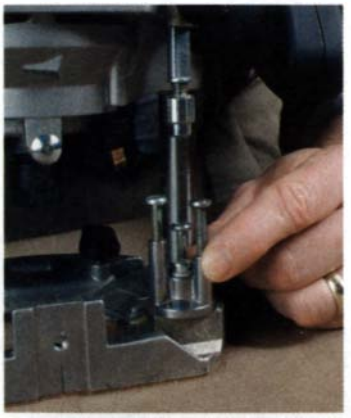
The Porter-Cable is the only router here with an electric brake, a device that automatically brings the motor to a quick stop. And it scored best on the vibration test. The generously sized opening on the base is the biggest of the group. However, after the housing had been plunged, I didn't relish all of the knob-turning that it took to reach the point where the micro-adjustment begins.

The DeWalt is an excellent machine, scoring high in many of the tests, so it's a close second to my top choice. It has one of the better depth-of-cut adjustments, and the plunge lock is, I think, the best of the bunch.

But I'd say the Bosch stands out as the one plunge router that best meets my overall needs. While not at the top in every test, it always scored high. I especially liked the micro-adjustment knob and multiple-stop system. Also, the Bosch was relatively quiet, a big plus for me. It felt right at home in my hands as I made each of the test cuts with little effort. □

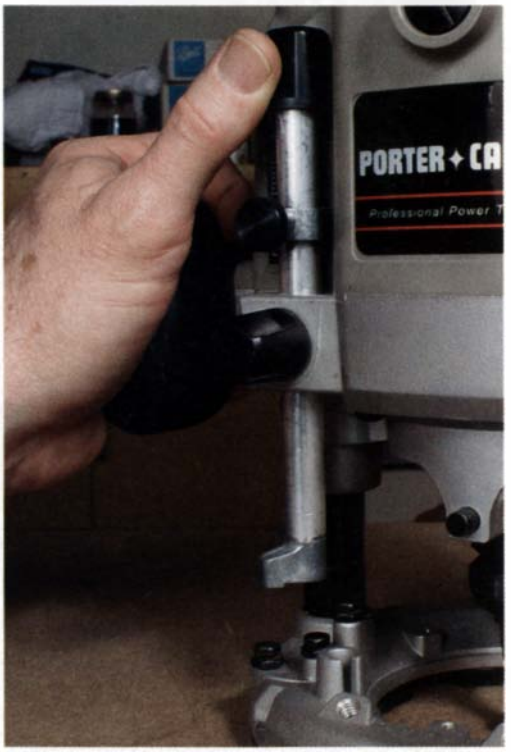
Tom Begnal is an associate editor.

MULTIPLE STOPS



Three-step turret stop. *The Festool has a turret stop with three adjustable steps.*

Stepped stops. *The Bosch turret, with eight equally spaced steps, works with a minimum of fuss.*

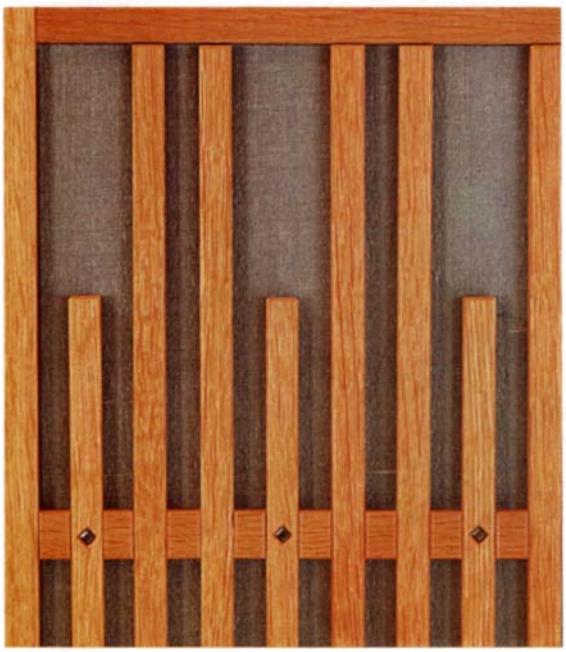


All thumbs. *Instead of a turning a turret to establish a new step, the Porter-Cable lets you change steps by rotating the top of the depth-gauge shaft with your thumb, so your hand stays on the handle.*

Extraordinary Built-ins

Case-good construction techniques and a furniture maker's sensibility can take "cabineture" to new heights

BY ROSS DAY



A unifying theme. *Latticework is used on all of the cabinet doors. Some intersecting members are pinned using brass, colored an antique brown.*

A few years ago, two women walked into my shop unannounced. One of them was the daughter of a client; the other was her interior designer. They were familiar with my furniture and asked whether I would consider making built-in cabinets for them. I said I was not doing cabinets anymore, just furniture. But the women said they didn't want cabinets in the traditional sense. They were looking for built-ins that looked like high-quality furniture.

My curiosity was piqued, because I had never done anything like this before. Case-good construction and furniture making really are two separate disciplines. Built-in cabinets generally are utilitarian in nature. To keep costs under control, the choice of materials and construction follow certain predictable paths. For one, doors often are attached with large European-style hinges, and drawers are usually set on metal slides, all of which make for easier adjustment and faster construction. Cabinets usually are attached to walls with screws, and moldings, if any, are nailed in place.

Fine furniture requires more handwork, such as hand-cut dovetail joints, which are time-consuming and costly if done on a large scale. But furniture presents the builder (and client) with many more options. The choices of materials are endless, and the design possibilities vast. These are all the reasons why I got into furniture making and why I took on this commission.

Designing a bedroom from scratch

My mission was to create a refuge—a place to relax, reflect and reenergize. The homeowners are both avid readers and art collectors and demanded lots of storage and display space. Their wish list included an entertainment/display center, a corner cabinet, three sliding door screens, three large wardrobes, two bookcases and even some freestanding furniture: a platform bed and two nightstands. Aesthetically, the clients were after what they called a "contemporary Asian feeling."

I looked for a traditional and historical link that I could update and found it in a book on Japanese architecture. I was intrigued by a style of fence and gate that utilized a latticework pattern with decorative nails at the joints. I sketched out various ideas and came up with a scaled-down version of this latticework pattern, which could be repeated throughout the room. The clients liked the idea. The latticework, which is applied to all of the door panels, became the focal point of many of the pieces, both large and small and helped tie them all together visually.

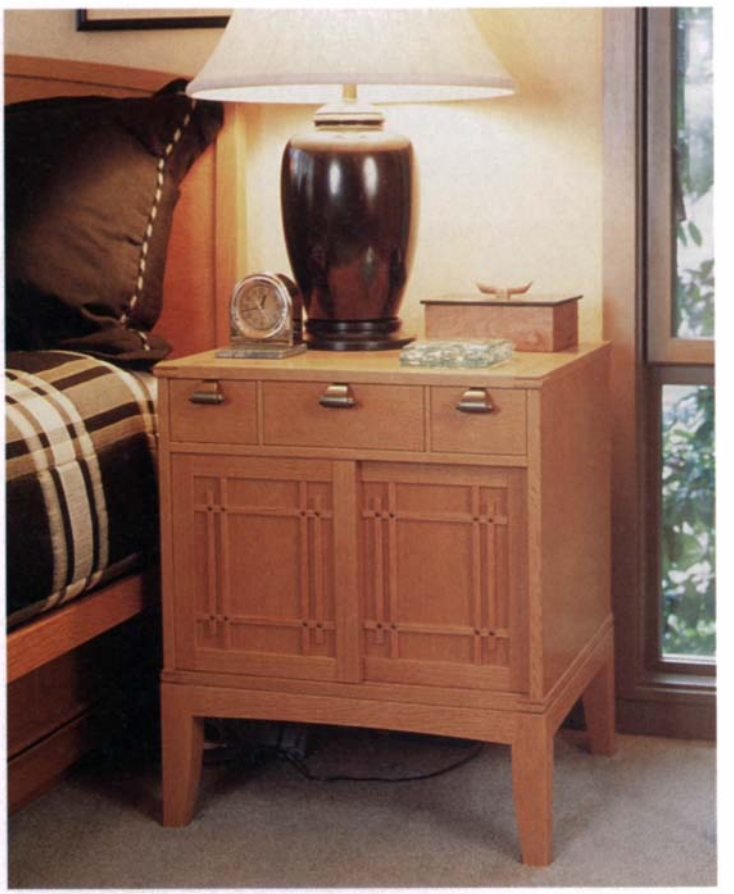
Top-quality materials make a difference

The clients requested that the primary wood be Japanese oak, a tight-grained, honey-colored wood. Unfortunately, it isn't available anymore. I was, however, able to track down some old-growth quartersawn American white oak and quartersawn French oak veneer. These are lighter in color and finer in grain than typical white oak and turned out to be a good match.

All of the boxes and panels were veneered medium-density fiberboard (MDF). Edges were covered with solid, shopmade banding, about ⅛ in. thick. Thicker edge-banding allowed me to ease the corners and provided a durable surface. I also used solid maple, primarily for drawer sides and backs. To keep shelves from sagging, I first built up a core of a ¾-in. plywood surfaced on both

Photos: Anatole Burkin


MODERN TIMES



Freestanding pieces complement the built-ins. *Similar exposed joinery and design details went into the nightstands and bed.*

sides with ¼-in. MDF. Then I veneered the faces and finished off the shelves with ¾-in.-thick edge-banding.

The designer provided handmade pulls from India. But when I first saw them, I wasn't too thrilled. The pulls were coated with layers of lacquer, shielding highly polished brass. To soften the glare, I sandblasted the pulls and other hardware and chemically treated them to yield a more subtle, antique brown finish.

The designer also suggested using some fabrics as an accent. The door panels of the entertainment center were wrapped in silk, and the corner cabinet was adorned with straw matting. These fabrics added color and texture to the overall scheme.

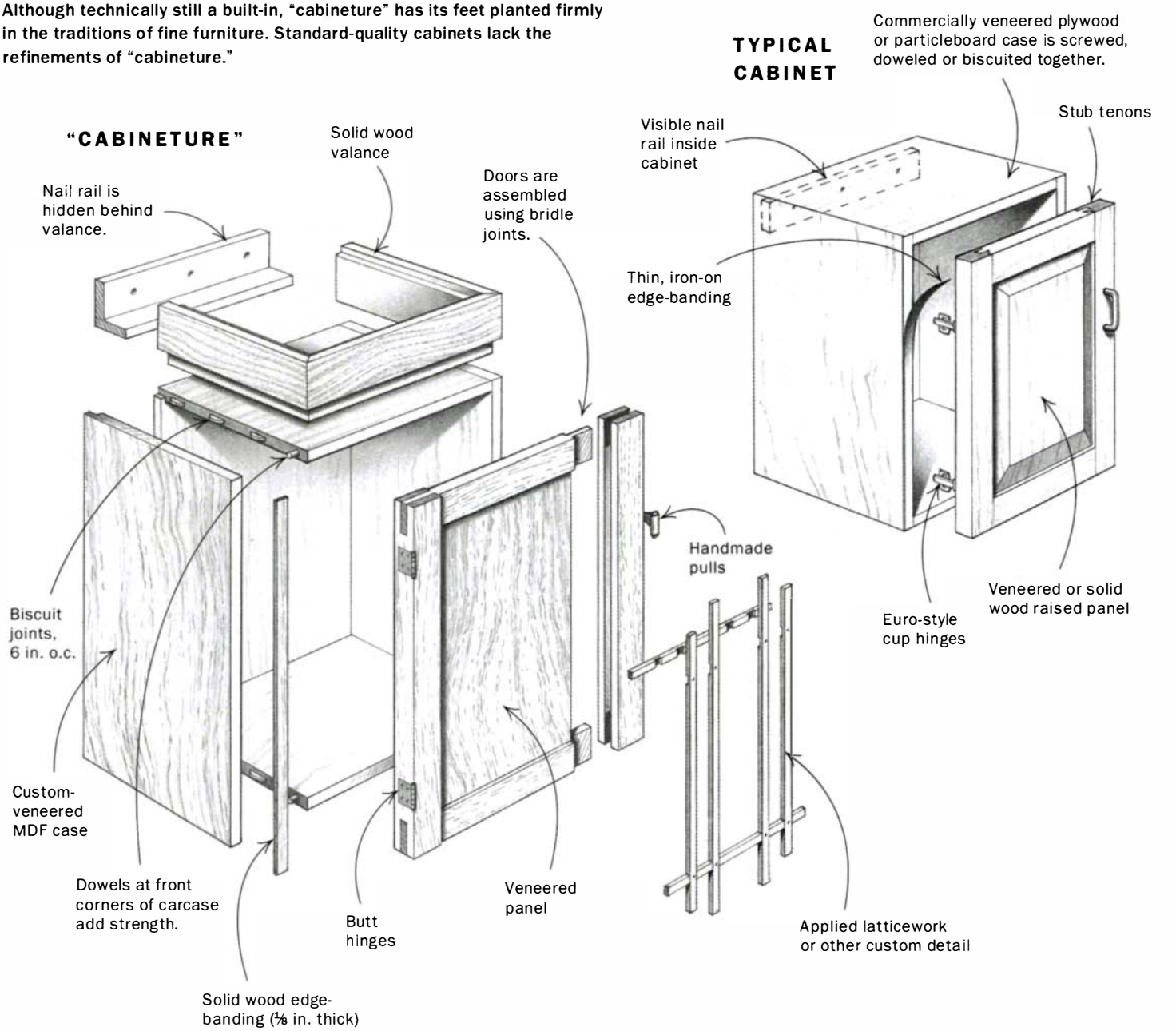
Joinery ranged from biscuits to hand-cut dovetails

I used exposed joinery throughout. All of the rails and stiles were connected with bridle joints (also known as slip joints). The tops of lower cabinets (and nightstands) were veneered and framed with solid wood, then joined at the corner with bridle joints. The rails and stiles of the headboard were joined the same way.

All drawers have variable-spaced hand-cut dovetails with narrow pins. The drawers were built upon frames (called NK drawers) that act as slides, in tandem with wooden guides. NK drawers are very

Carcase construction is pretty straightforward. *But lots of work went into the doors. Bridle joints are used on all of the rails and stiles. On the inside, sliding wire racks are used for storage.*

Although technically still a built-in, "cabineture" has its feet planted firmly in the traditions of fine furniture. Standard-quality cabinets lack the refinements of "cabineture."



strong, and because the drawer sides don't contact the case, drawers are easy to open and close. (Details on building NK slides will be published in the next issue of *Fine Woodworking*, #150.)

The boxes themselves were fashioned like typical built-ins. Biscuits were used to join the cases, and the backs were glued into rabbets. But biscuits don't have a lot of holding power at the narrow ends. So I added dowel joints at the front corners of the cases to make sure they would stay tight. Side-by-side cases were connected to each other using joint-connector bolts, which I tinted antique brown to match the rest of the hardware.

Time spent refining details pays off

The word details implies small or subordinate, but in furniture, details are as important as the materials, joinery and overall design. Screw up the details, and the entire project is weaker as a result. Take shadow lines, for example. If a cabinet has too few, it looks bland; too many, and it takes on a busy look. On traditional doors, shadow lines typically are achieved through the use of raised panels and profiled rails and stiles. This project had none of those details; instead, I created shadow lines by varying the thickness of parts. For example, the rails are 3/32 in. thinner than the stiles on all of the doors. The latticework on the flat panels is set back from the rails by another 3/32 in. The valances that run atop all of the pieces are gapped, leaving a ¼-in. shadow line. Additionally, the bridle joints on the corners of the headboard, nightstand top and a few other places are emphasized. Either the tenon is proud or the walls of the mortise protrude by a small amount.

The exposed-joinery concept was carried over to the lattice-

Drawings: Michael Gellatly

Hand-cut joints and handmade pulls from India. *All of the drawers have variably spaced, hand-cut dovetails. The author sandblasted the shiny original finish on the pulls, then patinated them antique brown.*

work. Where members cross, I added diamond-shaped brass pins, which were patinated to match the rest of the hardware.

A new discipline is born

When it came time to deliver and install the cabinets, I remembered one of the reasons why I got out of cabinetmaking. This can be tough, dangerous work. It took three guys and a Genie Lift to get everything in place. We had to build a bridge over a sunken living room to make a platform big enough to get the lift in position. Then the cabinets took a slow, wobbly ride up 12 ft. before being pulled over the railing to the second floor. That each box made it safely into the room was a minor miracle.

All built-ins must be fitted to walls, which are never perfectly plumb nor flat. To fit these cabinets, I used scribe strips. The cabinets were held back approximately ¾ in. from the walls, and the strips were handplaned to fill the gap. The method made fitting a lot easier and added another shadow line to the rather plain sides of the bookshelves and wardrobes.

This job would have been a lot harder to accomplish had I not been trained in both basic cabinetry and furniture making. For this challenging project, I drew on all of my skills, and that led me to a new standard of woodworking, somewhere in the great divide between case goods and fine furniture. I call this hybrid "cabineture," a style of working that combines the craftsmanship and ideals of both disciplines. □

Ross Day builds custom furniture in Poulsbo, Wash., and teaches furniture making part-time at the community-college level.

Fabric adds texture. *The top of the corner cabinet is covered in straw matting. The same material is also applied to the soffit.*

How to Fix Damaged Finishes

Scrapes, scratches, water marks, dents and dull finishes are not fatal

BY JEFF JEWITT

Different wood finishes vary greatly in how well they protect furniture and in how long they last, but they are all subject to the forces of light, moisture, air and general wear and tear. Sunlight, heat and water remain the biggest enemies of finishes, but moving companies, puppies and feisty 2-year-olds contribute their share of damage as well.

To repair an injured finish, you first need to identify which type of finish you're dealing with. Evaporative finishes, such as nitrocellulose lacquer and shellac, are the easiest to repair because any new finish will melt right into the old finish. Reactive finishes, such as varnish, are more difficult because new topcoats don't blend in with the existing ones.

You can identify an old finish with a two-step test using different solvents. Find an inconspicuous spot and dab a little denatured alcohol on the finish. After 30 seconds, press against the dampened area with some tissue paper. If the tissue sticks to the finish, it is shellac. If the alcohol doesn't affect the finish, try the same test with a little lacquer thinner. If the tissue still doesn't stick, the finish is probably an oil-based varnish, a polyurethane or a newer catalyzed finish. Once you know the type of finish and how it was damaged, you can decide what to do to fix it.

A final note: If you think a piece of furniture is valuable, you may want to consult a professional; or you can simply wax it to avoid the possibility of permanent damage to an old patina that may add value to the furniture. □

Jeff Jewitt restores furniture and sells finishing supplies in Cleveland, Ohio. He is a frequent contributor to Fine Woodworking.

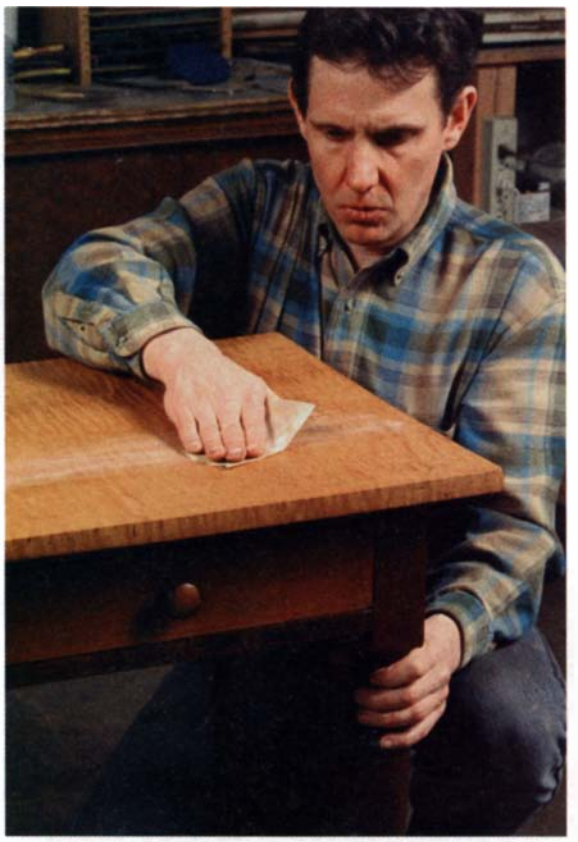
Scrapes, areas of finish and color removed from edges, are generally easier to repair than scratches, which occur in the center of a side or top and must be stripped and refinished. The first step is to determine if it's only the finish that's damaged or if part of the color is gone, too. Wet the damaged area with naphtha. If the wet surface blends in with the rest of the finish, you only have to repair the finish.

If both color and finish are missing, the naphtha will make the scrape appear lighter than the rest of the finish. In this case, you'll need to replace the original color first, then apply finish. The easiest way to replace color is to use a felt-tipped repair pen. The color selection is limited, but you can apply several different colors to achieve a match. A more difficult method is to mix some dry pigment with shellac and paint it in with a fine artist's brush.

On a lightly scratched varnish or polyurethane finish that is thick enough, your best bet is to sand out any scratches first. I usually start with 600-grit paper, but I've occasionally used 400 grit. While the traditional method calls for wet-sanding, I prefer to dry-sand. Wet-sanding gives you a false illusion of finish thickness, and it's possible to go through the finish before you know it. Depending on how deep the scratches are, you may have to sand the entire area to avoid hollows created by working one area too aggressively. Smooth out the sanded finish with fine steel wool to blend it in. You can match any original sheen by rubbing it out with 0000 steel wool or by using rubbing compounds. If the scratch is deep and white, and the finish is varnish or water-based, you'll need to strip and refinish the entire surface if you want a perfect repair.

If a finish is too thin to sand out without going through, simply add more finish. With an evaporative finish, such as lacquer or shellac, some scratches will disappear and blend right in with the new finish, as long as they're not too deep. Fill the scratch with finish by applying some lacquer or shellac with a red sable artist's brush. Several applications with overnight drying may be needed. When the scratch has been filled, sand the built-up layers back to a level surface, then apply more finish to the entire area. When the finish is dry, rub it out to the sheen that you want.

REPAIRING FINISH DAMAGE



Sand out scratches when possible. *Minor scratches in the finish will be easier to repair if you scuff the surface of the finish first.*

Fill fine scratches with more finish. *Fix small scratches in lacquer and shellac by painting in the proper finish with a small artist's brush. Then lay on a coat over the entire surface.*

REPAIRING COLOR DAMAGE

Every mover's secret. *Felt-tipped markers add color back to scraped or worn edges.*

This is a developed talent. *Mixing dry pigments with shellac for minor color repairs takes some practice and a fine artist's brush.*

Photos, except where noted: Susan Jewitt

COLORED WAX FOR AN EASY FIX

Deep gouges can be filled with wax. *Cut off a small piece of wax and rub it into the depression. Pare away the excess with a piece of wood and buff the surface with a clean rag.*

BURN-IN STICK FOR MORE PERMANENT REPAIRS

More durable gouge repairs can be made using burn-in sticks. *They are made from either shellac or lacquer resins, and they melt when exposed to a hot knife.*

Some damage is so deep that your only choice is to fill it as best you can to match the surrounding wood. The most popular fillers are colored wax and burn-in sticks made from shellac or a synthetic resin. Of the two, colored wax is easier to use, but burn-in sticks dry harder, so they're better for areas that will be subjected to more wear and tear.

To fill large gouges with wax, rub the area with the wax, or cut off a small piece and pack it into the depression. Then, using a chiseled spatula made from a small piece of wood, pare away the excess wax until it is fairly level with the surface. Rub the wax level with the surface using the back of a piece of fine sandpaper.

Burn-in sticks are a bit more difficult to use, and it's easy to damage the surface around the gouge if you're not careful. Melt part of a burn-in stick with a soldering iron or burn-in knife, then quickly press down with your finger to push the resin into the depression.

If the resin is shellac and the finish surface is varnish or oil, the repair is best leveled by wrapping a piece of muslin around a small piece of wood, wetting it slightly with alcohol and rubbing the repair until it's smooth.

If the finish surface is shellac or the burn-in stick is made of lacquer resin, level the filler by sanding very carefully with fine sandpaper lubricated with minerai spirits. You'll need to topcoat all burn-in stick repairs with more finish to protect them. While you're at it, you may want to lay on a new topcoat over the entire surface.

Work fast. *Quickly press down the hot resin into the depression with your finger.*

Smooth it out and blend it in. *A piece of muslin wrapped around a small block of wood and dampened with alcohol is a great tool for smoothing out a shellac burn-in stick repair.*

WATER AND HEAT MARKS

If the damage from moisture appears black or gray, water has permeated the finish and discolored the wood below. To repair such damage, you must strip the finish, sand the wood and bleach it with oxalic acid, which is available in powdered form at most hardware and paint stores.

If the damage appears as a white ring or a whitish, foggy area, water or heat caused the damage, and it is confined to the finish. The damage may be at the very top of the finish or closer to the bottom (where the finish meets the wood). There is no easy way to know exactly how far down the damage goes, and where it is will affect how successful any repair will be.

Most damage near the top can be rubbed out with some steel wool and minerai oil, rubbing compound or even fine sandpaper. The whitish color disappears fairly quickly, and once removed, the finish can be rubbed back out to the original sheen. If the finish is lacquer or shellac, a light padding with a rag moistened with denatured alcohol will remove the white spot. Dampen the rag just enough that it feels like the tip of a dog's nose—moist but not dripping wet—and use a back-and-forth pendulum motion to remove the white spot, working with the direction of the grain. If neither of these methods works, the damage was probably caused by heat to the bottom of the finish. in that case, your only choices are to strip off the finish and start over or find a good-looking vase to hide it.

Not all types of damage are equal. *The white water ring in the finish will be easy to repair. The black stain, also caused by water, goes through the finish and into the wood and requires more work to repair.*

It takes a little elbow grease, but not much. *Steel wool and mineral oil will usually remove white water rings.*

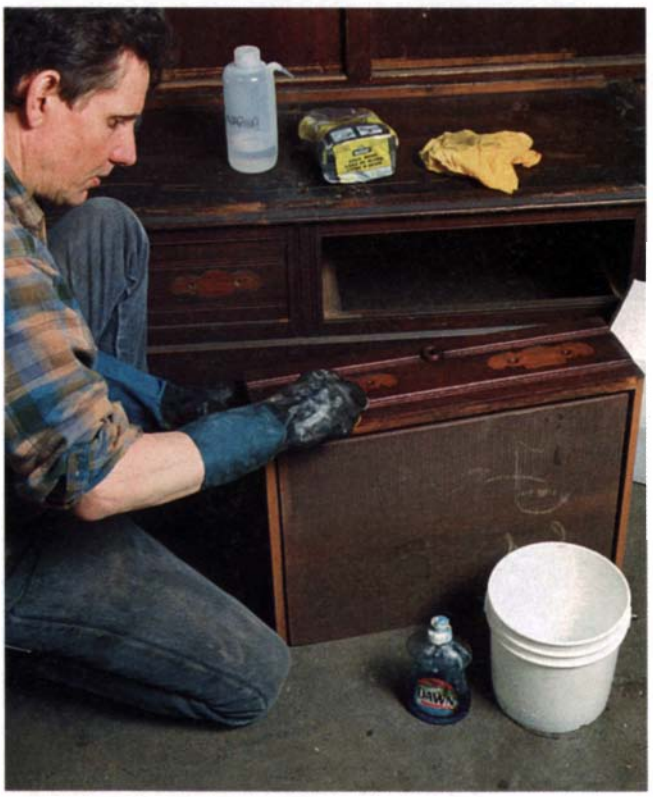
DULL AND DIRTY FINISHES

If a finish appears dull and dry but is otherwise intact, you can revive it with a simple cleaning and a coat of wax.

Start by wiping the finish thoroughly with a clean rag dampened with naphtha. This step removes any oil-soluble grime. Then switch to a detergent to remove water-soluble dirt. The best cleaner I've found is to mix one capful of Dawn brand dishwashing liquid in a pint of warm water. Use a slightly dampened cloth, not one that is dripping wet.

Next, abrade the finish using a dry, no-load, stearated 400-grit sandpaper (such as Fre-Cut or Adalox), then follow up with 600 grit. The goal here is to remove only the very top layer of finish but not to sand all the way through to the wood.

After wiping off the sanding residue with a rag dampened with naphtha, use a natural or dark-colored paste wax—depending on the color of the wood—to bring the luster back up.



Dingy finishes may require cleaning. *A rag moistened with naphtha removes oily dirt; dishwashing detergent removes the water-soluble grunge.*

A coat of wax will do wonders. *This drawer face clearly shows the benefits of a simple cleaning and a coat of wax.*

Photos, this page and facing page: Erika Marks

A Chisel Cabinet

Organized tool storage can improve your work habits

BY FRED WILBUR

Early in my career as a carver, I learned the frustration of a bench cluttered with tools. As most woodworkers know, spending time trying to find the right tool when you're in the middle of a complicated project is not an efficient way to work. Invariably, I found that the less-used tools migrate to the edges of the bench, where they are more likely to fall off and then require resharpening. Having suffered such disarray, I finally gave in to the wisdom of orderliness, confessing, as did Benjamin Franklin, "I found myself incorrigible with respect to Order; and now I am grown old, and my memory bad, I feel very sensibly the want of it." What makes this sense of order more imperative as one grows older is that the problem gets worse year by year, as you collect more tools.

Whether you are a carver with a collection of gouges or a cabinetmaker with scores of chisels and screwdrivers, the ultimate storage solution is a wall-mounted cabinet near your workbench.

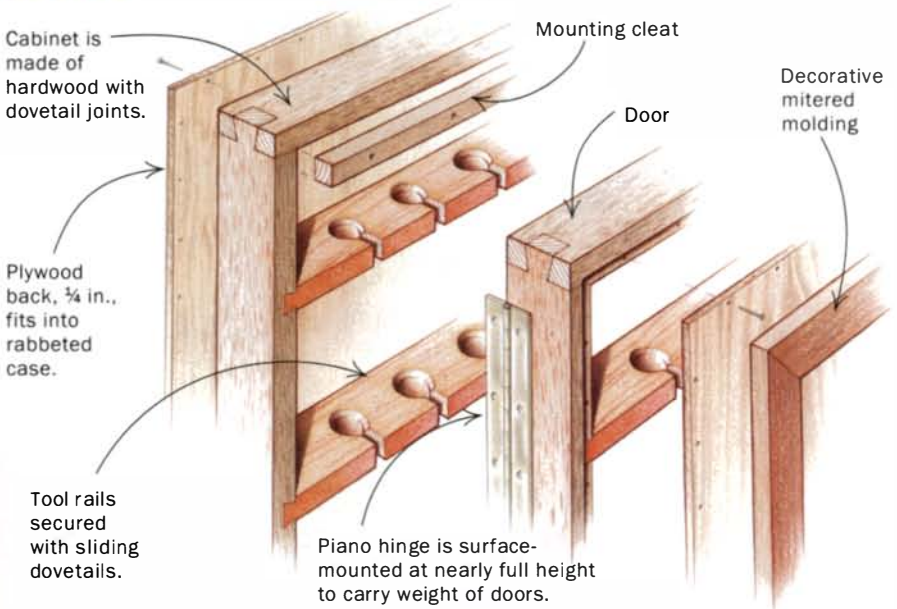
I made this cabinet from scraps many years ago. The drawing below shows the construction details, which afforded 183 spaces for gouges and chisels. It did look a little ridiculous at first—sheltering only a few gouges—but I have filled it up so that there are only a few vacancies left. Easy to construct, this wall-mounted unit is a shallow box with several horizontal dividers, or rails, secured with sliding dovetails. Two doors of exactly the same shallow depth echo the cabinet carcase. By using the inside of the doors for storage space, I doubled the cabinet's capacity.

The rails have holes to hold all of my chisels and gouges. Because the various handles weren't all the same shape, I found that a countersunk hole would best accommodate the tools in an upright and tidy position. Some handles had to be shaved slightly to fit snugly. I modified a spade bit so that I could drill and shape the countersunk holes in one drill-press operation. Then I cut slots in all of the holes using a finger-joint-type jig. I mounted doors to the carcase with piano hinges to carry all of the weight and used magnetic catches to hold the doors shut.

I always intended to add some pierced carvings on the front of the doors but have only applied bead-and-billet molding around the edges of the door panels. I'm sure Ben Franklin died with a few things left undone. □

Fred Wilbur is the author of Carving Architectural Detail in Wood, *published recently by The Guild of Master Craftsmen.*

CABINET DETAILS FOR STRENGTH AND CONVENIENCE



Drill and countersink in one shot. *With a standard shop grinder, an inexpensive spade bit can be shaped with a profile that will drill and countersink a hole at the same time.*

Access slots make it easy to slip tools in and out of storage. *A small piece of wood indexed into the miter-gauge fence makes the repetitive cuts quickly and accurately.*

Photos: William Duckworth; drawing: Michael Gellatly

Basic Guide to Buying a Lathe

What to look for and what to avoid when purchasing a new or used machine

BY JON SIEGEL

I earn my living by turning wood, and I've been a turner for the last 30 years. I spend most of my time making turnings for furniture and architectural applications, but I also lecture and give demonstrations at woodworking clubs, conferences and classes. One of the questions I am most frequently asked is, "What kind of lathe should I get?" This is akin to asking, "How long is a piece of string?" But to help my students, I have prepared a checklist of things to look for in a lathe.

When buying a lathe, it is the economies that you will regret, not the extravagances. You never will be able to produce fine work on a lathe that is poor in design and light in weight. I generally suggest getting the heaviest lathe that you can manage, fiscally or physically. But beyond this you must evaluate the most important parts of a lathe: the bed, the tool rest, the tailstock, the headstock, the motor and the stand.

Finally, the type of turning you will be doing has a crucial bearing on what to look for in a lathe. If you will be turning mainly bowls, you need the ability to turn at low speeds and a machine able to absorb the vibration of turning large, possibly irregularly shaped objects. If spindle turning is your game, a wider range of easily adjusted speeds is desirable. A longer bed may also be desirable, especially if you plan to turn long pieces, such as bedposts.

The height and structure of the bed are critical

While mass is the most important factor in a lathe's stability, the rigidity of the bed runs a close second. The most important feature is the height of the bed structure: A lathe that will turn a maximum diameter of 12 in. with a length capacity of 40 in. should have a bed-structure height of at least 5 in., excluding its feet.

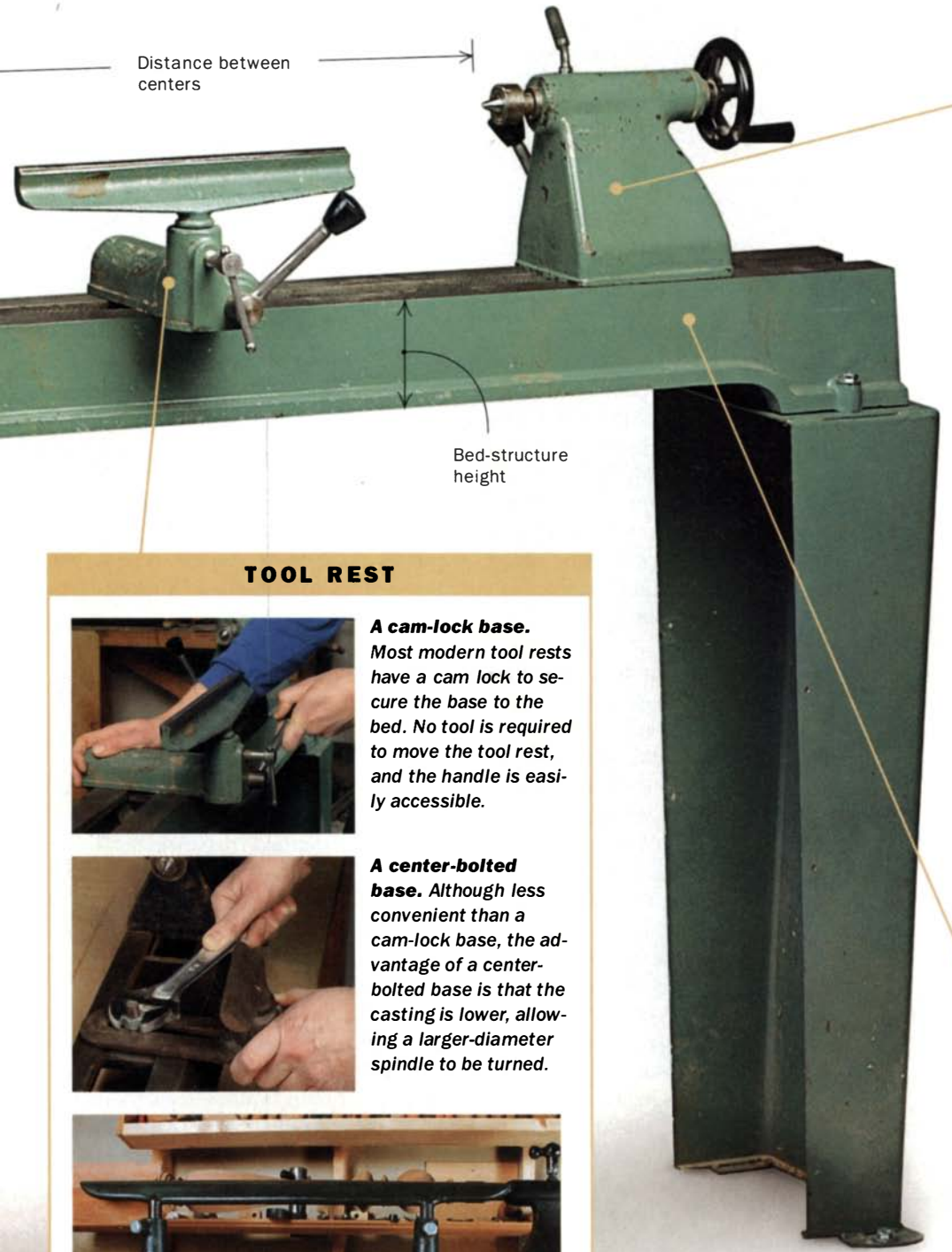
The design of the bed is more important than the material it is made from. In the old days, when you ordered a wood-turning lathe, you made your own bed out of wood. This remains a good idea. You can make the lathe bed as long as you want, and a dense

THE PARTS OF A LATHE

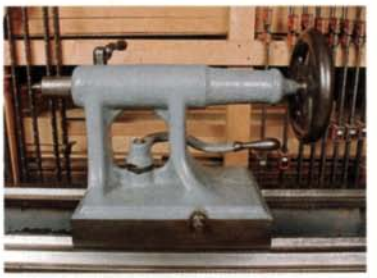
Whether made for turning pens or classical columns, all lathes have the same basic structure: a bed, a headstock, a tailstock, a tool rest and a motor. The distance between centers determines the maximum length of spindle that can be turned, and the swing is the maximum diameter bowl that can be turned.

HEADSTOCK

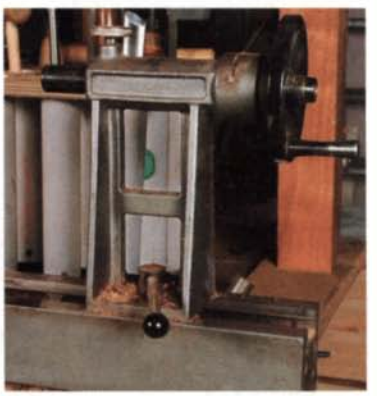
Turning heads. *Many lathes allow the headstock to swivel 90° or 180° to increase the swing and allow turning of larger-diameter bowls.*



TAILSTOCK



Good tailstock. *This tailstock has a wide base with the hold-down bolt forward of the center of the base to minimize vibration.*



Poor tailstock. *A tall tailstock with a narrow base is likely to vibrate.*

TOOL REST

A cam-lock base. *Most modern tool rests have a cam lock to secure the base to the bed. No tool is required to move the tool rest, and the handle is easily accessible.*

A center-bolted base. *Although less convenient than a cam-lock base, the advantage of a center-bolted base is that the casting is lower, allowing a larger-diameter spindle to be turned.*

A longer tool rest with two bases. *Designed for turning long spindles, the two bases diminish vibration significantly but reduce maneuverability.*

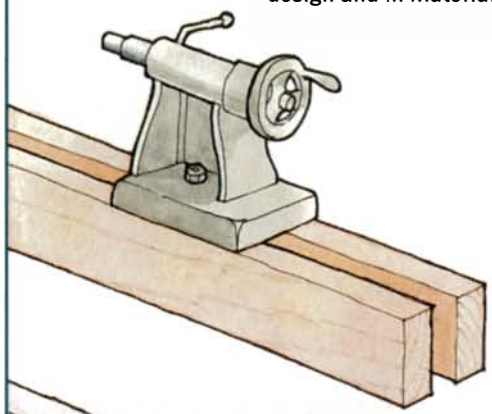
BED

Check under the bed. *The underside of the bed on many low-priced machines is a painted-over rough casting. The tool rest and the tailstock will never slide freely over such a surface.*

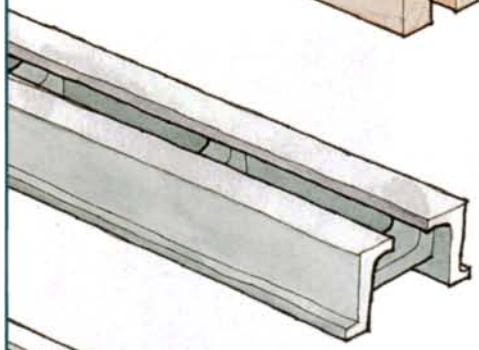
Photos, facing page (lathe) and this page (top left, middle left): Erika Marks

BED STYLES

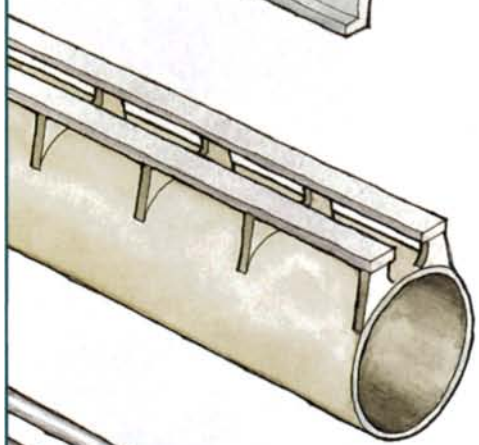
The conflicting goals of making a lathe vibration-free and economical to buy have resulted in a wide range of beds, both in design and in materials.



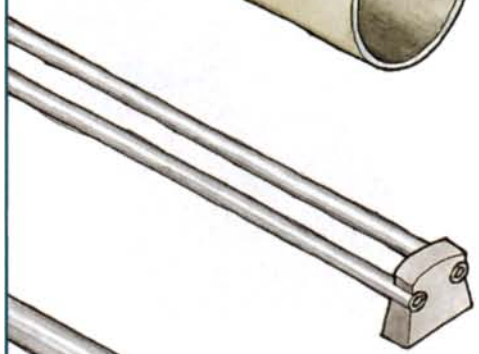
Popular in the past, and still a good choice, a wooden bed provides mass and a length to suit your needs.



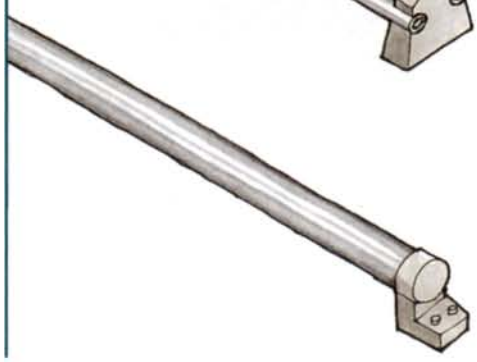
The author's favorite is a solid cast-iron bed because of its vibration-absorbing mass and great rigidity.



Possibly the way of the future, a steel bed welded to a large-diameter steel tube combines good bed height with low vibration.



Twin steel tubes are an invitation to vibration and flexing.



It is hard to align the headstock and tailstock on a monorail tube and impossible to get top-quality work using a lathe with this type of bed.

hardwood with ample bed height provides plenty of mass. The hold-down bolts on these lathes are somewhat less convenient than those on metal beds, because you mostly reach underneath to adjust them, which is one of the reasons why my first choice is a flat-topped cast-iron bed.

The ribs under a cast-iron bed tie the front to the back, giving torsional rigidity. People have tried to make lathe beds out of steel parts welded together. Most of these attempts were failures. A few years ago a Canadian company, Oneway Manufacturing, rewrote the book on welded lathe beds. Oneway's beds are based not on a pair of rails but on a large tube with flat steel bars welded on top. These beds are highly successful because they have a very large vertical dimension and a flat top. But whether they are better than a cast-iron bed of similar weight and cost is still a subject of debate.

All beds must be accurately machined, and this means more than just the top being flat: The slot must have smooth and parallel sides to guide the tailstock as it moves along the bed; the underside of the slot must be smooth and parallel to the top, because the clamp nuts that hold down both the tailstock and the tool-rest base must slide freely.

Avoid lathe beds fashioned from a pair of steel bars, either round or square, hollow or solid. These beds twist easily, causing vibrations. The longer the lathe, the greater the flexibility of the bars. With the tailstock in its usual position, it falls near the middle, the most flexible point. With the tailstock at the end, the tool rest is near the middle. These situations lead to vibrations. The monorail type of lathe, which resembles a drill press lying on its back, will make you tear out your hair with its vibration and difficulty aligning the headstock with the tailstock.

The tool rest should be sturdy

During turning, the tool rest is nearest to where the cutting takes place, and that's where vibration usually starts. Many new lathes fail to provide a solid tool rest.

The tool rest consists of two parts: the base, or banjo, and the T-rest (the upper part). Most modern lathes have a cam-lock base that allows the rest to be locked to the bed by means of a front-mounted handle. Ease of adjustment makes this the best system, but a cam-lock base has some disadvantages: The castings rise quite high above the bed, which can interfere with the work; and the handle can get in the way. A simple, center-bolted base is perfectly good but requires a wrench to move the base.

The T-rest has a round shank that fits into the base. The longest T-rest that can be used with a 1-in. shank is about 15 in. (shorter on wooden beds). A longer rest has two shanks, requiring two bases, which are a must for large spindle turning and are a joy to use because of their extreme rigidity. Perhaps the only reason why turners don't use two bases all the time is the maneuverability that one base allows, especially during bowl turning, when the angle of the T-rest is frequently changed.

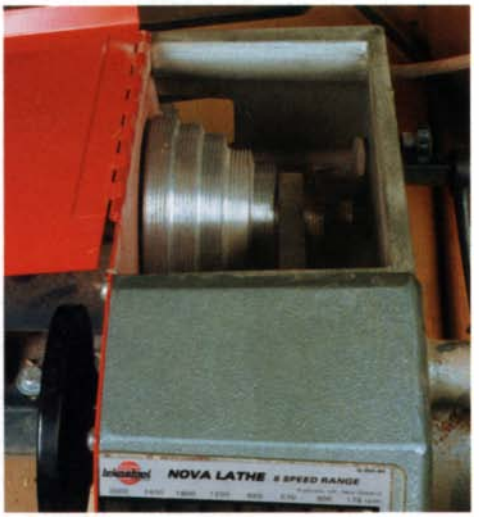
The tailstock needs a large base

Because it is the function of the tailstock to push the workpiece against the headstock, it must have a wide base. The most common problem with a tailstock is a too-small base. On the best lathes, the size of the tailstock base, as measured along the bed length, is greater than the center height of the lathe. The hold-down bolt or cam should be forward (left) of the center. The part of the tail-

Drawings: Jim Richey

The way of the future. *Electronic speed control is the easiest to adjust because the motor can be either running or still. It is the most expensive form of speed control.*

Shifting on the fly. *Manual control via variable-speed pulleys can be changed only with the motor running. Many turners swear by this robust method of speed control.*



Not high tech. *Adjusting speed via belts and pulleys isn't convenient because the machine must be stopped before the belt can be shifted. However, it is inexpensive and reliable.*

stock that holds the center is called the ram. This should extend (feed forward) by turning the handwheel clockwise.

The ram on a tailstock can be internally or externally threaded. I prefer they be threaded on the inside and driven by a screw connected to the handwheel. This time-tested design allows the tailstock center to self-eject when the ram is fully retracted. A hollow tailstock ram is threaded on the outside and operated by a threaded wheel rather than a central screw. An externally threaded ram is cheaper to make, but the presence of the threads compromises the fit between the ram and the tailstock casting.

Headstock should provide solid support

The fundamental job of the headstock is to support the spindle, which transfers power from the motor to the piece being turned. When faceplate turning (i.e., without the use of a tailstock) the entire weight of the object being turned and the resulting vibration bear on the headstock. For this reason it is critical that the headstock be very solid and well-machined.

The bearings that hold the spindle should be large and well-supported. A strong spindle lock is necessary for removing faceplates and chucks, and an indexing device is useful if you want to set up a fluting jig with your router. Pay close attention to the spindle-nose design, and be sure the measurements of the spindle threads and Morse-taper socket match one of the common sizes (see the story on p. 70).

Pivoting headstocks allow larger bowls to be turned, but care must be taken not to stress the bearings and spindle by turning too large a blank. And most factory-supplied tool rests no longer provide good support when the headstock is turned 90° to the bed.

SPEED AND HORSEPOWER REQUIREMENTS

High-speed spindles. *For spindle turning (1 in. to 4 in. dia.), a ½-hp motor with a speed range of 400 to 2,000 rpm produces fine results. For larger spindles, more horsepower and lower speeds are needed.*

High-powered bowls. *Turning 12-in.-dia. bowls requires 1 to 2 hp and a speed range of 200 to 1,500 rpm. For 24-in.-dia. bowls, starting speeds of 100 rpm or slower are needed, powered by motors of 2 to 5 hp.*

Speed control and horsepower are important

The greatest recent breakthrough in turning has been the introduction of electronic speed control. This system is available across the entire range of lathes with a.c. and d.c. motors, although sometimes it's an option that will add to the cost.

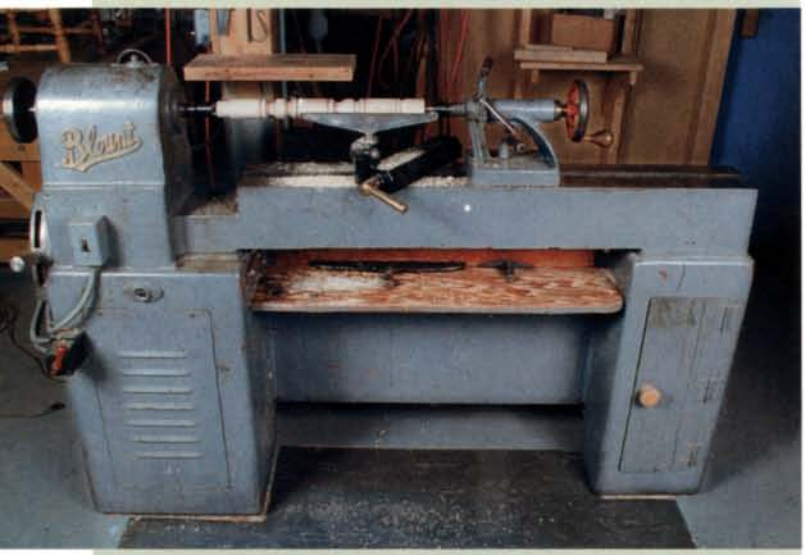
For a large lathe, you may want to look at a three-phase motor. These motors were generally confined to industrial sites with a three-phase power supply. Today, however, frequency controllers, also called inverters, can convert a domestic single-phase input to a three-phase output while controlling the speed of the three-phase motor.

An older form of speed control is through the mechanical adjustment of belts and pulleys connecting the motor to the spindle. Fewer new lathes still use belts as a form of speed control, but the vast majority employ them for transmission. Belts can be a source of frustration, especially at the low speed and high torque demanded by bowl turners. However, most slipping and vibration problems caused by belts can be eliminated by using the right belts at the right tension.

With regard to what speed and what horsepower you will need, here are some guidelines: For spindle turning (1 in. to 4 in.

Photos, except where noted: Mark Schofield

Shopping for a used lathe



More value for your money. *By scanning the classifieds, you may find a lathe like this, with a timeless design, well-machined parts and a solid structure, for a fraction of the price of a new lathe with the same features.*

If you are looking to purchase a heavy lathe, you may get more mass for your money in an old machine. Do not buy a lathe if the tailstock is missing. Not only will that prevent you from turning spindles, but even a bowl turner will need the tailstock to rough out large chunks between centers, for drilling and for other purposes. It is nearly impossible to find a replacement tailstock that will fit properly. Do not reject a lathe because the tool-rest base (banjo) is missing. A tool-rest base can be fitted from another machine.

The most common spindle-nose threads for wood lathes in North America are: ¾ in. 16 tpi; 1 in. 8 tpi; 1 in. 12 tpi; 1¼ in. 8 tpi; 1½ in. 8 tpi; and 33mm-3.3mm. A very old machine may not have standard spindle threads and tapers. This may mean re-machining threads on modern accessories or having adapters made. You should also machine the lathe spindle of any machine that does not have the standard tapered centers. A precision inspection of a lathe is beyond the scope of this article, but you should look for play in the bearings, play in the tailstock and runout of the spindle. If you have a dial indicator, you can check the spindle runout; it should be under 0.002 in. total. If you do not have an indicator, you should check the runout by feel.

Many old lathes are for metalworking and, although there are fundamental differences between metal and woodworking lathes, the former can be used in woodworking, especially for large work such as bowls, turned at low speeds. The presence of a carriage and the prismatic ways on the bed (not a flat top) make it harder to fit a wood-turning type tool rest base and T-rests to the bed.

dia.), 400 rpm to 2,000 rpm and ½ hp; for 12-in.-dia. bowls, 200 rpm to 1,500 rpm and 1 hp to 2 hp; for 24-in.-dia. bowls, 100 rpm (or even less for uneven blanks) to 800 rpm and 2 hp to 5 hp.

The stand must be stout enough to resist vibration

A massive stand is not a substitute for a massive lathe and can only slightly mitigate the shortcomings of a poor machine. The stand can help control small vibrations caused by an unbalanced workpiece, but the stand needs to be heavy. A cast-iron stand is excellent but expensive. Some steel stands made from angle iron are simply the cheapest way to get the lathe off the floor, and no more.

Which lathe is right for you?

In the last few years mini- and midi-lathes have become very popular. These benchtop lathes have a swing of around 10 in. and a distance between centers of around 14 in. Whereas most mini-lathes require dedicated accessories, a midi-lathe with a 1-in.-dia. spindle with eight threads per inch and a #2 Morse-taper socket allows accessories to be shared with larger lathes. For this reason, and because I have been impressed by the solidity of some of these midi-lathes, I suggest those readers with a lathe budget of under $500 get one. Then learn the basics, decide later what kind of turning most interests you, and trade up from there.

Few of the larger lathes (12-in. swing and around 36 in. between centers) in the $500 to $1,500 price range have overly impressed me. If you plan to turn workpieces near the capacities of these machines, at least look at a used heavy-duty lathe. Once you reach the $1,500 to $3,000 price range, the quality improves, and if money is not a consideration, the new top-of-the-line lathes with cast-iron or welded steel beds will set you back $3,000 to $5,000.

Before you buy, whether new or used, ask yourself the following questions: Is this the most robust lathe I can get for my money? Can I get all of the accessories I need? Does the speed control offer the range of speeds I need, and are they easy to change? Do the parts appear to be constructed with accuracy and care? If the answers are all yes, the money you will spend will be rewarded by many years of happy and successful turning. □

Jon Siegel has been turning wood and metal for more than three decades. At his shop in New Hampshire, he uses lathes of nearly every size and age.

Entry-level lathe. *Small but well-proportioned, a midi-lathe offers an economical way to begin turning on a solid machine.*

An Arts and Crafts Library Table

A nontraditional approach to building a desk with drawers

BY ERIC KEIL

I've never seen the virtues of building a table with drawers in the traditional way—with a double-tenoned stretcher below the drawer and a dovetailed top rail. It just seems like unnecessary work. I've developed methods for building a table with drawers that are faster and, to my mind, stronger. It's the same approach I use when building a chest of drawers. I build frames to go over and under the drawers, then simply attach them to preassembled ends. This approach makes the entire project more manageable and all but guarantees a smooth and square glue-up.

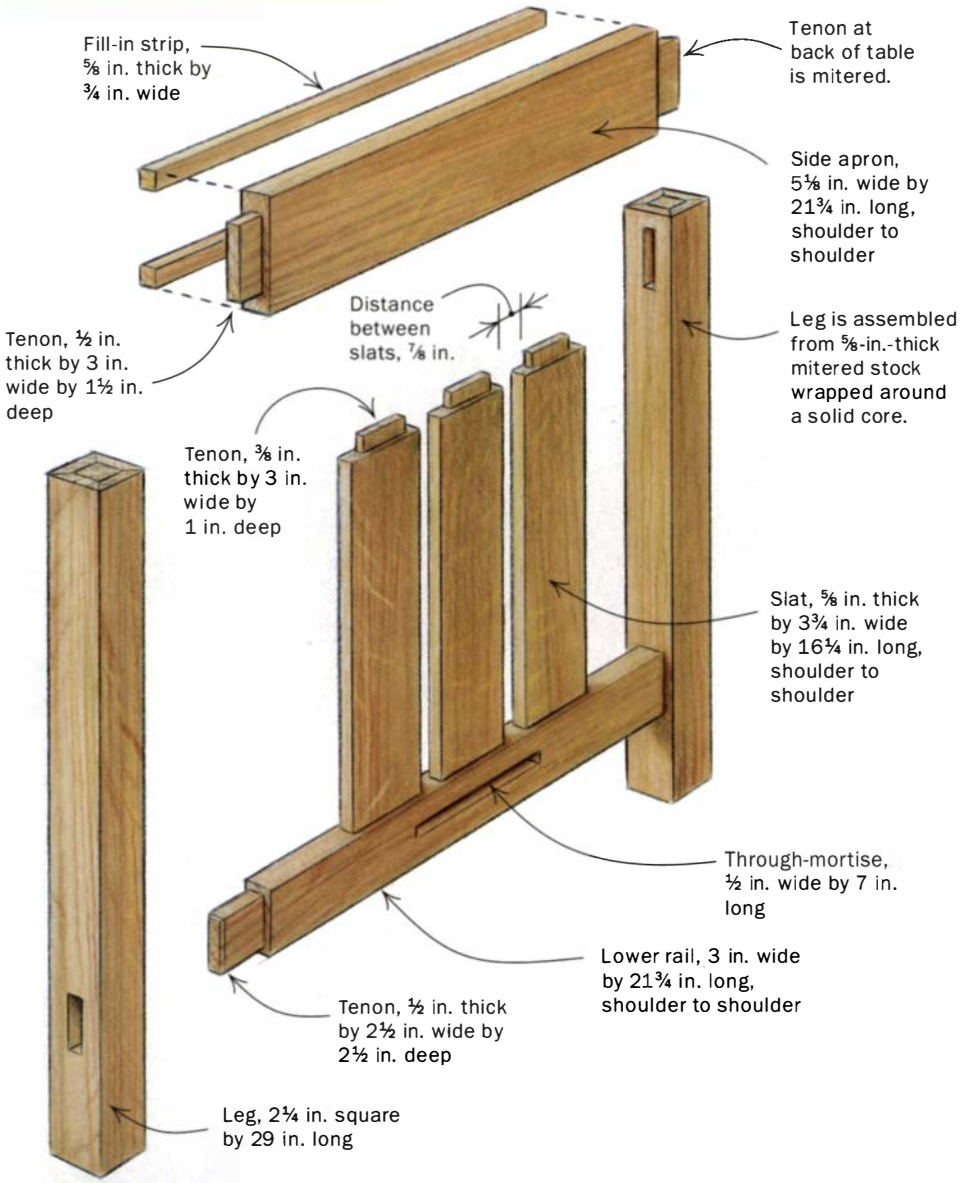
This library table is adapted from various Stickley catalogs from the turn of the 20th century. It would work well as a writing desk or as a reading table. My approach to the construction of this traditional Arts and Crafts piece is straightforward. I used quartersawn stock, hand-hammered hardware and a slightly lighter finish than is customary for this style.

The best boards go on top

For this project, I ordered 100 bd. ft. of oak, then riffled through to choose boards for specific parts. Once all of the boards had been surfaced, I designated the best of the lot for the tabletop, which I typically glue

Photo, this page: Michael Pekovich

Table-end glue-up



up first so that I know what I'm working toward. I also sorted all of the other lumber, denoted which pieces will be used where and milled them to their finished thickness.

The less-attractive lumber was designated for interior parts, such as the two frames. These frames are identical to face frames on an ordinary plywood cabinet, but they have a very different use. Just as on a chest of drawers, the frames span the two ends, and drawers are housed between them. I built the frames using biscuit joinery, but mortise-and-tenon joinery would work, too. Once installed, the frames will be joined in so many ways that the chance of their failing is negligible, if not impossible. I left the frames slightly oversized to be squared up later.

Assemble the ends

Building the ends was the first big task of this job. I started with the legs. To ensure figured surfaces on all four sides, I ripped four matching quartersawn boards 2¼ in. wide, then mitered the edges at 45°. The easiest way to make the legs was to miter the four faces first, see that they fit together square, then cut a solid core. The solid core helps keep the assembly square during glue-up and supports and strengthens the mortise-and-tenon joinery of the apron. I cut the core piece slightly undersized (a small 1/32 in. or so) to ensure that all of the joints would close up and to avoid failure of the leg joints during seasonal expansion.

I placed the mitered faces side by side and taped up the corners, making sure that there were no gaps between the pieces. Then I flipped over the assembly, spread

LEGS WITH QUARTERSAWN FIGURE ON FOUR SIDES

Four mitered pieces are required for each leg. *Choose quartersawn stock with matching fleck patterns, then miter both edges.*

Strips of masking tape act as clamps. *Set the mitered edges of the legs tightly against each other, then tape them together.*

Wrap up the leg. *Spread glue on all of the interior surfaces, including the core. Then wrap the four mitered sections around the core and secure the assembly with additional tape.*

Drawings: Bob La Pointe

Rout the mortises. *Using an edge guide on a plunge router, drop the bit a little at a time until you reach the desired depth.*

glue in the V-grooves and on the inside faces. I simply set the core in place, rolled up the entire thing and bound the last corner with tape. If the joinery is cut with care, the pieces should close up without any trouble. Slight gaps can be coerced shut with the use of a clamp or two.

I allowed the legs to cure overnight, then cut all of the leg mortises with a ½-in. straight bit mounted in a plunge router outfitted with an edge guide. Even the through-mortises can be cut this way. To handle the through-mortises on the thick legs, though, I plunged from each side of the leg rather than all the way through the leg from one side.

The rest of the end assembly was fairly simple. All of the mortises were cut with a router and squared up with a chisel.

I cut the tenons on the tablesaw. First I established the shoulder cuts with the board held horizontally and then the trimmed the cheeks with the workpiece held upright. For efficiency, I cut all of the mortises and tenons for the entire table at the same time. I then angled the blade to 45° and chamfered the ends of the through-tenons.

Attach the frames and shelf

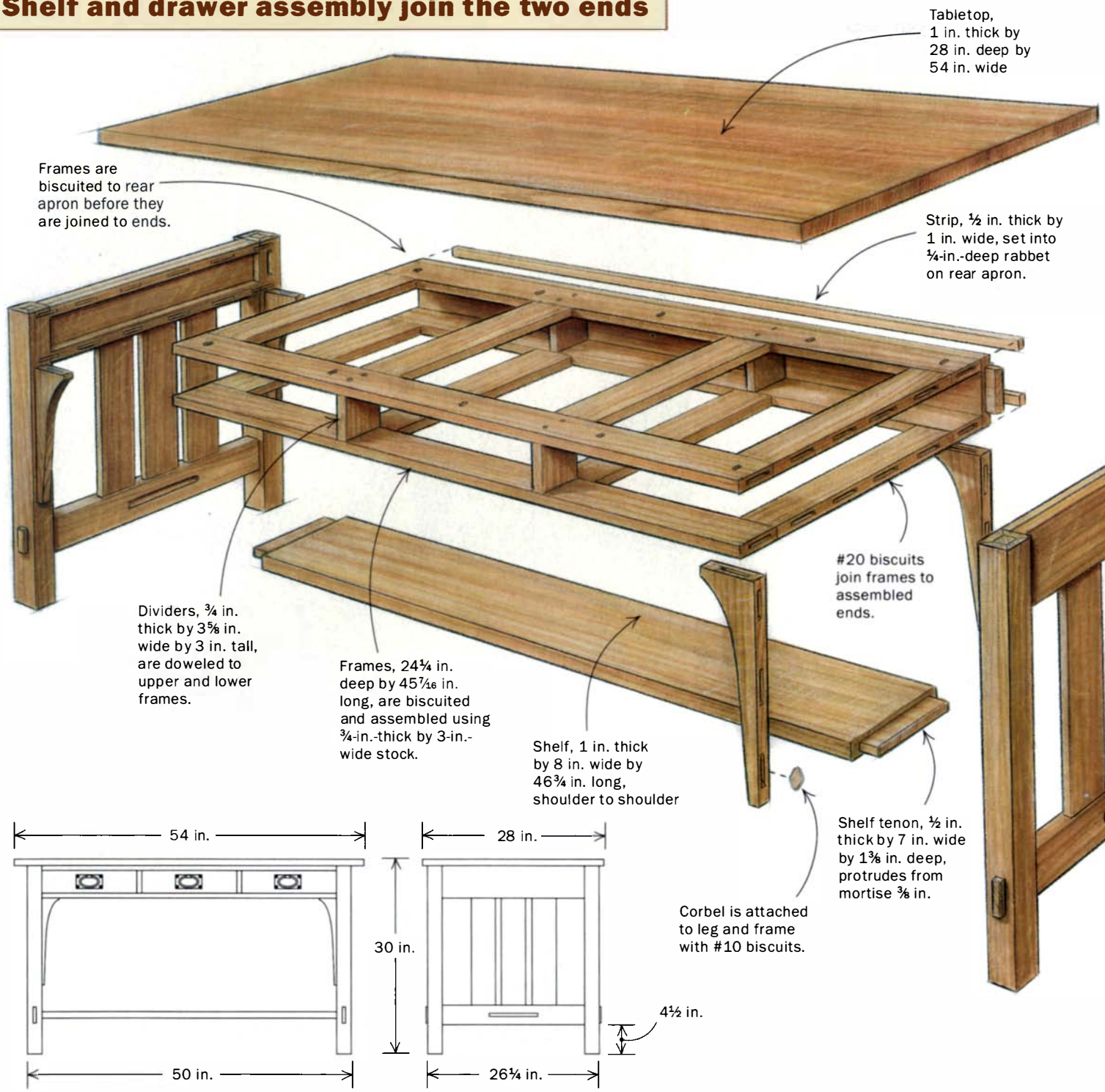
I scratched my head for some time trying to figure out how to handle the rear apron of this table. I wanted the corbels to be a full 1 in. thick, but that meant they would be flush with the rear apron, which neither mimicked the drawer fronts nor provided a necessary shadow line between the apron and corbel. In the end, I decided to build out the top and bottom of the rear apron to

Assemble the ends. *First fit the slats to the apron and lower rail, then set the assembly into the mortises on the legs.*

Biscuits make for foolproof alignment. *After the insides of the ends are blocked out flush with the legs, biscuit slots are cut to accept the frames.*

Photos, except where noted: Matthew Teague; this page (top right): Michael Pekovich

Shelf and drawer assembly join the two ends



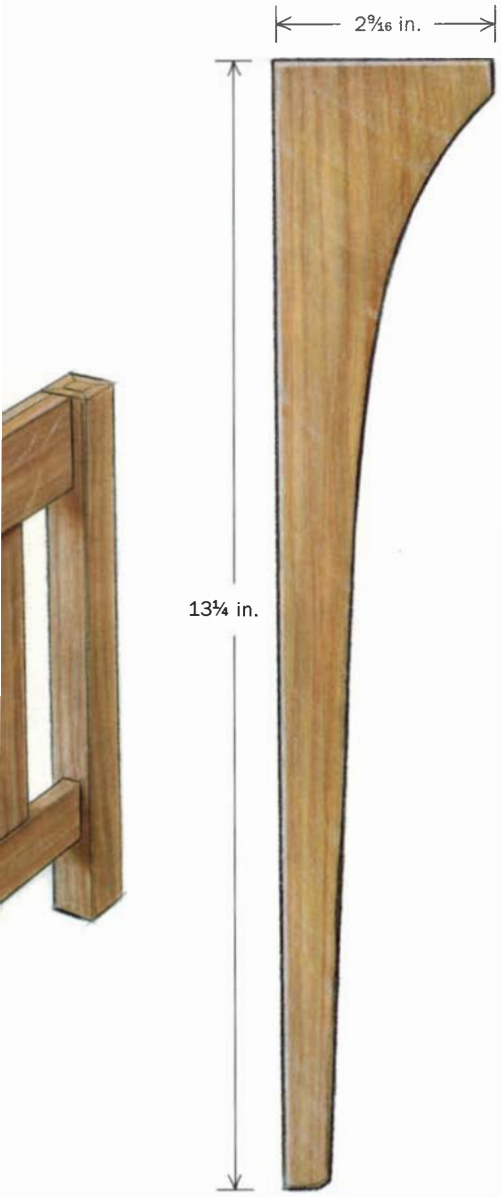
echo the top and bottom frames on the front of the desk.

After cutting the tenons on the rear apron, I ran a rabbet ¾ in. wide and ¼ in. deep along the outside edges. After assembly, ½-in.-thick strips will be added to create raised areas that mimic the front and provide a necessary change in thickness where the corbel abuts the leg and apron.

Because the frames were to be biscuited to the ends, I added fill-in strips to the inside of the apron at top and bottom, making sure that the strips were flush with the front and rear legs. The strips can be attached with glue or with glue and screws.

Once the fill-in strips were in place, I squared up the frames using a large sled at the tablesaw, using the length of the rear apron as a reference. I then drilled holes for the tabletop. While I could have let the drawer dividers into sliding dovetails, I simply cut them to size, set them in place at the front and back of the frames and doweled them from above and below. Once the drawer glides are installed, the dividers will be locked in place by about five different joints.

I used #20 biscuits to join the frames to the two ends and to the rear apron. To accommodate the corbels, I cut #10 biscuit



CORBEL

slots underneath the frame and along the inside of the legs.

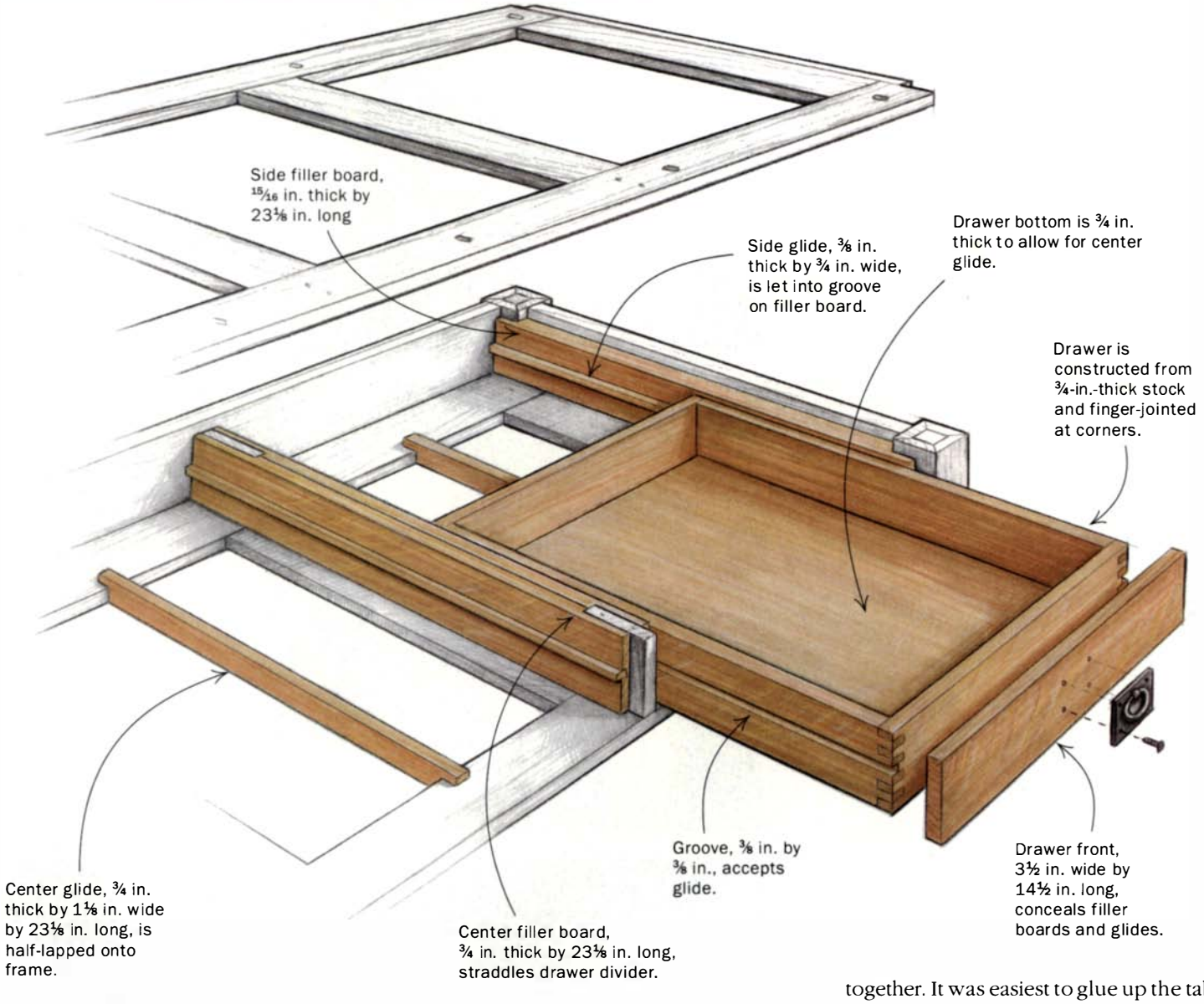
I dry-fit the assembly to be sure that the shelf and the frames fit onto the ends and closed up squarely. Once I was confident there wouldn't be any surprises, I glued the rear apron to the frames, making sure that the ends of the apron aligned exactly with the ends of the frames. Then I was finally ready for the entire assembly to go

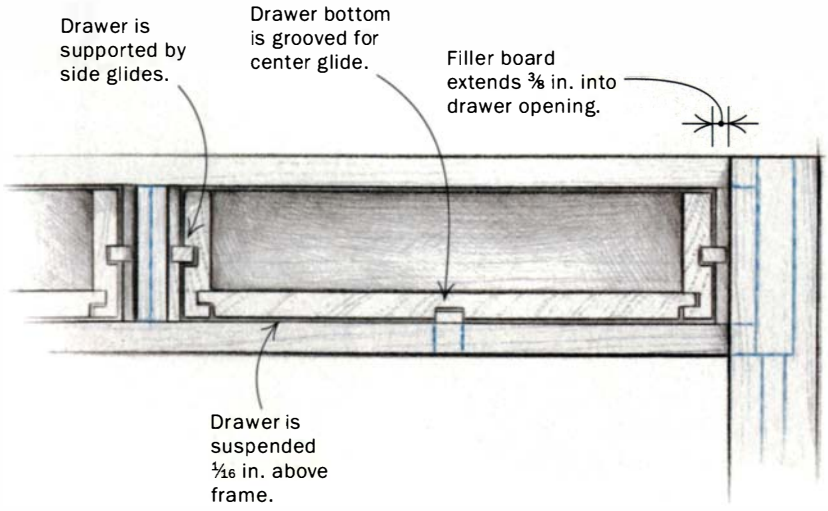
Frames are the starting point. *The author constructs two frames that will go above and below the drawers. The frames are simply biscuited together.*

The rear apron is biscuited to the frame assembly. *Note that the drawer dividers are already in place.*

Bring it all together. *The through-tenoned shelf, the biscuited frames and the ends are all assembled in one operation. The glue-up proceeds easily when it is done with the table upside down on a flat surface.*

Install drawer blocking and glides last





together. It was easiest to glue up the table upside down on a flat surface. One nice thing about using preassembled frames is that, at glue-up, it took only a few clamps to pull everything closed.

Install the drawer glides

I know that secondary woods and plywood drawer bottoms might be acceptable when building furniture, but I can't help myself—I love the sound and feel of a heavy oak drawer seating itself smoothly into place. And, as I mentioned before, I ordered the lumber in bulk, so using oak as the secondary wood allowed me to use up some of the less-desirable pieces.

The method I use for building and installing drawers is one I've relied on many times. While I could have let the drawers

Block out the ends. *The ends of the table are blocked out with a board grooved to accept the drawer glides.*

Glides span the dividers. *Center dividers are sandwiched between two filler boards that house the drawer glides.*

Insert the drawer glides and install the center glide. *Glue the drawer glides in place and mount the center glide on the lower drawer frame. The center glide ensures that the drawer tracks correctly.*

ride on the frames alone, I prefer drawers that have a bottom glide and are side-hung. Using three wooden glides, it is simple to make small adjustments to the fit and to the drawer reveal, even before anything is installed.

My first step was to make the drawers themselves. I used a box-joint sled on a tablesaw (see *FWW* #148, pp. 60-63) to construct simple finger-jointed boxes that will receive false fronts once installed. I left the drawers about 1 in. shy of full length (from front apron to rear apron) to accommodate the drawer fronts and to allow some room for adjustments.

Once the drawers were glued up—and it is essential that there be no twist in the drawer—I used a dado setup on the tablesaw to plow grooves in the two sides and along the center of the ¾-in.-thick drawer bottom. After that, it was time to install the glides. Essentially, I was simply blocking out the ends and the voids between the dividers, then setting glides into grooves. The glides can be sized and adjusted to fit the drawers before any glue has been applied, but it's important to get a perfect fit before securing them permanently. A few small screws or brads are all it takes to attach the glides. Once everything is in place, the grooved drawers should ride smoothly along the glides. Then it was a simple matter of gluing the drawer fronts to the drawer boxes.

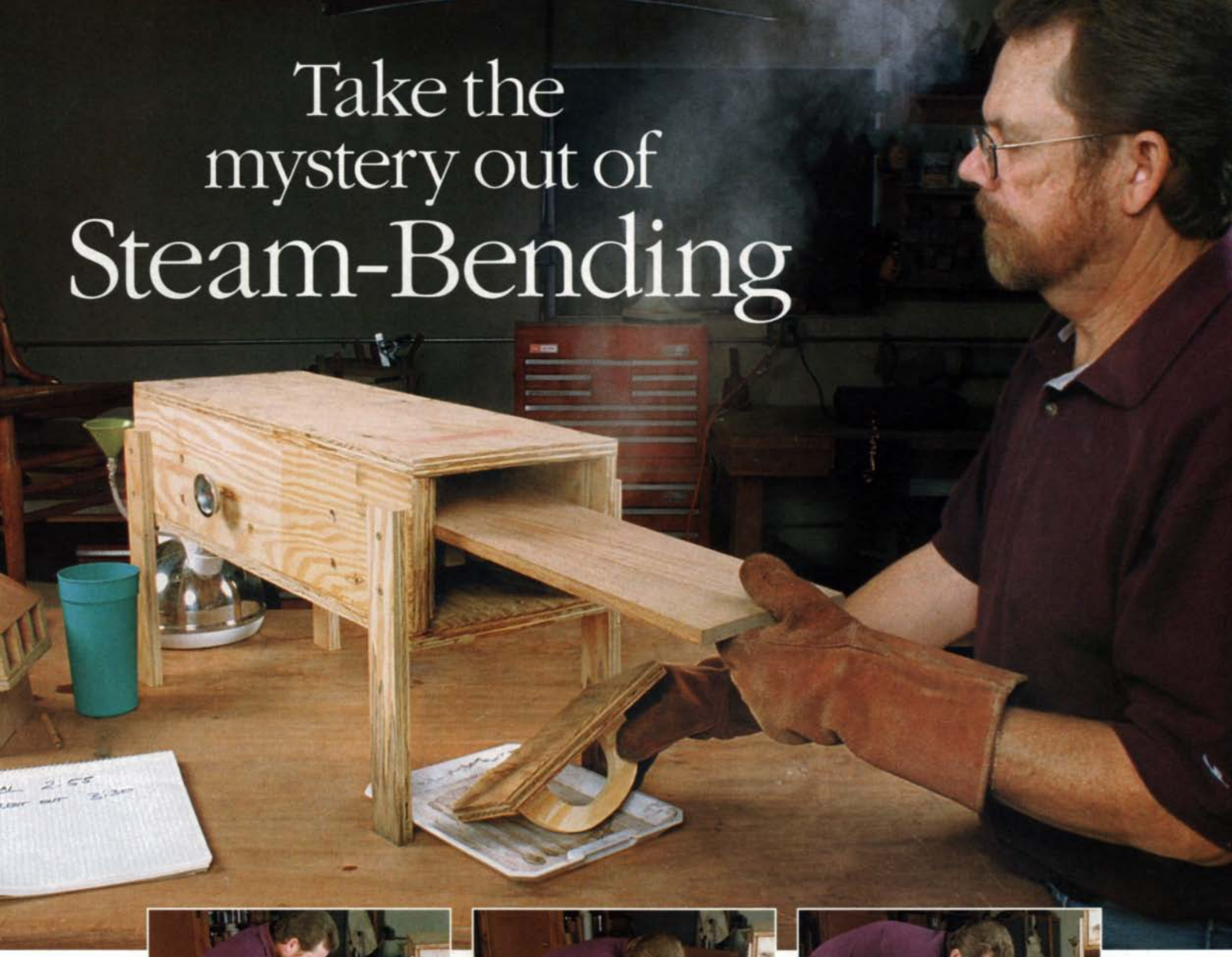
Because I use a spray setup for finishing, I sprayed the top and base separately, because it's easier to spray the base when you don't have to work into corners or worry about overspray. I coated the piece with a mix of Minwax stains and let it sit for a week. I then sprayed on two coats of flat lacquer.

The tabletop itself was screwed directly to the frames. It was fixed at the center with screws, and then the front and back were screwed into elongated holes—which allow for seasonal movement—through the upper frame. The drawer fronts, likewise, were simply attached with screws.

A final touch was the hand-hammered copper pulls (see the back cover) from Gerald Rucks. With the solid drawers, smooth-running glides and the authentic pulls, the desk is a pleasure to use. □

Eric Keil builds custom furniture and cabinetry in Wilkes-Barre, Pa.

Take the mystery out of Steam-Bending



It's not magic—all you need is a source of steam, a box and a reliable bending form

BY LON SCHLEINING

Steam-bending is fast, strong and authentic. You'll never see a glueline nor have a piece break because of short-grain weakness. Steam-bending does not require green wood. Nor does it require a vast array of tools. What it does require, though, is lots of heat, a box to capture steam and a sturdy bending form.

Once you realize that each of the components works in conjunction with the others, the setup for bending is straightforward. There is almost no limit to the parts you can make by steam-bending—chair parts, table legs, curved drawer parts—except your imagination. I usually start with a drawing of the finished part, then design a form to bend it, allowing for a bit of springback (how much the part relaxes after it's been bent). The size of the bending blank determines the size of the steambox you'll need to use. The larger the box, the larger the steam generator it takes to heat it, so the box should be only as large as necessary for the parts you plan to bend.

The easiest way to understand the basics of bending is to see it done, so for this article I'll demonstrate by bending the back slat for a chair. The slat is made of ½-in.-thick material, and the radius is not very tight, which makes this is a good bend to warm up on.

The bending techniques illustrated here will work for simple bends of a slight radius as well as for more complex bends using compression straps (for more on compression straps, see the story on pp. 82-83). Whatever bending you design into your projects, what you learn here should lay the groundwork for success. As you gain experience, your confidence in bending will build, and your designs will grow bolder.

The best wood for steam-bending

Many experts claim that you must use green or air-dried lumber for steam-bending, but in the Los Angeles area where I live, air-dried stock is not a convenient option. I've had no choice but to bend kiln-dried material, and the results have been quite successful.

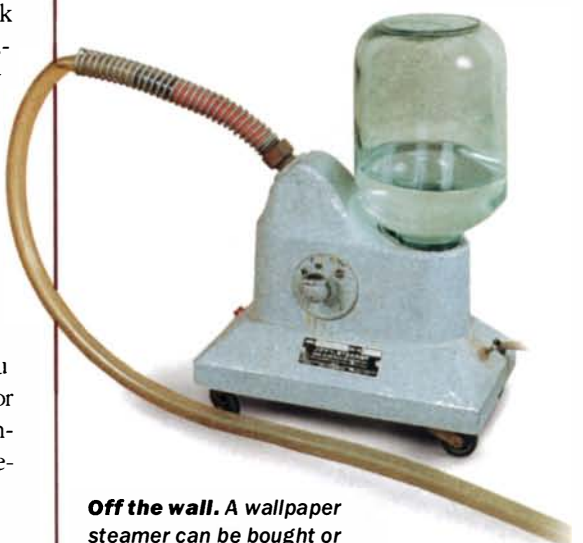
Kiln-dried wood is not only easily available, even if you live in the city, but it's also dimensionally stable, dry and ready to be milled as soon as bending is complete and the piece has had time to cool.

Any wood will bend somewhat, but long-grained woods such as hickory, ash

FIND A SOURCE OF STEAM

Off the shelf. *This kettle, available for $29.95 from Lee Valley Tools, comes with an extralong spout to accommodate a steambox.*

From the kitchen. *The author's electric deep fryer, on longtime loan from his mother, is outfitted with a frame to hold a steambox.*



Off the wall. *A wallpaper steamer can be bought or rented and provides a reliable source of steam.*

The boiler's size must be proportionate to the size of the steambox. The larger the box, the larger the boiler because more steam is required to keep the box as hot as it needs to be: at least 200°F. No matter how big the heat source is, the steambox will never get any hotter than 212°F as long as there is a pressure release in the box, creating the perfect temperature control.

If the steambox doesn't reach 200°F within 20 minutes or so, chances are your boiler is too small for the size box you're trying to heat. Often it's a matter of simply using two kettles instead of one to get the box up to temperature.

Electric heating is probably safer than devices that have an open flame, but as long as you are careful, any sort of heat source works fine.

The electric kettle available from Lee Valley Tools (800-871-8158) puts out a lot of heat for its small size. It is possible to rent or buy a wallpaper steamer. But an electric deep fryer is cheap (look for one in a thrift store) and puts out a great deal more heat than an electric cooking pot or wallpaper steamer. A two-burner propane steamer will heat a very large steambox but must be used outside only. Whatever sort of boiler you use, there must be a convenient way to add water. Even the small kettle goes through 2 qt. of water an hour.

For the outdoors. *This shopmade propane burner will put out an exceptional amount of steam, but because of its open flame, it should be used only outdoors.*

Photos: Matthew Teague

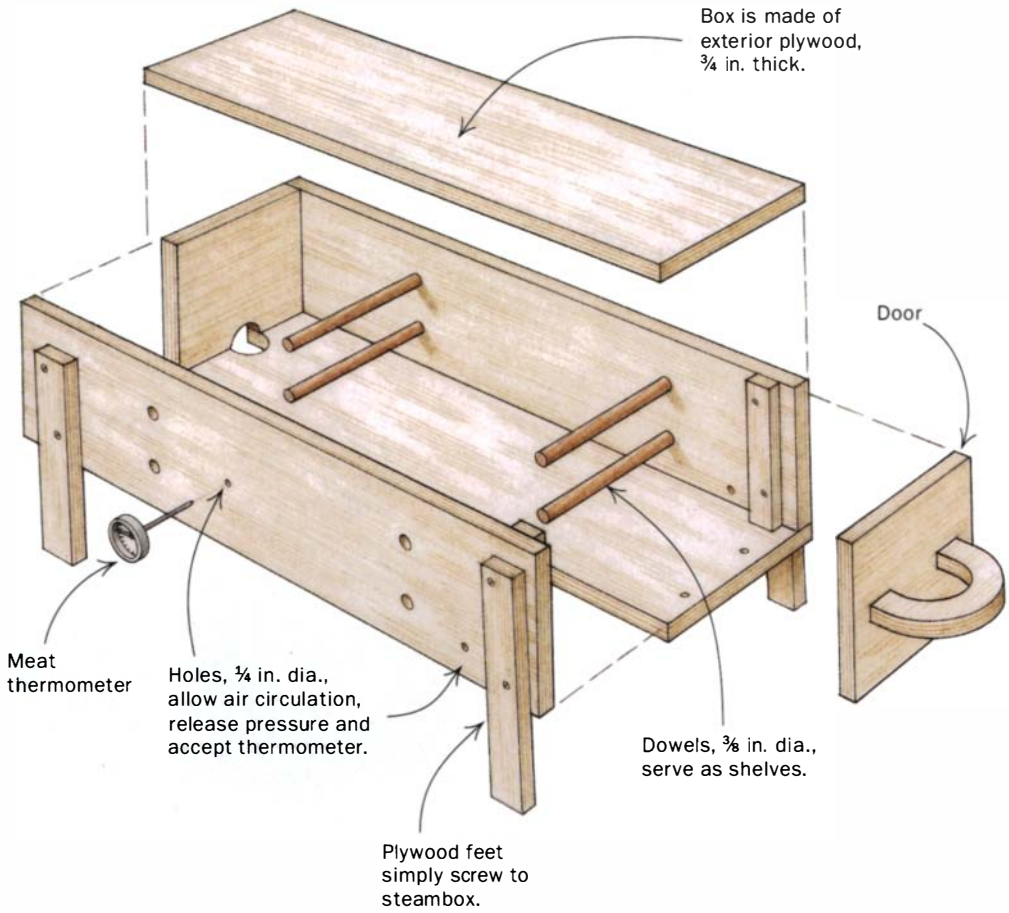
BUILD THE STEAMBOX

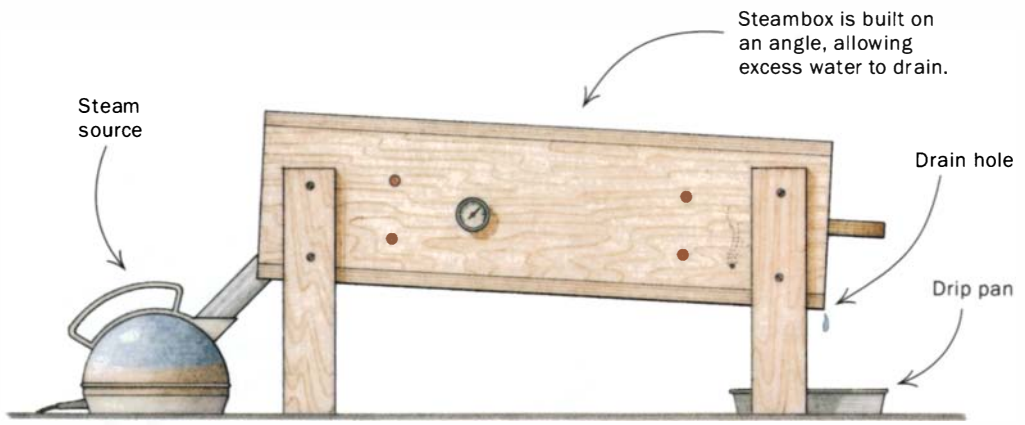
I typically use ¾-in. exterior plywood for the box itself. It's inexpensive and is fairly stable, even when it's steaming hot. Inside, dowels are used for racks, which allow the steam to circulate around all four sides of the blanks so that the heat will penetrate evenly.

Build the box only large enough for the number and sizes of parts you'll be bending at one time. I usually build a new box for every project.

The box should not be tightly sealed. Drill ¼-in. holes in several areas to provide access for a thermometer and to allow the steam to circulate. Use a common meat thermometer to measure the temperature in several places to make sure it's uniform. Resist the use of metal in steamboxes. Hot steam, hot wood and wet steel react in such a way as to turn the wood black.

Plastic pipe is a tempting material to use as a steambox. It works okay, but as it heats, it also softens. Unless its entire length is supported in a wooden V-trough, it will sag in the middle. It also lets heat easily escape, so you might need to insulate it. As with a wooden box, use dowels for racks to hold the pieces away from the sides and bottom of the pipe and to allow air to circulate.





Keep water in the pot. *When using this small electric kettle, the author adds water often, ensuring that there's plenty of steam to keep the temperature inside the box above 200°F.*

Take note of the the time. *Once the blanks are inside the steambox, monitor the temperature and note the time it reaches 200°F.*

Drawings: Vince Babak

and oak bend easiest. Dense woods, such as cherry, hard maple and most exotics, are certainly more challenging. Ideally, wood for steam-bending should have straight grain, which enables you to bend without stressing the areas already weakened by grain direction. I suggest starting with oak, because it is much easier to bend than most other species.

Predicting springback is not an exact science

If at all possible, use a full-sized drawing of the part to help design the bending form. Be sure to take into account that the shape will relax, or spring back, somewhat after it's been bent. Build some overbend into the form so that the part will relax to the shape you want.

Numerous factors affect springback, such as the radius, the thickness of the part, degree of bend, how quickly the part is bent, how long it was steamed, how long it stayed on the form to cool, the type of wood and its moisture content. The bad news is that if you're going to bend just a couple of parts, you'll have a difficult time predicting the amount of springback.

The rule of thumb is to allow for more—rather than less—springback than you expect. While a piece that has been overbent can be straightened out easily, it is nearly impossible to add more bend after your initial effort.

It's quite easy to straighten out the piece a little if it's bent too far. A wet rag placed on the concave part of the bend will straighten it out some. Heating the part with a hair dryer will accelerate the process. Do not try to bend the part just a little more once it's cooled—it will break almost every time.

Make a practice run before bending a piece

Begin by cutting several practice blanks out of oak. To determine grain runout, hold up the blanks so that light reflects along the surface of the edge that will be curved. The straighter the grain, the better. Oddly, it seems to make little difference how the end grain is oriented: whether vertically, flat or diagonally.

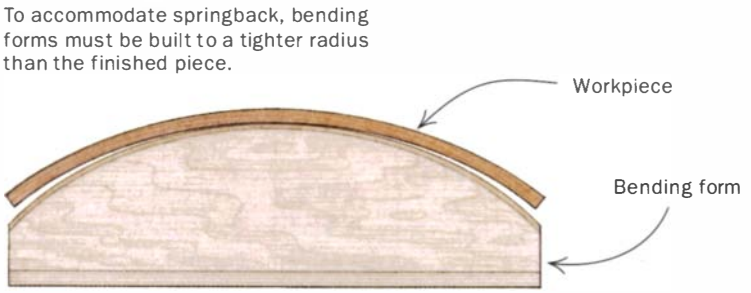
I usually load the blanks into the box while it's cool so that I don't have to work around the steam any more than necessary. Once the pieces are in place, close the lid, plug in the boiler and wait for the temper-

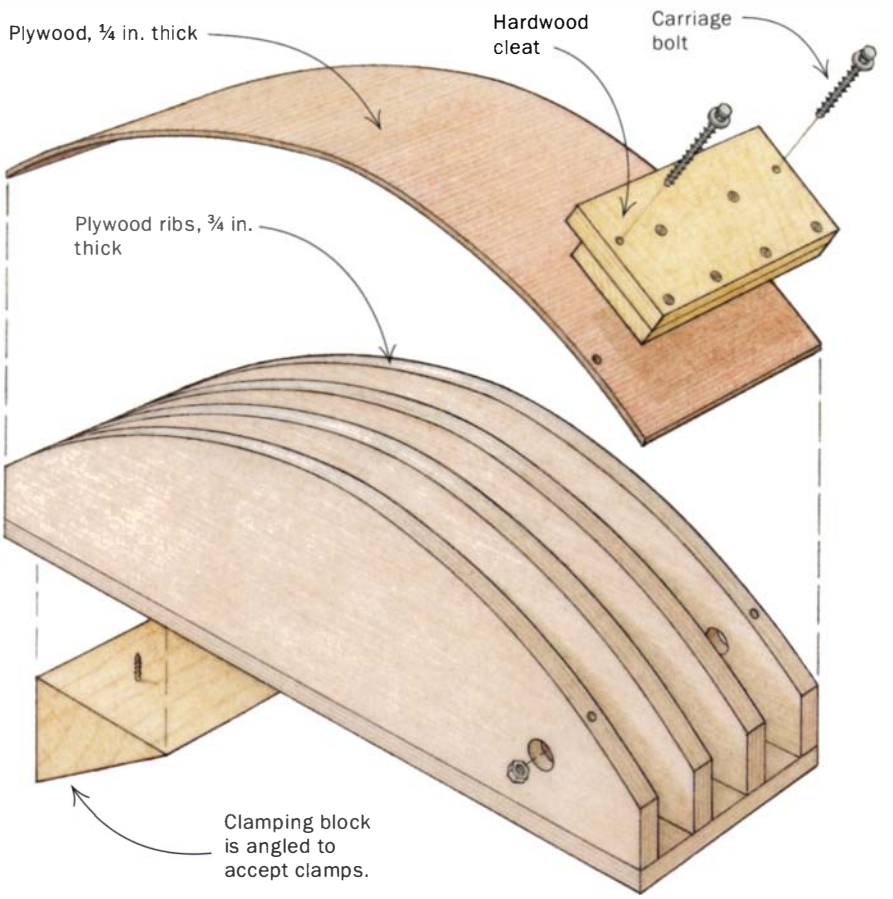
MAKE A STURDY BENDING FORM

The form serves as a mold for the shape of the part being bent. I usually draw the part full sized so that I can plan the form accordingly. The drawing shows both finished and rough sizes for the part and serves as a map for building the form. This is the time to build in overbend to allow for springback.

Use layers of plywood shaped like your drawing to build the form. Any flaw in the curvature here will telegraph into the final product, so shape carefully. Clamp pockets or a wedge system provide a means to clamp quickly. Speed is important because of the limited time the part will stay hot enough to bend.

Add a cleat of some kind so that the form can be held securely to a bench. Build the form stronger than you think it needs to be. It must absorb the stress of bending.





ature in the box to rise above 200°F. Check the temperature with a thermometer in several spots to make sure it's uniform. Note the time when the box reaches the correct temperature.

Because the heat must penetrate to the core of the material, monitor the temperature throughout steaming; add water as needed. Remember, it's heat, not moisture, that allows the piece to bend. Wood should be steamed for one hour per inch of thickness. For a ½-in.-thick chair back, leave the piece in the steam for a half-hour—or just a bit longer. If wood stays in the steamer too long, it begins to get dry and brittle and becomes harder to work.

When the blank comes out of the box, it will be very hot. When I work around steam, I wear gloves that cover my forearms. Once the piece is out of the steambox, it cools rapidly, so bending must be done immediately. It's important to work both quickly and deliberately—quickly to begin bending, deliberately to get the right shape. Don't force it. Give stock time to get used to the idea that its surfaces are changing length. After a few tries, you'll begin to develop a feel for the material and become a better judge of how quickly or how slowly you need to go.

Use clamps or wedges to hold the part on the form while it cools. You want to be sure that the piece has had time to dry completely before you remove it from the form. Whenever possible, let the piece cool for 24 hours.

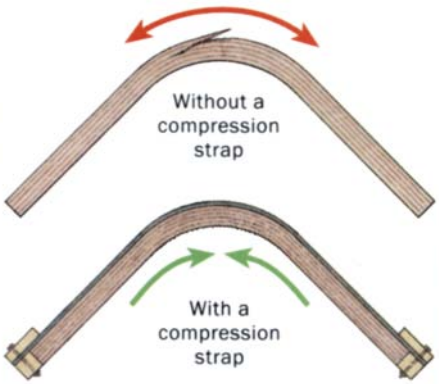
When the part comes off the form, it will spring back a bit. If the curve is correct, congratulations. If it's bent too much, use a hair dryer and a wet cloth as described on p. 81. If it's not bent far enough, start from scratch and make a new bending form with more curvature in it. Once the kinks have been worked out, make a series of cooling forms, which will enable you to bend a number of pieces in assembly line fashion.

Bending wood is not the answer to every woodworking application, but in certain situations, it's the only viable option. With careful setup, it's also a simple task. And no matter how many times I do it, I'm amazed when a blank comes out of a steambox so pliable that I can bend it into a knot. □

Lon Schleining is the author of "Treasure Chests," a forthcoming book from The Taunton Press. His video, Steam Bending, *is also available from The Taunton Press.*

Compression straps aid tricky bends

HOW IT WORKS



When making dramatic bends without a compression strap, the outer surface stretches and often fails. But using a compression strap limits the stretching of the outside surface and forces the piece to compress on its inside surface.

Simply put, bending changes the lengths of the inside and outside surfaces of a piece, and does so quite significantly. Left to its own devices, wood will naturally try to stretch on the outside (convex surface) before it tries to compress on the inside (convex surface). If it stretches much beyond 10% of its total length, fibers begin to tear apart; the typical steam-bending failure. Enter the amazingly simple compression strap. Even the hardest bends, such as the hoop for a Windsor side chair, are simple when you use a compression strap.

It's fast and easy to make a basic compression strap, but commercially built straps are available as well (Lee Valley Tools—800-871-8158). You can gather the necessary materials—some nuts and bolts, some galvanized metal strapping—from a home center, and then you'll need only a drill press and a few scraps of oak. Use at least ¼-in.-dia. bolts to fasten the strapping to the blocks. Galvanized metal is a good choice for bracing material because it won't turn the oak black as uncoated steel can.

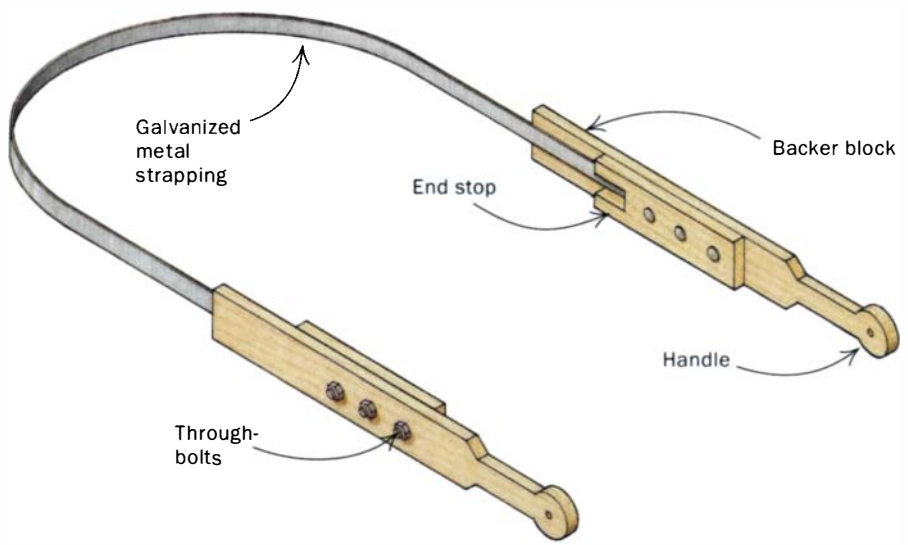
Using a 1-in.-square by 42-in.-long chair back as an example, start with a simple full-sized drawing. It makes cutting out and assembling the parts more straightforward.

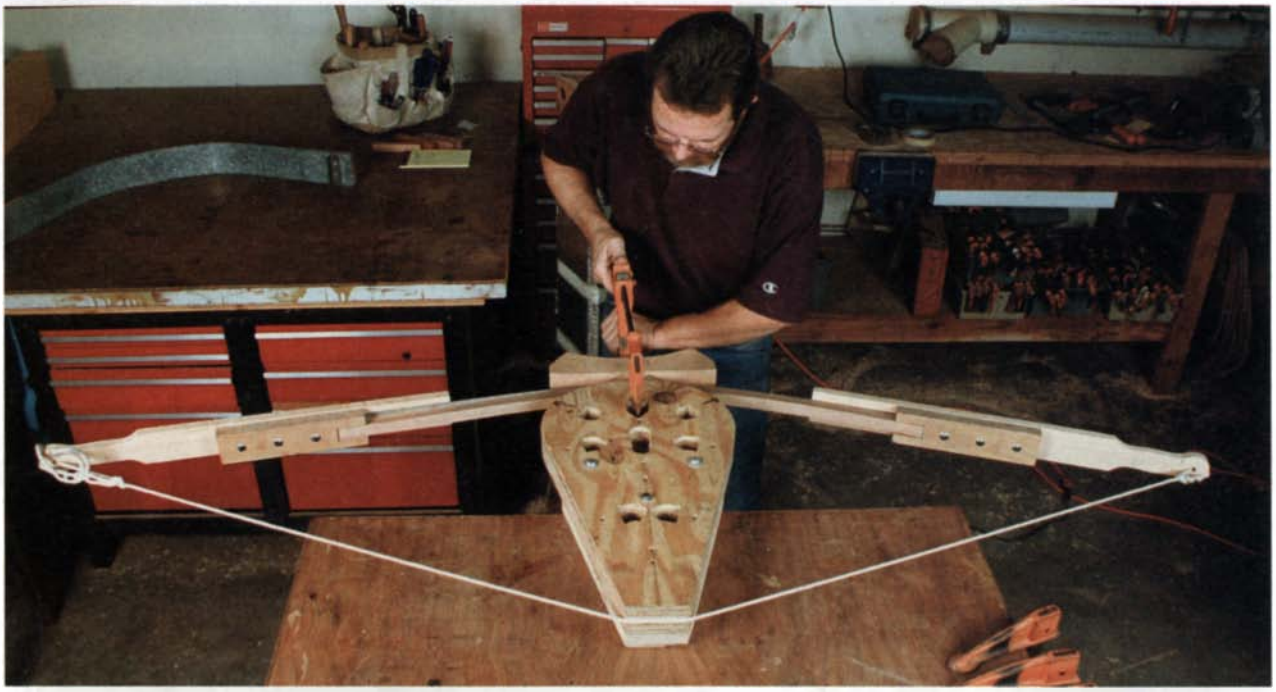
Build the strap as strong as you can manage and then some. It's easy to underestimate the tremendous end pressure you'll generate. Imagine shortening a 1-in.-square by 42-in.-long piece of oak by a couple of inches. Sound unrealistic? But this is exactly what must happen when the piece is bent 180°. Sometimes, just for fun, I place a coin in the strap between the part and the end stop. The coin imprints so deeply into the end grain that you can almost read the date.

Backer blocks will help keep the part from jumping out of the end stops as the end pressure builds during bending. By combining them with long handles for better leverage, you do two jobs at once.

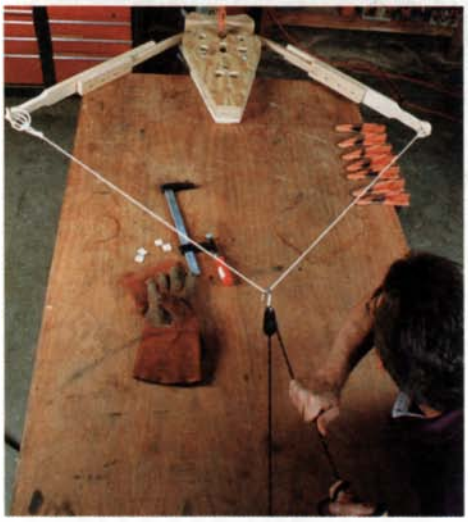
Be sure to use a center punch to drill

COMPONENTS OF A STRAP





Beginning the bend. *With the form screwed to a work surface, load the blank into the compression strap and clamp it in place.*



Pulley system lends a hand. *Because the author typically works alone, he gains leverage by using a pulley system, made from an inexpensive block and tackle bought from the hardware store.*

Clamps ease the bend. *As the bend progresses, clamps help pull up the blank. Once the bend is complete, the assembly stays on the bending form for only a few minutes.*

Cooling forms save space. *Once the bend is complete, a cooling form, made of MDF, is a good way to store the piece for cooling overnight. Using cooling forms also enables you to bend other blanks almost immediately.*

the holes in the strapping metal. Otherwise, the drill will wander across the surface of the strap before it begins to take hold. Regular twist drills will go through the steel just fine.

Cut out the pieces, then round all of the sharp edges so you don't cut yourself. Drill holes for the bolts, tighten up everything, and that's all there is to it.

Using compression requires loading the blank into a compression strap before bending. Place the hot blank in the strap between the end blocks and add shims at the ends so that the piece is securely wedged into the strap. Then use the handles on the strap to bend the part.

COOLING FORMS REQUIRED

As soon as the bend is completed, take the part off the form and clamp it into a cooling form. A cooling form keeps the part in its final shape while it cools. The cooling form allows you to bend numerous blanks—one every few minutes—using a single bending form.

I build cooling forms out of plywood or particleboard, using more curvature than the final part needs but less than the bending form. Cooling forms are an easy way to achieve a greater degree of accuracy with the final shape.

It's likely the bends you commonly see in furniture were made with a compression strap, not just by bending the part unaided. Though it seems like a lot of trouble to build a strap, the process of bending even severe shapes goes from nearly impossible to very straightforward almost instantly.

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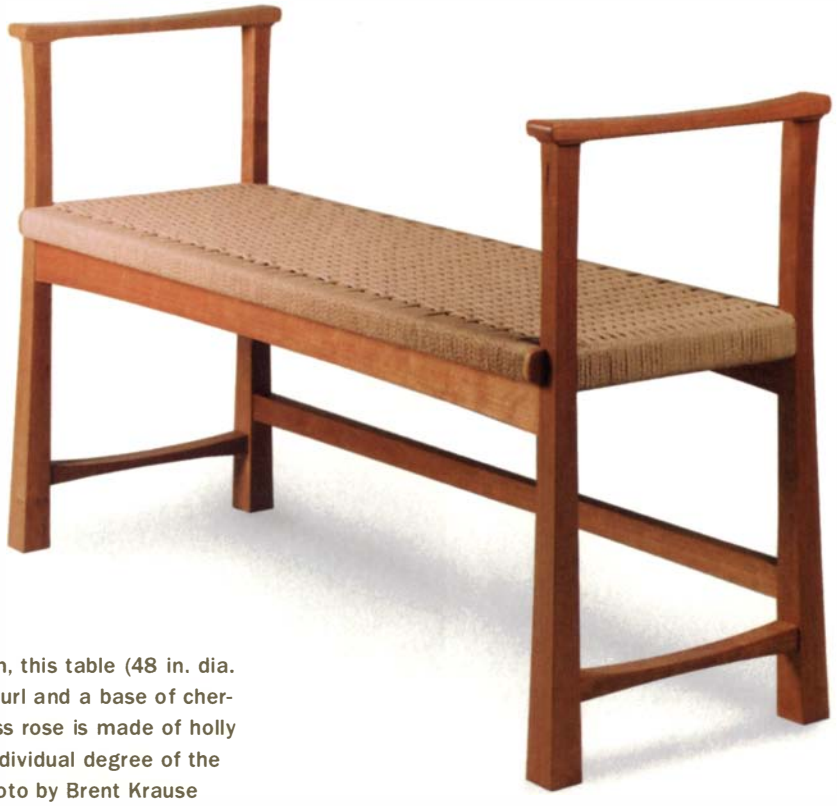
Mark Edmundson

Edmundson made this cherry bench (16 in. deep by 42 in. wide by 27 in. tall) while on break from the College of the Redwoods, where he studied under James Krenov. The bench has an oil finish and features a Danish cord weaved seat. The style borrows from a chair designed by Carl Malmsten, under whom Krenov studied. Photo by Seth Janofsky



Jeff Tucker

Made for a beach-house entertainment room, this table (48 in. dia. by 30 in. tall) has a top made of madrone burl and a base of cherry and curly cherry. The veneer inlay compass rose is made of holly and ebony. The outer ring marks off each individual degree of the compass. The table has a lacquer finish. Photo by Brent Krause

Michael Gordon

Gordon began this piece (8 in. by 8 in.) by turning the upper and lower sections out of curly maple. He then drilled holes into each piece and glued the vertical staves in place. The basket section was woven of dyed reed. Photo by Paul Rogers

Greg Bodnar

Bodnar got the idea for this jewelry box while drawing a chest of drawers that incorporated the legs sculpturally into the piece. The jewelry box (10½ in. deep by 21 in. wide by 9½ in. tall), built using hand tools, is made of mahogany with the drawer faces carved from lacewood. The finish is an oil varnish.

Timothy McKibben

Based on a piece that appears in Jeffrey P. Greene's *American Furniture of the 18th Century* (The Taunton Press, 1996), McKibben built this William and Mary highboy as a project for Palomar College's hand-tool joinery and veneering classes. The highboy (22 in. deep by 38 in. wide by 68 in. tall) is made of beech, poplar, cherry, cherry veneer, madrone burl veneer and tulipwood banding. The upper and lower cases were finished with milk paint and shellac, while the legs were stained a darker color for contrast.

Lawrence O. Baum Jr.

Built to go behind a sofa, this table (17 in. deep by 54 in. wide by 27 in. tall) is made of figured curly oak, wenge and ebony. Baum's design intention was to make the top float mysteriously above curved and tapered legs. "In ordinary room light," said Baum, "the top supports disappear, and it does seem to float." Photo by Karen Miller

John Nesset

Nesset was commissioned to make this piece for a couple in Minnesota who live in a Frank Lloyd Wright-style home. The horizontal lines and cantilevered top of the sideboard, which is used to store heirloom silver, mimics the couple's home. Made of black walnut, ebony and plate glass, this display cabinet (23 in. deep by 96 in. wide by 37 in. tall) features a combination of bridle, wedge and compound-wedge joinery. It has an oil wax and wax finish.
Photo by John Posl

Bruce VanSledright

VanSledright designed this piece to match a dining table that belongs to his client, an artist who appreciates Arts and Crafts furniture. The linen press (15⅛ in. deep by 26 in. wide by 45 in. tall) is made of quarter- and flatsawn curly white oak. It displays typical Craftsman features, such as pegged or wedged mortise-and-tenon joinery, hefty components and flat panels. The finish is linseed oil, superblond shellac and wax.

Thomas Grace

This Pennsylvania spice box (11 in. deep by 15 in. wide by 23 in. tall) was made from walnut that Grace found in his brother's woodpile. Likewise, the tiger-maple drawer fronts came from his father's firewood stack. The piece contains three secret compartments and is finished with oil.

Todd Panabaker

Made of cherry with northern white ash drawer sides, this lingerie cabinet (16 in. deep by 20 in. wide by 58 in. tall) was made as part of a bedroom set. Panabaker's inclusion of the saber-feet design was inspired by Mario Rodriguez's article "Where Furniture Meets the Floor" (*FWW* #135, pp. 42-47). The finish on this Shaker-style cabinet is a wiped-on polyurethane.

King Heiple

Inspired by one of Ernie Conover's designs, Heiple's tool cabinet (15 in. deep by 36 in. wide by 17 in. tall) is made of black walnut and quartersawn white oak. The knobs were all turned from cocobolo, and the hardware is brass. Heiple also made the legs removable in case he should ever want to use the cabinet as a chest-on-chest.

Charles J. Morehouse

This Chippendale chair (17¾ in. deep by 20½ in. wide by 38 in. tall) is made of mahogany and finished with a brown mahogany oil stain and gloss lacquer. Morehouse, having recently become fascinated with the Queen Anne and Chippendale styles, began work on this chair after reading Eugene E. Landon's article "Making the Chippendale Chair" (*FWW* #60, pp. 38-45).

Tips for photographing your furniture

1. *Use 35mm color print (negative) film of moderate speed (ISO 200-400).*
2. *Clean and dust the furniture.*
3. *The furniture will appear more three-dimensional if it is lit so that each plane has a different brightness. Take care, however, to avoid excessively bright highlights or dark shadows.*
4. *To be sure the photos will be free of distortion, avoid the use of wide-angle lenses, and photograph with the camera positioned even with the center of the furniture both vertically and horizontally.*
5. *Photograph the furniture from several angles. Include some head-on shots, as well as some shots that show both the front and side of a piece.*
6. *Keep the background simple. A cluttered or otherwise distracting background may draw the viewer's attention away from the subject.*

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Rules of Thumb

BY PHILIP C. LOWE

Keep track of your progress with squiggles and lines

One of my clients came into the shop one day very excited about an 18th-century desk with bookcase that he had just purchased and the fact that the desk had a signature beautifully written in faint chalk on the underside of its bottom panel. Curious to see who the maker was, we laid the desk on padded sawhorses and took a close look. Lo and behold, the famous maker turned out to be "BOTTOM." What the client thought was a signature simply was a cabinetmaker's notation used to keep track of the many parts and mating joints. Upon further snooping, we turned up markings that indicated the top and bottom of the bookcase, again artfully written in chalk in inconspicuous places.

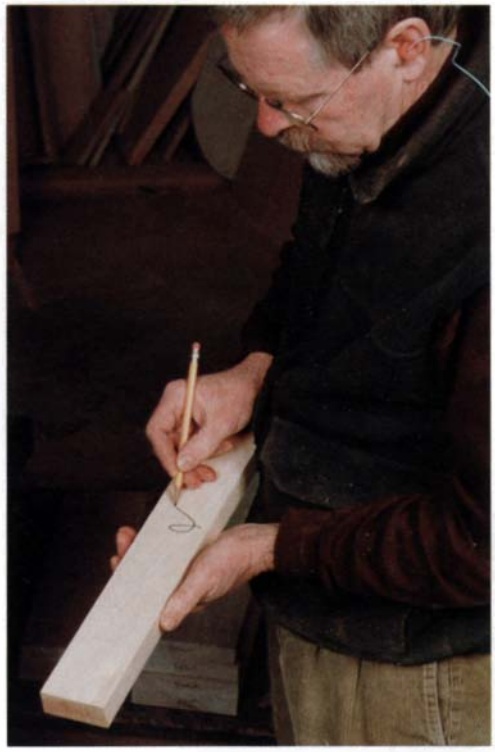
That early American furniture maker knew something that every woodworker today eventually learns: If you don't mark your parts as you progress through a job, you'll waste time trying to remember what goes where and what you have already done to which parts. You also will make costly mistakes, such as ripping a board with a roughsawn edge against the fence or placing the out-of-square end against a stop when crosscutting a board to length. The accumulation of mistakes like these builds larger inaccuracies into your project, creating problems that become too big to correct later on. Keeping track of reference surfaces is a big step toward elevating the quality of your work. The time you spend up front making a few marks and squiggles will pay for itself many times over.

The exact way that you keep track of parts and processes is up to you. The trick is to have a marking system that is easy to understand and that can be recognized at a glance. I label parts as I work through the milling, joinery and assembly of a piece.

Cut and mill stock, labeling parts as you go

Following a stock list, I cut all of the parts to rough width and length. As I go I label each part—rail, stile, top, bottom or panel—on the end grain (this way it will not be planed off during milling).

Once the rough cutting is complete, I step to the jointer and flatten one surface. I put a squiggle on this surface so that I can keep track of it as I mill. On the planer, once the other rough side has been planed flat, I alternate the surfaces as I thickness the board, to try and remove an equal amount of material from both (boards tend to move if all of the material is planed from one side). The squiggle mark is removed, but I don't need it anymore.



Develop your own marking system. *These simple symbols allow you to keep track of what's been done during the course of the project. After he begins milling stock, the author marks the first jointed face with a small squiggle.*

After the board has been thicknessed, one edge is run through the jointer. *A straight line marks the square corner between the jointed edge and the face that ran against the fence.*

Two small lines mark the first squarely cut ends. *These ends will be placed against the stop when the pieces are cut to final length.*

After thicknessing, I joint an edge on each part. As I run each piece, the edge cut by the jointer knives is squared with the surface that runs against the fence. These are the two most important surfaces, and I mark each one with a straight line to indicate the square corner. I make the same marks when I use a jointer plane to straighten an edge. Next I rip the parts 1/16 in. wider than necessary, keeping the freshly jointed edge against the rip fence. This allows me to set the jointer to a 1/16-in. depth of cut to remove saw marks and to bring each piece to final width.

Matching panels—At this point, just before jointing the final edge, I match the boards that will be glued up into panels. I lay out

Photos: Asa Christiana

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each set of boards on two battens. I first want to match the grain so that the color differences and joints are as inconspicuous as possible. When I am happy with the match, I draw a large triangle on the first panel, spanning all of the joints. On the second panel I draw two lines across the first joint, three lines across the second and four lines across the third. If there is a third panel, I draw small triangles across the joints. This way all of the panels have separate markings and can be easily matched again if they become mixed.

For the parts that will be glued up into panels, I usually run alternating surfaces (grain allowing) against the jointer fence. If the fence is slightly out of square, this procedure will give me compensating angles between mating edges, ensuring that the panel ends up flat. The marks I made on the reference surfaces help me keep track of the process.

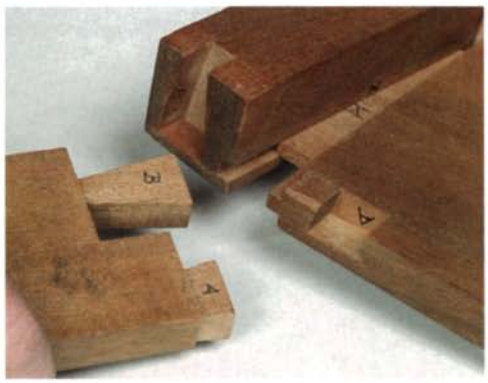
Panel boards are matched for appearance. *A large triangle records the order and placement. When gluing up multiple panels, use different marks to distinguish them.*

When cutting parts to length, I first cut each piece square on one end and then mark this cut end with a couple of lines. This way I know which end to rest against a stop when cutting parts to final length, ending up with both ends cut squarely.

A few marks deliver better joints

Joinery calls for its own set of marks. A few lines on a corner indicate which surface I use as a reference when laying out the mortise. A squiggle or an X marks the single surface or edge used to lay out a tenon. By using the same edge to lay out each part of a tenon, instead of flipping my square or marking gauge around to the other side of a board, I can be sure that I am laying out a square shoulder line, even if some of the other surfaces of the board are not perfectly square. This concept carries over to laying out and cutting many other joints, whether by hand or by machine.

Marking for reassembly—I always like to mark each corresponding mortise and tenon with small letters, numbers or Roman numerals. And I am careful to replace these marks if they get planed or sanded off later. The tenon cheek (after the tenon has been fit) is a good place for these markings. I also mark the mortise with a small symbol right alongside its opening, so the mark will get covered by the shoulder when the joint is assembled. On antique pieces I sometimes find the mortise and tenons marked in similar places with matching chisel cuts.



Place letters, numbers and Roman numerals in inconspicuous places to designate mating joints. *Here, a table leg is matched with a drawer rail and apron.*

When I dovetail a drawer or case, I need to know that the matching pins and tails go back together. So I use numbers or letters to mark the corresponding pins and tails in places that are easy to find but will be hidden when they are assembled.

A couple of other markings that I use and see quite frequently on antique pieces are the designation of surfaces—boldly written as "bottom" or "inside." These markings indicate what the part is or how it relates to the case or table.

Whatever markings you choose, the objective is to keep track of what you have done to each part and how each one relates to the overall scope of milling, layout or assembly. Squiggles, lines, triangles, letters, numbers or other personal hieroglyphics become your road map as you make your way through the construction of a piece of furniture.

Perhaps the most important markings of all are your signature and the date of completion, placed so they can help to identify and acknowledge your work for as long as the piece lasts. □

Last but not least are the furniture maker's signature and the date of completion. *These are placed in an out-of-the-way spot for future generations to discover.*

Q&A

Sawdust as a crack filler

I am building a mahogany dining-room table. I have saved the sawdust to use as a crack filler. When I mix it with yellow glue, the sawdust turns black and stays that way after it hardens. Should I be mixing the sawdust with something else?
—Jack Burres, Northridge, Calif.

Chris Minick replies: Shopmade sawdust filler does a great job filling in mistakes, natural defects and gaps in dovetails and other joinery. I don't use yellow glue for the binder, though. Instead I make the putty by mixing sawdust with whatever finish I am going to use for my first sealer coat. When both the sealer and the putty are made from the same resin, the light reflection, absorption and refraction of the patched surface and the sealed wood are identical. The patch virtually disappears.

I typically seal my projects with dewaxed shellac, so I use dewaxed shellac as the binder in my sawdust putty. But you can make sawdust putty with any common solvent-based wood finish (such as lacquer and varnish). However, putty made from oil-based varnish takes a very long time to dry (several days if the patch is deep). Also, because water-based finishes do not penetrate the wood surface, sawdust putty made with a water-based finish appears much darker than the surrounding wood, not unlike the putty you made with yellow glue.

Sawdust putty made with finish as the binder works great for projects that are not stained. If the wood is to be stained, liquid hide glue is the best binder to use. Hide glue will take stain much like wood. [Chris Minick is a consulting editor.]

Plans for period pieces

I want to build a copy of the Goddard-Townsend six-shell block-front secretary. Where can I find plans, measured drawings, articles and books on the subject? —Terry Hawkes, Highland, Mich.

Lonnie Bird replies: One of the challenges of building reproductions of period furniture is gathering dimensions, proportions, construction notes and other details. Adding to the difficulty is the fact that many outstanding examples of fine American antiques are inaccessible for close study because they're either part of a museum display or locked up in a private collection. But if you're willing to spend the time, you can usually gather enough information from several sources to build a piece of furniture that you're pleased with. Here's a list of sources I typically use and the process I follow:

Read a book—Books are an important part of the research process. Dover has reprinted many old publications that contain dimensioned drawings of early pieces. For example, *Masterpieces of Furniture* (Dover, 1974), written by Verna Cook Salomonsky in 1930, contains a description and measured drawing of a Newport six-shell block-front secretary attributed to John Goddard (plate No. 87). For a free catalog of Dover reprints, send a written request to Dover Publications, 31 East 2nd St., Mineola, NY 11501.

For a close-up study of carvings and other details, check out *Master Craftsmen of Newport* (Americana Press). This book includes more than 300 pages of exhaustive research on Newport furniture and includes hundreds of photos. *American Furniture in the Metropolitan Museum of Art* (Random House) also contains photos of a Newport secretary along with construction details.

Visit a museum—For inspiration there is nothing quite like viewing a piece firsthand. Although most museums won't allow you to measure or even touch the pieces on display, you can view them up close and examine details that may not be evident in a book.

Be sure to take your camera, along with some fast film. Most museums will allow you to take photos without a flash. Also,

FINISH-BASED FILLER

Sawdust putty makes a great filler for small cracks and defects like this hole left by a pin knot. *Shellac is the binder here—because it will also be used as the sealer coat—and the sawdust is cherry to match the board. After the repair has been sanded and the sealer coat applied, the small hole becomes much less obvious. Varnish, lacquer and even hide glue can also be used as putty binders, depending on the finishes that will follow.*

Photos: Michael Pekovich

bring supplies for note-taking and sketching.

Scale a photo and make a drawing—In addition to design details, dimensions often can be gathered from a good photo. It's important to work from a large, sharp image. Obviously, many books contain detailed photography, but the full-page ads in *Antiques* magazine are also a good source. Additionally, many museum book stores sell professional-quality photos.

If you know the height of a piece, you can scale a photo to find dimensions of individual elements. Divide the height of an object by its height in the photo to obtain a ratio you can use to find other dimensions. For example, to find the height of an ogee foot, measure its height in the photo and multiply by the ratio.

Scaling a photograph will get you close to the true dimensions, but it's best to follow this process with a full-scale drawing. A drawing ensures that the proportions look correct and the dimensions add up. I typically make a drawing on ¼-in. plywood so that I can stand it up for viewing.

Build a prototype—When constructing furniture elements with compound curves, such as ogee feet and the arms of chairs, I build prototypes. This allows me to study the lines and proportions. Sometimes I'll build two or three models, each with subtle changes, until I'm satisfied.

[Lonnie Bird teaches woodworking and builds reproductions of American antiques.]

The articles and ads in* Antiques *magazine contain many detailed photos of period furniture. *With a scale, a set of dividers and some basic math, dimensions can be approximated from these images.*

Wood's colorful chemistry

Why do some woods darken considerably when exposed to light and air?

—Ray Emerson, Boston, Mass.

Jon Arno replies: While this sounds like a simple question, it involves one of the most complex aspects of wood chemistry, namely wood extractives.

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the most recent or outermost layers are actively used to conduct sap. As this sapwood dies and becomes supplanted by new layers, the tree converts the dead inner tissue into heartwood.

Left unprotected, this internal dead tissue or heartwood would be vulnerable to invasion by decay organisms. So, to protect itself, the tree produces antiseptic compounds called extractives that are transported inward along the tree's horizontal conductive tissue, called rays, and then stored in the dead heartwood tissue.

You might say this process of heartwood conversion is the plant kingdom's version of embalming. In terms of the chemistry involved, these extractive compounds tend to be very complex, and their molecular structure differs from species to species. Like most antiseptic compounds, they are rather volatile or interactive when exposed to alien compounds. One common change that occurs in these extractives is the forming of pigments.

In many species, the internal chemistry of the tree itself causes these pigments to form while the heartwood is still embedded in the tree. With still others, such as purpleheart, the pigments don't fully materialize until the log has been milled and the extractives exposed to the oxygen in the air. In a few species, such as cherry, the extractives are photosensitive, and light functions as the primary catalyst in causing the pigments to form.

In virtually all woods, however, the sapwood fails to develop the same pigments because it lacks the necessary extractives to initiate the process.

All species oxidize to some extent, darken over time and develop an aged patina. Eastern white pine becomes darker until, after many generations, it has become a warm orange, hence the term "pumpkin pine" used by antique dealers to describe country-style pieces. Oxidation is a problem for restorers, when new wood must be doctored to match old wood. Oxidation is also responsible for obscuring the beautiful purple highlights in the heartwood of freshly cut, air-dried walnut.

[Jon Arno is a wood technologist and wood consultant in Troy, Mich.]

All wood species are sensitive to oxygen and tend to darken with age, but cherry is also very sensitive to light. *A roughsawn cherry board is much lighter just a few plane strokes beneath its surface.*

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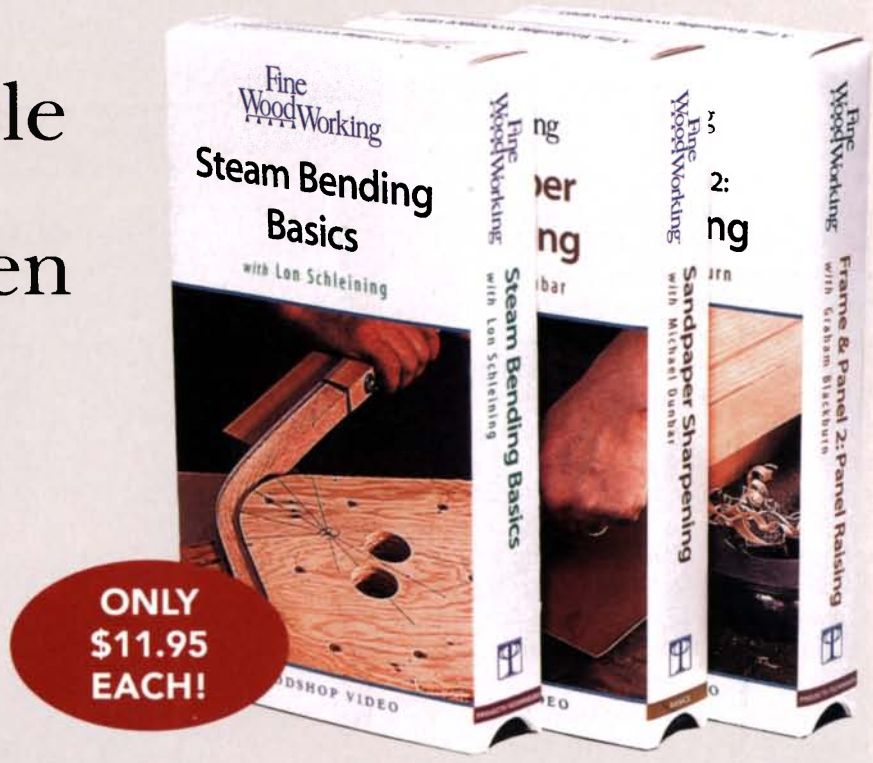

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BY DARRYL KEIL

Coaxing veneer over the edge

Is it a solid top or is it veneer? *With a vacuum press, veneer may be coaxed to do what seems impossible, such as conform to a profiled edge on a round tabletop.*

Lumber with stunning figure is becoming increasingly difficult to find. Bird's-eye maple is one example. Savvy loggers know which trees to cull for veneer mills, which will fetch them more dollars per log than wood destined for the lumberyard. Furniture makers seeking spectacular figure sometimes must go with veneer or settle for less showy wood.

I recently veneered a table with bird's-eye maple. The veneer I found was saturated with bird's eyes. But I wanted the top to resemble a solid slab and not be framed or edge-banded, common construction methods when using veneer. Using a vacuum press, I was able to bend the veneer around the profiled edge of the substrate to create the look of a solid top.

Shaping veneer this way isn't the easiest trick in the book, and certain woods take more kindly to this type of torture. I've found that close-grained woods, such as maple and cherry, work better than open-grained woods, such as mahogany and oak. Burls, by the way, are excellent choices for this kind of work because they will compress willingly. Whatever you use, I recommend making a practice run to get a feel for the procedure.

1. PREP THE VENEER

Glue the veneer edge to edge

Forcing veneer over an edge creates a lot of stress on the veneer. A table of this size (30-in.-dia. top with a ¾-in.-radius roundover) requires several pieces of veneer joined together to make up the width. In typical veneering, sheets of veneer are simply taped together using special veneer tape. Then the assembled sheet is glued to a substrate—medium-density fiberboard (MDF) or good-quality plywood—tape-side up. Once the glue sets, the veneer tape is rewetted and scraped off, leaving behind a seamless surface.

A taped joint, however, cannot withstand the stresses of being molded over a profile. I solved this problem by first edge-gluing the sheets of veneer together.

Begin by taping the pieces of veneer edge to edge, in the usual way, using masking tape instead of veneer tape. Once

Veneer seams should be edge-glued. *Begin by temporarily joining the seams with masking tape.*

With the tape in place, fold back the veneer along the seams and apply yellow glue to the edges. *When the glue dries, remove the tape.*

Photos: Anatole Burkin

the joint has been taped, fold back the veneer on itself and run a light bead of yellow glue along the edge. Finally, unfold the veneer, clean off the squeeze-out and place an additional piece of masking tape to hold down the joint. Place the sheet on a nonstick surface and weight it down with something to keep it flat until the glue cures. Then peel off the masking tape and cut the glued-up sheet oversized, allowing for some material to be trimmed off after glue-up to the substrate.

Although edge-gluing veneer this way makes for extra work at the outset, a glued veneer joint is better than a taped joint and worth the effort for any type of veneering job. Additionally, working this way eliminates the time-consuming task of removing the veneer tape.

Glue up the flat section

In the first pressing, glue up the flat areas of the top and bottom of the tabletop. It's important to keep the profiled edge free of glue. Begin by masking off the edge of the substrate, keeping the tape about ½ in. from the beginning of the edge detail. Spread urea resin glue, then remove the masking tape and lay the veneer in place.

Then flip the panel upside down upon a caul, either a piece of melamine-coated particleboard or some other sheet good that's been covered with plastic to prevent it from sticking to the veneer. Next, spread glue (urea resin, again) on the underside of the substrate and lay down a lesser grade of veneer. Veneering both sides of the substrate is necessary to keep the panel stable.

Use just enough glue to leave a slight ridge when a finger is drawn across the substrate. The glue will migrate only about 1/16 in. beyond the area that was taped and won't interfere with the next step. Finally, slide this sandwich into the vacuum bag.

Force the veneer to conform

Once the first pressing has cured, you can move on to gluing the edge. Veneering a compound curve is challenging because the veneer does not want to bend in two directions at once. But it can be coaxed into submission with the right technique.

It's not necessary to cut darts in the veneer to help it conform. Because a vacuum press supports the veneer evenly around the entire top, the wood fibers on the edge

2. GLUE EVERYTHING BUT THE EDGES

Mask off the perimeter of the substrate. *Keep the tape about ½ in. from the edge of the profile.*

Spread glue inside the taped section. *Then remove the tape and wipe off any glue that may have strayed to the edge.*

Place the oversized veneer atop the substrate. *Flip the assembly onto a caul that has a nonstick surface or use plastic wrap.*

With cauls on both sides of the assembly, slip it into the vacuum bag. *Remember to glue a backer sheet of veneer to the underside of the tabletop.*

can be compressed enough to eliminate most of the wrinkling and creasing that naturally occur at the onset of the process.

Before gluing the edge, trim the backside veneer flush to the substrate. Then trim the face-side veneer close to the size of the top, allowing for the edge. The less the veneer ends up overhanging, the less it tends to wrinkle.

First apply a light coat of plastic resin glue to the substrate and to the underside of the veneer. The water in the plastic resin glue makes the veneer more pliable. Plastic resin is a two-part glue that has a good open time but dries very hard and will prevent the veneer from creeping. Use a brush to get the glue deep into the crevice.

Next, lightly wet the veneer along the edge with water. A plant mister or sponge works well. This also helps further soften the veneer and makes it pliable. But don't get carried away. If too much water gets into the wood cells, there won't be any place for the glue to go.

Before sliding the glue-up into the vacuum bag, place the workpiece (good-side up) atop a piece of 2-in. rigid insulation foam (available at lumberyards), cut to a slightly smaller diameter than the tabletop. The foam raises the workpiece, allowing the vacuum bag to wrap itself around the edge and apply sufficient pressure.

Next, turn on the vacuum pump and let it run briefly, just long enough for the veneer to begin buckling. It will look like a disaster in the making, but don't worry. Use a wallpaper roller and massage away at the wrinkles, which will compress the wood fibers.

After rolling the perimeter once, increase the vacuum, stop the machine and massage some more. Repeat this process, probably five or six times, until you have the veneer worked all the way over the edge. Let the press go to full vacuum and roll the edges one last time. You won't get a perfectly smooth edge; the aim is to get most of it smooth.

Once the glue has cured, remove the overhang on the underside with a router or laminate trimmer fitted with a flush-trimming bit. Invariably the rolled edge will have a few wrinkles where the veneer has folded over on itself. These may be sanded smooth. Be prepared to do a little color blending with dyes or touch-up sticks where wrinkles were sanded out. □

3. GLUE AND ROLL THE EDGES

After the first pressing, the edge is prepared for gluing. *First, spread plastic resin glue around the edge and deep into the crevice.*

Place the workpiece on a piece of rigid foam. *Dampen the veneer along the edge and slide the assembly into the vacuum bag.*

Start the vacuum pump, but shut it off when the veneer just starts to bend. *Massage away the wrinkles along the top edge using a wallpaper roller. Run the pump a little more, stop it and roll over the wrinkles. Repeat as needed.*

Once the glue has cured, clean up the edge. *A router or laminate trimmer equipped with a flush-trimming bit will do the job.*

A few wrinkles are inevitable. *They may be sanded away, leaving the edge smooth.*

WOODWORKER'S MART

See ad index on page **112** for reader service number.

WOODWORKER'S MART

See ad index on page 112 for reader service number.

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INDEX TO ADVERTISERS

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BY TERI MASASCHI

A revolutionary way to French-polish

A new way to a classic finish. *The French polish on this table was applied using Abralon, a new type of abrasive pad.*

In the sometimes-arcane world of finishing, few techniques are more mysterious than that of French polishing. While most woodworkers revere the thin-glaze, high-gloss look that this method yields, they are less fond of the labor and time involved.

My method of French polishing, which uses a product new to woodworking, is revolutionary. It produces a surface that a traditional finisher would be proud of in a fraction of the time and with far lest effort than with the traditional method.

A new kind of pad

Before starting my French-polishing method, the surface must be prepared. For close-grained woods, dry-sand through 400 grit, then dampen the wood to raise the grain. When it dries, resand again through 400 grit. For open-grained woods, use grain filler to fill the pores and then dry-sand through 400 grit. This is where my new method parts company with the traditional way.

The new product, called Abralon and made by Mirka Abrasives Inc., originally was designed to smooth out gel coats on fiberglass camper shells and boats. The product also works beautifully on wood coatings. An Abralon polishing pad consists of a ¼-in.-thick disc of laminated silicon-carbide mesh (grits range from 180 up to 4,000) and a ½-in.-thick interface foam pad. The abrasive discs are 6 in. dia., but the foam pads, which help cushion the sanding, come in 5-in. and 6-in. sizes. The setup can be used with 5-in. and 6-in. sanders.

I use a 5-in. variable-speed random-orbit sander with a 6-in. Abralon pad. I prefer a 5-in. sander because the extra circumference of the pad around the hard edge of the sander provides a cushion against bumping an adjacent surface and protects the surface if the sander is slightly tipped. I recommend that you use an air-powered sander because there is the slight risk of polishing lubricant entering an electric sander and causing a shock. If you don't have an air-powered sander, the first step can also be done by hand with a sanding block and paper.

With a 500-grit pad, use a 50:50 mixture of boiled linseed oil and mineral spirits to wet-sand the wood and create a slurry. Sand until the oil disappears, then reapply one more dose of the oil mixture and repeat the sanding. This step adds depth of color to the wood by penetrating it with oil and burnishing the surface. A minor amount of abrading also takes place, and the sawdust slurry helps fill the pores.

A different kind of padding

To apply the shellac to the workpiece, use a hook-and-loop hand block, a 4,000-grit disc and an interface foam pad. The combination of the pad and disc creates a firm cushion to burnish with and also acts as a sponge to hold the shellac and alcohol.

Make a 2-lb. cut of shellac by dissolving flakes in denatured alcohol or buy premixed shellac. Two products I like are Mylands' Heat Resistant Finish and Behlen's French Lac. Charge the pad with about two tablespoons of alcohol, then with about a table-

Fill the pores first. *Sand the surface with a 500-grit Abralon pad lubricated with linseed oil and mineral spirits. The resulting slurry fills pores, burnishes the surface and adds depth.*

Photos: David Nufer

AN ABRALON PAD IS THE HEART OF THIS FRENCH POLISH

Prepare the Abralon pad. *A polishing pad consists of a 4,000-grit disc backed by a foam pad, attached to a hook-and-loop hand-sanding block. The pad is loaded with shellac, alcohol and mineral spirits.*

Move the pad in long strokes. *When the pad has first been loaded, move it in long strokes with the grain, gliding over the surface to deposit a light coat. Don't worry about overlapping already wet areas.*

Switch to a circular rubbing pattern. *As the liquid in the pad is used up, more muscle is required to move the pad. The pad will begin to burnish the surface, which develops the level of sheen or polish.*

spoon of shellac. Apply a few drops of mineral oil and test the wetness of the pad by gently striking it on another surface. This pouncing integrates the polish and alcohol and removes the excess liquid, leaving the foam wet but not sloppy.

There is no need to wait for the oil to dry before polishing with the shellac/alcohol mix. Begin by gliding the charged pad over one section of the workpiece, moving back and forth in long strokes. Without stopping, change to a circular motion and bear down on the pad using both of your hands and your body weight. It's easier to do this on a bench that is at or below waist level. When the pad begins to dry, recharge it and continue the process until the entire piece has been worked this way.

Up to four coats of finish may be applied per day. But as the finish builds, the pad will have a tendency to stick. To keep it moving smoothly, increase the amount of oil used with each recharge. If the pad continues to stick, stop working for about an hour or so. If you end up with a major stick or streak that mars the finish, allow the piece to dry. Then sand the problem area level with a block and 600-grit wet-or-dry paper, lubricated with two parts mineral spirits and one part paraffin (lamp) oil. Remove the oil with naphtha before adding more polish. The pad and hand block may be stored in an airtight container overnight. Stored this way, one pad will finish an average-sized occasional table. The number of coats applied is a matter of preference. When you feel the finish has enough depth, proceed to the last step, which burnishes the surface. Recharge the pad and increase the amount of alcohol in proportion to the other ingredients.

This rubbing method will probably cause shortness of breath and a sore arm and shoulder. Then you know you are doing it right because it is this friction that is doing the polishing. The time to stop rubbing is when the desired gloss has been achieved.

If things go wrong. *The pad may stick to the surface if too many layers of finish have been applied too quickly and if there is not enough oil in the pad. Repair the surface by sanding with 600-grit wet-or-dry paper lubricated with mineral spirits and paraffin oil.*

Obstructed areas that cannot accommodate a big pad, such as a tabletop with a piecrust molding, need a custom-made pad. Small pieces of wood, shaped to the relevant pattern, are set up with hook-and-loop fabric and pieces of the interface and Abralon. The strokes and circular rubbing are reduced in size according to the area being polished.

If the final sheen is too glossy, rub it out with 0000 steel wool and Wool Lube or wax. A light waxing can be applied at the very end. Abralon is available from Mirka Abrasives Inc. (800-843-3904) and Woodworker's Supply Inc. (800-645-9292). □

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Craft Revival

A builder by trade, Arts and Crafts collector on the side, Gerald Rucks finally let his hobby become an obsession. From a modest shop off his house in Warren, Mich., Rucks started Arts and Crafts Hardware (810-772-7279), where he makes everything from upholstery tacks to mailboxes. And he works metal using the same methods and tools used 100 years ago. The bails are sand-casted, and the plates are hand-hammered. Rucks said it takes a new employee two months to master his hammering technique. "You have to get into a rhythm," Rucks said. "As soon as you hit it a little too hard, you've ruined all the softer blows and have to start over." The hand-patinating process involves heat and natural extracts, but perfecting it took too long, Rucks said, to give any more information than that.

Hammering the bail. *After fitting a nipple to the hand-hammered plate, a few taps with a mallet set the sand-casted bail in place.*

A fast patina. *To give the pieces a seasoned look, hardware is dipped in a mixture of natural extracts, then heated with a blowtorch.*

Photos: Michael Pekovich