TAUNTON'S

Fine WoodWorking

Build an Arts & Crafts bed

June 2002
No. 156

Six ways to edge plywood

Furniture-design survival guide

Solutions for blotch-free staining

Moisture meters for every budget

Perfect joinery using backsaws

Traditional tombstone doors

Brush on a flawless finish

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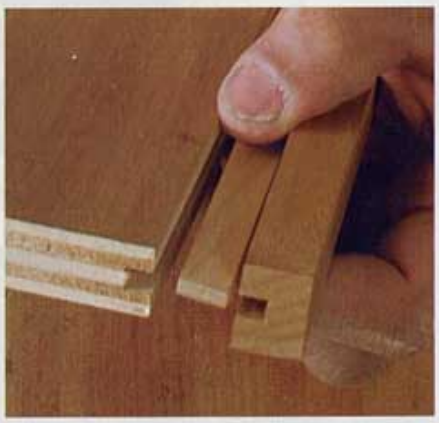

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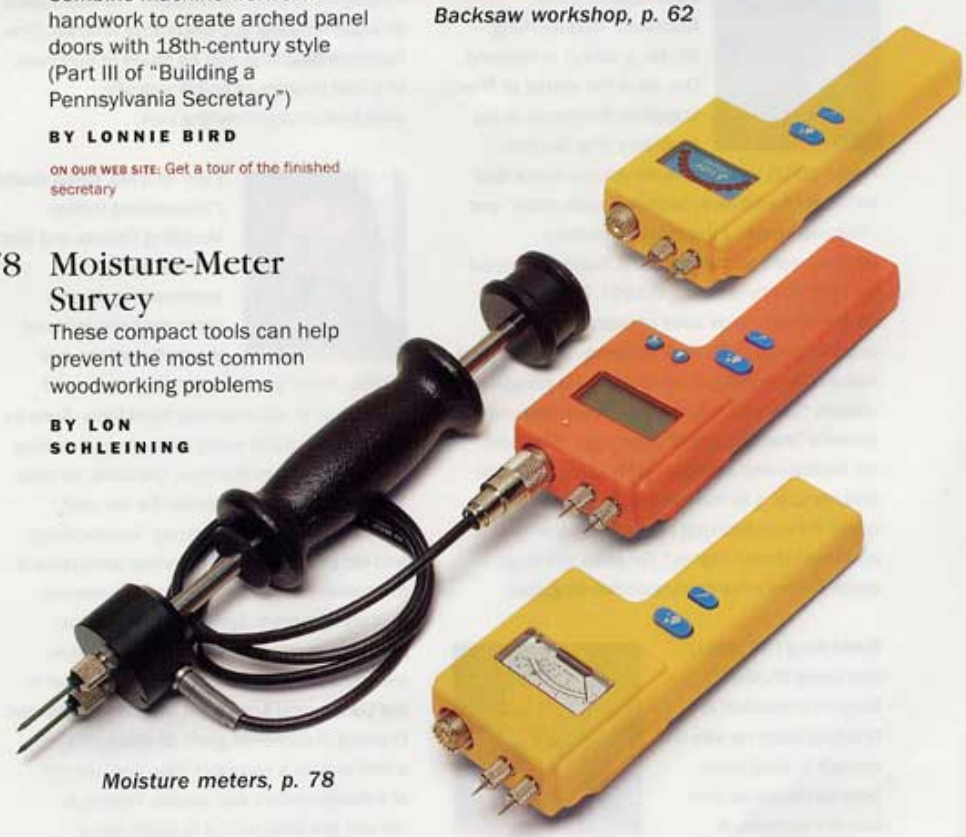

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Letters

The great dual-cover experiment—I believe that *Fine Woodworking* magazine portrays the topics of interest to woodworking neophytes and top artists alike.

Those who know and appreciate *Fine Woodworking* either subscribe or purchase it at their favorite newsstand without regard for the message portrayed by the photo on the cover.

If your intent is to attract new readers and subscribers, by all means, do not replace the magnificence of such wonderful craftsmanship that only a photograph of the completed piece can convey.

In case you need reminding, I offer this primer: You are in business to sell magazines and to derive the income from there. If you are in doubt over the impact that high-quality photography of beautifully crafted furniture contributes to the sale of a product so aptly named, may I suggest that you continue to use pictures of individuals doing something but that you rename the magazine *Fine Fred*.

See how many fewer copies your replacement sells!

—Edwin Lester, Tucson, Ariz.

You asked for feedback on the *FWW* #154 dual magazine cover, so I'll weigh in with my opinion. Let me first state that my serious interest in woodworking dates back to the early '70s, about the time of the general resurgence of interest in crafts across the United States. For those of us just getting interested in woodworking in those days, there were two fundamental issues to resolve: how do we learn to do good woodworking and where do we buy the tools to do it? The latter question was answered when I found Woodcraft Supply and later Frog Tool Co. These sources of supply gave a much needed option to the local Sears.

The question of learning the craft was more difficult to solve. Serious books were not readily available at the time, particularly books that revealed the how-to of various techniques. And there were no schools, at least locally. Then along came *Fine Woodworking*. I remember that my roommate and I were dubious of your magazine at the beginning, so we flipped a coin to see who would subscribe for a year. He lost and had to pay up, which is the reason that I'm not a charter subscriber. Suffice it to say that your magazine filled a much needed void in elucidating the mysteries of the craft. And you continue to do so.

With this background in mind, I can now cast my vote for the cover that shows Lonnie Bird performing a task. It's not that I dislike a shot of the finished piece, but I think the real value of your magazine has been showing people how to accomplish the task at hand. More often than not, you show a photo of the finished piece in the article, and certainly the Current Work section offers inspiration to your readers. So mark me down for a cover showing work being done.

—Jerry Spady, Oak Ridge, Tenn.

Poll results revealed—Based on the results of our unscientific online poll, 61% of you favored the cover featuring the finished piece. Only 39% of you liked the cover with the man and the piece. A total of 3,643 voted. To read some of the comments, visit our web site (www.finewoodworking.com) and go the link named Cover Poll.

PVC heating hazards—The custom tool hooks made from PVC pipe and illustrated in Methods of Work (*FWW* #153, pp. 16, 18) are nice-looking, but the instructions call for applying heat to the pipe in order to straighten one part of the curve. PVC releases toxic and carcinogenic gases when heated, so the risk to one's health is hardly worth the easy

Calling all toolmakers

The next edition of our annual *Tools & Shops* bonus issue is already in the works. And once again we're looking for photos of artfully made hand tools and toolboxes to showcase in the Current Work department. Feel free to send them via snail mail (*Fine Woodworking*, 63 S. Main St., Newtown, CT 06470) or e-mail (cbaumann@taunton.com). If you need tips on photography, take a look at p. 87 of this issue's Current Work.

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manufacture of an item which could be made in some other, safer way.

–Jim Stark, Hanover, Ind.

Inspect your compressor—Reading through your recent *Tools & Shops* issue prompts me to write about a safety issue I don't see addressed often: the placement of air compressors inside the shop. A number of years ago, I had the experience of having an air-compressor tank explode inside my two-car garage workshop. The explosion blew the double garage doors into the driveway and sprayed shattered glass into the street. The drywall inside the shop was collapsed between the studs, and the stucco outer wall had large cracks and a prominent bulge. If I had been in the shop when it happened, I would surely have been killed or seriously injured.

When the fire department came to investigate the accident, they told me that the tank had corroded from the inside, thus becoming weak along a welded seam. In my area, commercial shops are required to locate their air compressors outside the building to prevent injuries in the event of such a failure. While I would admit that the odds against such an accident in a small shop are pretty high, the potential adverse consequences make it worth considering locating the compressor outdoors.

The fire-department investigators also suggested I replace my compressor with one that had an ASME certified tank. All tanks for commercial shops must be ASME certified, which sets certain standards for materials and workmanship.

–Carter Pease, San Diego, Calif.

Shedding more light—As a consulting electrical engineer, lighting designer and woodworker, I would like to say that Jack L. Lindsey did a very good job covering the subject of lighting design in his article "Lighting for the Workshop" (*FWW* #154, pp. 56-61).

I only thought of one other issue which might have been mentioned: covers to protect the tubes from breakage should a long board strike one. For commercial projects, we generally specify strip lights with 4-ft. wire guards, which protect the lamps from such instances. Another approach may be to use 1-ft. by 4-ft. wraparound fluorescent fixtures—which come in two-lamp and four-lamp versions—with an acrylic lens over the lamps in lieu of open strip lights. The acrylic lens not only distributes the light better but also protects the lamps from being struck by lumber.

–Michael A. Svoboda, Memphis, Tenn.

The sexes in sync—I read Carol H. Peterson's letter (*FWW* #155, p. 10), and as a woman, occasional carver and the wife of a woodworker, I think I can comment on her polite but serious criticism.

Please don't think that all of your female readers feel slighted by the so-called gender-specific language commonly used. The word *man*, used in the broad sense, and the pronoun *he* have always been grammatically inclusive. It has taken years of social conditioning and widespread ignorance of the rules of grammar to make women, sensible by nature, take offense at such indifferent and ordinary terminology as *one-man* shop, *mailman*, *chairman*, etc.

So I hope you won't take the criticism too seriously. I also hope that the current absurd fashion of inclusive language will soon follow the fraudulent Neanderthal man—oops! I mean Neanderthal person—into obscurity and obsolescence.

–Mary Ann Tardiff, Willard, Kan.

I, for one, am very tired of our entire society having to be gender neutral in order to satisfy a political agenda. I am not in favor of terms such as *person access hole* in place of *manhole*. People who are so thin-skinned as to take offense to simple English language terms need to find themselves. What do they expect will be done with such terms as *man-of-war* jellyfish, *sex* bolts, *bastard* file, *man-eating* shark? I for one do not worship the *Goddess*.

Please do not capitulate: Do not roll over. Please do stay focused on fine woodworking, tools and tool techniques.

–Paul A. Rousseau, Foster City, Calif.

Bosch weighs in—I read Rex Alexander's tool review of the Bosch 1295DVS sander (*FWW* #155, p. 30) and was surprised to find that, in Alexander's view, the 1295DVS needed to be more aggressive. I wondered if he compared apples with oranges when comparing it to his older Bosch sanders.

The 1295DVS—which, with the exception of the microfilter and variable speed switch—is technically identical to its predecessor, the1295DH.

Alexander mentioned that frequent emptying of the canister was a nuisance. I find it important to note that random-orbit sanders equipped with a traditional bag or canister typically collect 50% of the dust generated. The rest remains in the air or the shop environment. The new Bosch microfilter system is over 80% efficient in collecting the dust. While this means the canister will have to be emptied more frequently, to me the added efficiency is worth it, especially in those applications in which the use of the vacuum-hose accessory is impractical.

A tip for cleaning the filter: Before opening the lid, tap the dust canister against the workbench. This will knock loose the dust in the microfilter's pleats and make emptying the canister easy and much cleaner than emptying a bag. In very humid environments, a puff of compressed air, applied from the outside of the microfilter, does the trick. This should restore the filter efficiency to peak performance.

–Frank Schnitzler, product manager-sanders, Bosch Power Tools

Not high-tech enough—With regard to Tom Begnal's article "10-in. Combination Tablesaw Blades" (*FWW* #155, pp. 32-37), I fear that *Fine Woodworking* has raised more questions than the magazine has given answers. I found that four issues should be addressed.

The test never defined what a combination blade is. The type of teeth used on the various blades was not clarified. Are they ATB, flat ground, whatever? A true combination blade is a Budke blade.

It seems that what was tested was

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.

blade sharpening proficiency and care, not so much the blade itself. I suspect this because I think that you did not buy the blades on the open market but rather asked for them from the manufacturers. This gave the makers an opportunity to provide a quality of sharpness not otherwise available. The product has to be bought for the test to be accurate.

At least one blade, the Everlast, was, I have been informed, created especially for the test and is not commercially available. It is not in the catalog.

And the last issue, which is equally important, what were the noise levels?

–John Grew Sheridan, San Francisco

ASSOCIATE EDITOR TOM BEGNAL REPLIES: The article defined combination blades in lay terms: a cutter used for both ripping and crosscutting. Most of the saws tested, including the top performer, had a 40-tooth alternate-top-bevel configuration. But for this test I wasn't trying to analyze tooth configuration. I simply asked sawblade manufacturers to send me the smoothest-cutting combination blade they make, regardless of the tooth arrangement. The science of tooth configuration and performance is another article in and of itself.

The blades were indeed supplied by the manufacturers. And, perhaps I'm being naive here, but I have no reason to suspect that any of them would "tune-up" a blade before sending it to us. Yes, the sawblade market is a competitive one, but I am not yet ready to believe that manufacturers would practice such shenanigans.

The Everlast blade is commercially available. Simply call the number listed in the article.

I didn't test for noise because the focus of the article was smoothness of cut.

Industrial machinery information— There are currently several magazines, including *Fine Woodworking*, that include tool reviews and head-to-head tool comparison articles. Whether you're a weekend woodworker or a small production cabinet/furniture shop, just a little reading can make the choice of which 14-in. bandsaw, 12-in. portable planer, 10-in. sliding compound-miter saw or 7¼-in. circular saw to purchase an easier one to make. However, I feel there are many people, myself included, who are looking for something just a little bit bigger and better than you can buy down at your local Home Depot.

The problem with these machines is the apparent lack of objective information about them available to us little guys. With names like Northfield, Mattison, Tannewitz, Guilliet, Pinheiro, Yates and Stetson Ross, how do we get information to make a decision on which ones to stay away from and which ones might provide dependable service for years to come? I realize a dedicated review per issue about these types of machines is probably too much to ask for, but I would very much appreciate any information you can pass along or publications you can recommend about these tools.

–Sean Ferguson, Rogue River, Ore.

EDITOR REPLIES: We plan to publish reviews of larger tools, such as combination machines, in the near future. But for the most part, we have to focus on the smaller and midsized tools that we know most of our readers are interested in. (Keeping up with just that category is a nearly impossible task!) You may find answers to your questions, however, by visiting our online discussion group, Knots, at www.finewoodworking.com. There you'll meet a community of very informed woodworkers willing to share their knowledge and unvarnished opinions.

More on pipe clamps— I am writing in reference to the Q&A "Pipe clamp slipping on galvanized pipe" (*FWW* #153, pp. 114, 116). A number of years ago, I also bought galvanized pipe in spite of the manufacturer's recommendation to use black pipe. I have several Jorgensen (Pony) ¾-in. clamps, which have a sliding plate type of clutch. My experience has been similar to Gary Rogowski's, only better. I really don't recall ever having a clamp head slip.

I have one pair of pipe clamps that has a cam-type sliding clutch. These have slipped. I learned to live with the problem by setting the cam tight before tightening the clamp, but black pipe would definitely be a better choice for them.

I have one short clamp made from aluminum conduit which works well, and I really like the light weight. I wouldn't recommend aluminum for a long clamp because of increased deflection.

–Dick Hagwell, Longview, Wash.

Insulting a woodworking master— I was dismayed after reading Lon Schleining's review of Frank Klausz's video (*FWW* #154, p. 28). I replayed the entire video to refresh my memory of its content. It is obvious that the video is not about Frank the showman, but about Frank the dedicated teacher. While Frank does demonstrate free-hand grinding techniques in the video, he also shows how to grind a chisel with a Lee Valley jig.

Fine Woodworking magazine, along with craftsmen like Frank Klausz, have had a great impact on countless woodworkers. Those who choose to master the skills so well explained in the video will surely find themselves elevated to a higher level of woodworking.

–Bill Bigelow, Madison, N.J.

EDITOR REPLIES: Frank Klausz does indeed show two ways to grind edge tools. We regret the error.

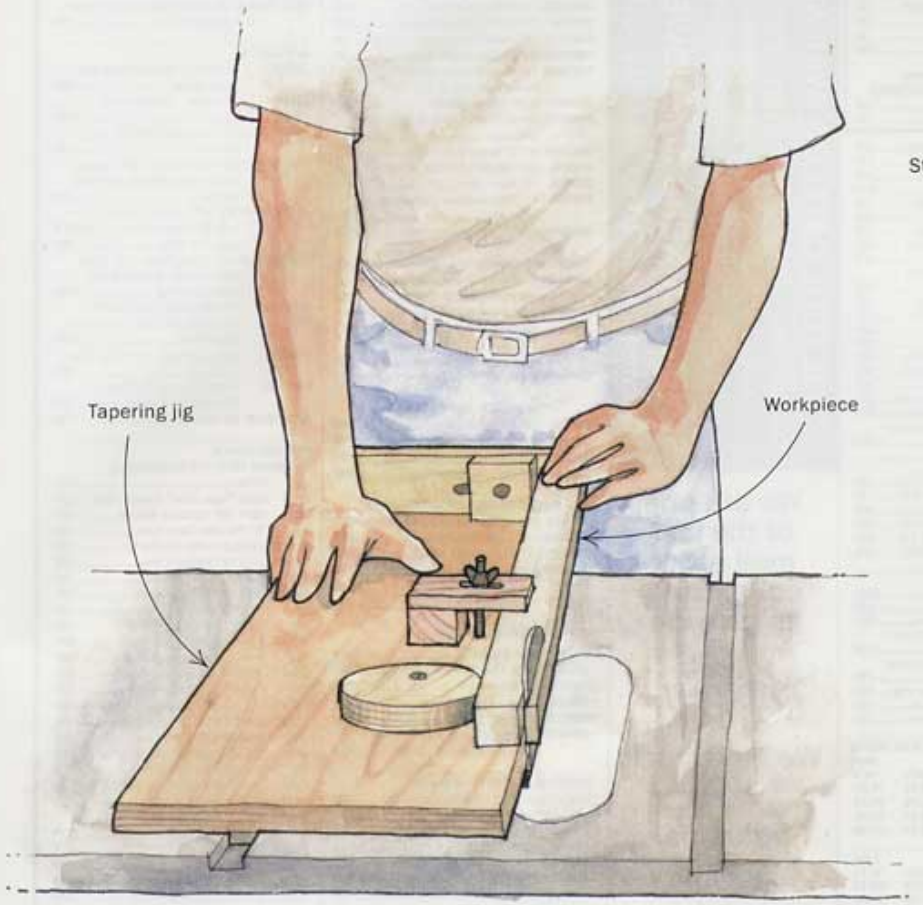
Clarification on LVLP spraying— In the November/December 2001 issue (*FWW* #152, p. 121) an article on LVLP spraying incorrectly stated one aspect of setting up a Binks Mach 1 spray gun. If you wish to convert this gun from HVLP to LVLP, do not replace the needle. The standard needle is all that's required, and no other is available.

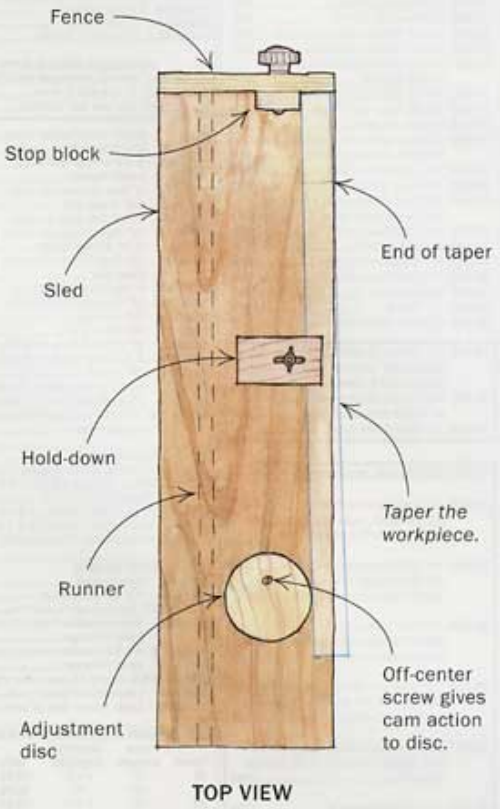
About your safety:
Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something 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.

–Anatole Burkin, executive editor

EDITED AND DRAWN BY JIM RICHEY

Adjustable jig for cutting tapers





TOP VIEW

This adjustable tapering jig for the tablesaw is easy to make and sets up in a flash. It replaces all of those dedicated one-time jigs, and it's more reliable than a jig that puts the blank directly on the tabletop.

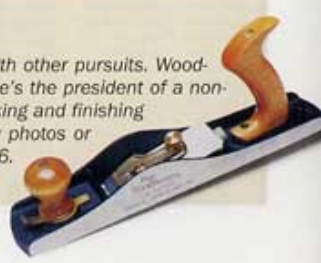
The fixture is basically a sled with a runner on the bottom that slides in the miter-gauge slot. This arrangement ensures that the edge of the sled is snug against the blade every time. No fence adjustments are required. The jig consists of five main parts: The sled, the runner, a fence at the front that incorporates an adjustable stop block, a hold-down and a cam-action disc at the back that sets the taper angle.

To make the fixture, first cut the 30-in.-long sled from ¾-in.-thick plywood and an equally long hardwood runner to fit the miter-gauge slot. Put the runner in the miter slot, raise the sawblade all the way up and, with the edge of the sled square against the blade, nail two brads through the sled into the runner to attach it temporarily. Remove the sled, invert and secure the runner with four countersunk screws. Now attach the fence assembly to the front and the disc to the back. Secure the 3½-in.-dia. disc with a wood screw ¾ in. off center that creates a cam action that will vary the depth of the taper cut.

To use the jig, first adjust and lock the stop block on the fence to set where the taper will end. Then, with one end of the workpiece against the stop block and the other end against the disc, turn the disc until the finished width of the leg is in line with the edge of the sled. Readjust both stops, if necessary, until everything is perfect. Now push the workpiece blank against the two stops, lock it down and cut the taper. Turn the blank 90° clockwise and make a

A reward for the best tip

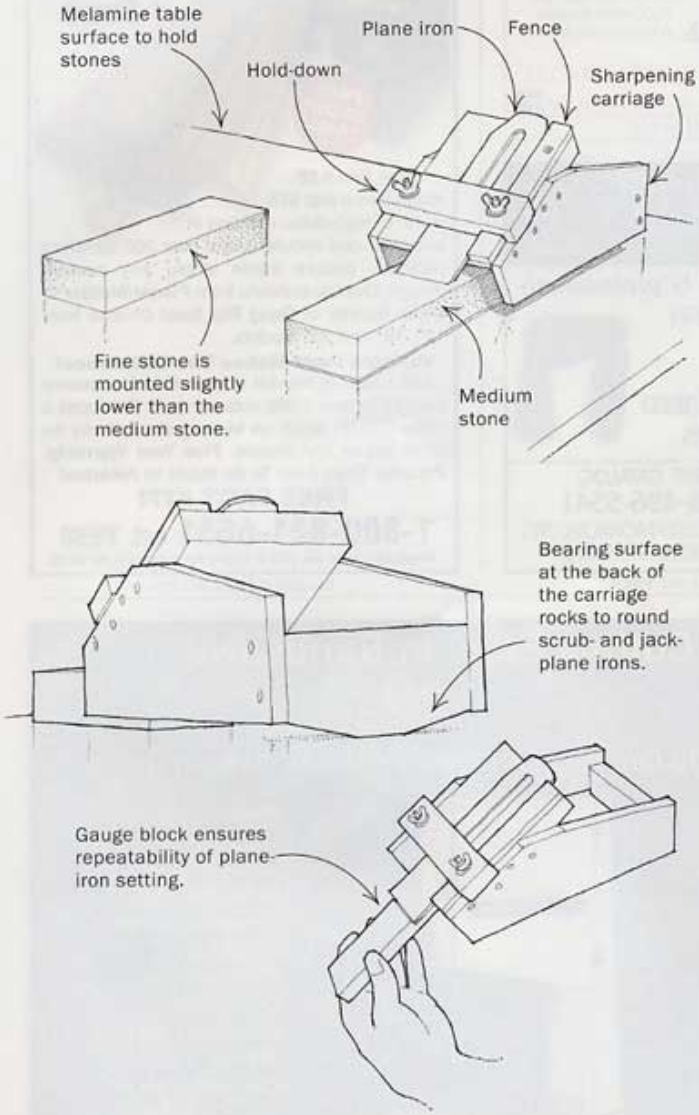
David Hastings is retired from a 42-year career of many different business ventures, but he remains active with other pursuits. Woodworking is only one of his hobbies. He also plays tennis and races his 1951 MG roadster. In addition to that, he's the president of a nonprofit adult education program near his home in suburban Philadelphia, and he keeps busy by taking woodworking and finishing courses given by many of the people who write for Fine Woodworking. *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.*



second cut. This will produce a leg that is beautifully tapered on two sides. To make a leg that is tapered on four sides, you will need to readjust the disc for cuts three and four.

–David Hastings, Haverford, Pa.

Shop-built sharpening carriage



The main difficulty I had in sharpening plane irons and chisels was maintaining a consistent sharpening angle. I could get the tools sharp enough initially, but I didn't like the concave bevel that would result. Also, the bevel tended to get higher and higher as time went by, eventually requiring a serious session on the grinder.

So I finally made this sharpening carriage that solved my problems when I used it with a carefully set up stone table. The stone table is fitted with two stones: a medium stone to restore the tool's main bevel and a fine stone to hone a final microbevel. The trick is to mount the fine stone 5/16 in. lower than the medium stone. This automatically produces a microbevel of 1° without moving the blade in the jig.

This sharpening setup has other advantages. It produces a flat main bevel rather than the weaker concave bevel that is produced on a grinder. Also, because the jig straddles the stone, it eliminates the oily mess created by a roller riding on the stone.

The carriage is simple to make. Cut the sides from 3/8-in.-thick plywood and the other pieces from scrap hardwood. Lay out the front ramp of the fixture at your preferred bevel angle (30° in my case). Add an alignment fence for a plane iron and a hold-down device on the top of the angled ramp. One optional feature to include is a narrow bearing surface at the back, as shown in the drawing. This allows you to rock the plane iron from side to side to create a rounded cutting edge for scrub and jack planes.

I made up three versions of this jig: One for 30° plane irons, another for 30° chisels (with the bed cut away to accommodate the handles) and yet another for 25° paring chisels. Of course, dimensions and angles can be adjusted easily to suit your preferences and individual tools.

To make the stone table, mount the two stones in routed troughs of different depths in a piece of melamine. My stones are 7 in. apart and 11 in. from the front edge. The medium-grit stone is 1 11/16 in. high, and the fine stone is 1 1/2 in. high.

To use the jig, adjust the plane iron in the jig for an angle of 30° on the fine stone. Make a gauge block to ensure repeatability of the blade projection. Starting with the plane iron on the medium stone, move the carriage back and forth until you have restored the main bevel. Then, without adjusting the plane iron, move the carriage to the fine stone and hone a short microbevel.

–Bruce Tombleson, Bussiere Galant, France

Sawhorse crosscutting aids

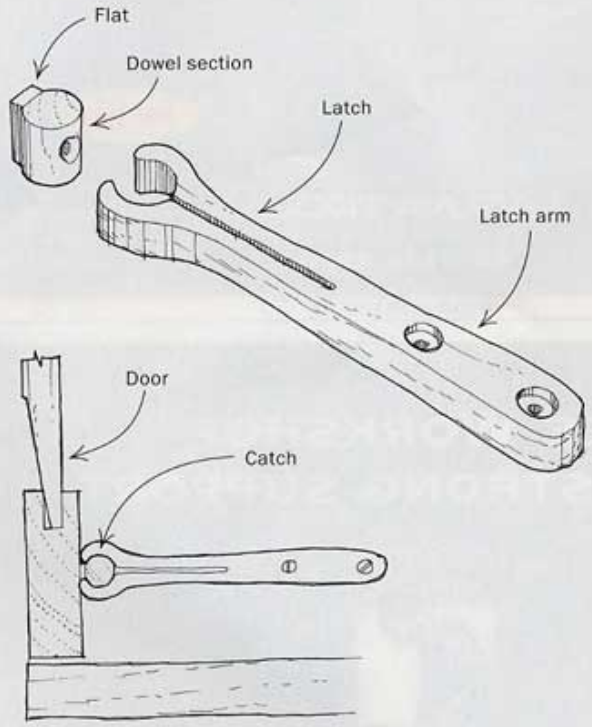
These two hold-down arms are mounted on sawhorses to enable clamp-free crosscutting of long boards. To make them, screw to-

gether two arms from scrap offcuts the same thickness as the stock to be cut. Mount the arms to your sawhorses with a thin shim under each one, so that the workpiece will slide under the arms easily. The arms should be mounted in opposite directions—open to you on the near end and closed on the far end (as shown). Properly set up, these arms will lock the board in place and prevent it from pivoting or lifting.

—Louis Pennacchia Jr., Syracuse, N.Y.

Quick tip: To keep dust and fog off the lenses of your glasses, spray with a product called Rain-X and wipe off. It works better than anything else that I have tried. The product is available wherever car parts are sold. *—Richard Dininny, Elmira, N.Y.*

Wooden cabinet latch

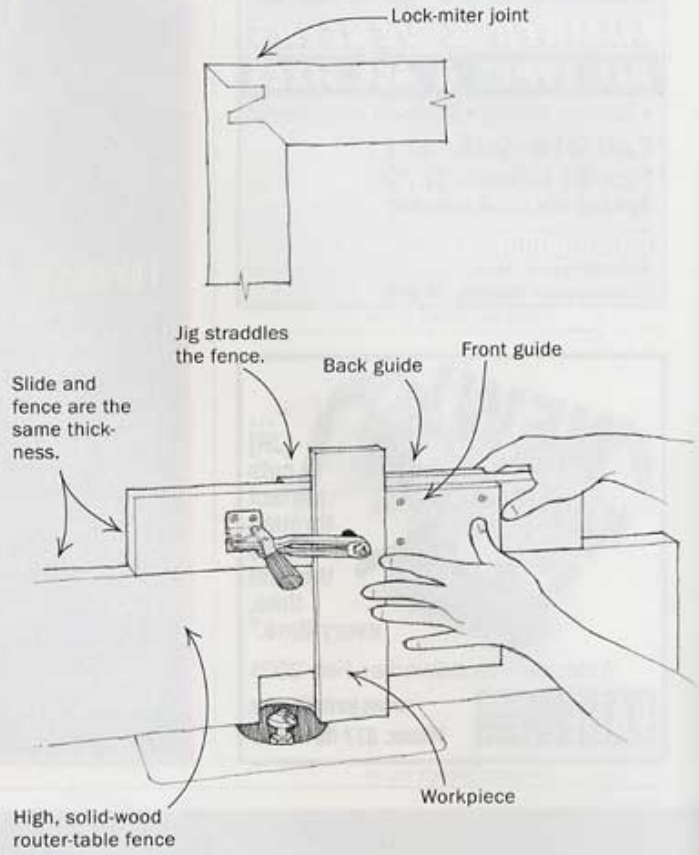


I first made this wooden latch several years ago when I couldn't use the traditional turn latch on a reproduction antique cabinet. The latch has functioned so well over the years that I have begun using the design in other cabinets. The body of the latch is a 5-in.-long piece of ½-in.-thick walnut, a wood I chose for its shock resistance. It is attached to the top or bottom of the case interior. The length of the slot, which gives the latch its spring action, is about half the total length of the body. The width of the opening can be modified for the amount of tension desired. The catch is just a wooden dowel with a flat piece glued to it.

—Bernard Resh, Lancaster, Pa.

Jig for routing lock-miter joints

Here is a simple jig that enables the safe and accurate cutting of lock-miter corner joints that require both a horizontal and a vertical pass over the router bit. Cutting these joints by holding boards



in a vertical position with just your hands is a daunting task. The operation can be dangerous, and the results can be inaccurate.

This jig requires a sturdy, extrahigh router-table fence. Mine is 6½ in. high and more than 1½ in. thick. The jig carriage consists of an 18-in.-long slide, cut from the same stock as the fence to ensure identical thickness. The front and back guides are 5-in. by 8-in. chunks of ½-in.-thick plywood. One De-Sta-Co clamp holds the workpiece tightly against the jig. Because the carriage fits snugly over the top edge of the fence, only light hand pressure is needed to hold the lower part of the board against the fence as it engages the bit. You can accommodate workpieces of different widths by moving the clamp. *—Norman Ellis, Tuscaloosa, Ala.*

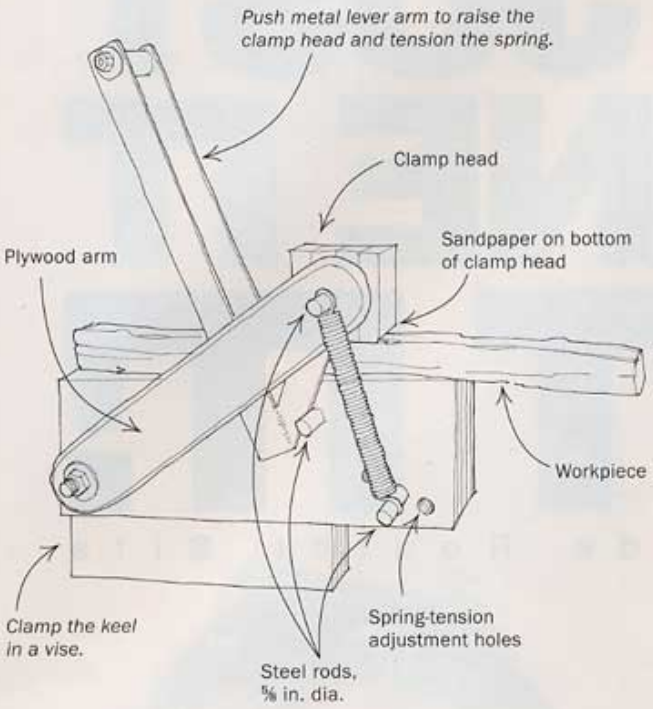
Quick tip: When using a hand scraper, wear cotton gloves with PVC dots. The gloves effectively dissipate the heat that is generated, give you a better grip and keep your hands dry and cool.

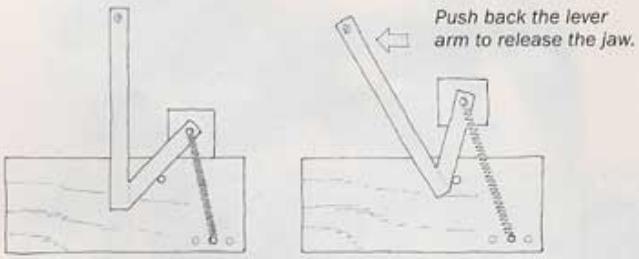
—W.D. Timberlake, Houston, Texas

Miniature shaving horse

For those chair makers who like to work standing up or who don't have space for a full-sized shaving horse, this little version (see p. 20)—made to be held in a bench vise—is both compact and portable. To use it, simply clamp the keel in the bench vise, push back the lever arm to raise the upper jaw of the jig and lower it onto the workpiece. The spring mechanism closes the jaw automatically and provides gripping force.

The key feature of the horse is a ⅝-in.-dia. steel shaft that goes





through the wooden arms, the metal lever arms, the clamp head and the springs. A second shaft through the body of the horse provides a fulcrum point for the lever arms. A third shaft provides an attachment point for the springs and can be moved to increase or decrease the clamping force. Clamping pressure can also be adjusted by using stronger or weaker springs. The clamp head has sandpaper on the business side to enhance the grip. You could also add a strip of sandpaper to the top edge of the body for an even better grip.

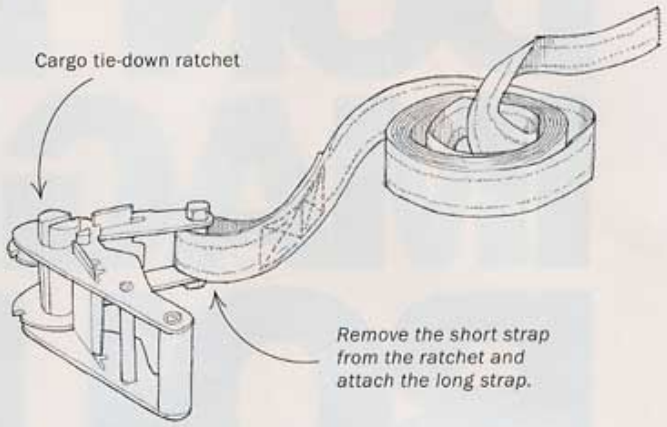
All of the wooden parts of the jig were made from ¾-in.-thick Baltic-birch plywood. The lever arms were welded up from 1-in.-wide, ⅛-in.-thick steel. *—Louis Mengoli, La Mesa, Calif.*

Quick tip: Make your furniture templates from clear Lucite plastic. This allows you to move the pattern around the blank until you find the perfect grain pattern to complement the design.

—Robert McElroy, Grants Pass, Ore.

Tie-down band clamp

For edge-banding round tabletops and clamping odd shapes, I use a modified cargo tie-down as a band clamp. Tie-downs are heavy nylon straps with a ratchet on one end used by truckers to secure



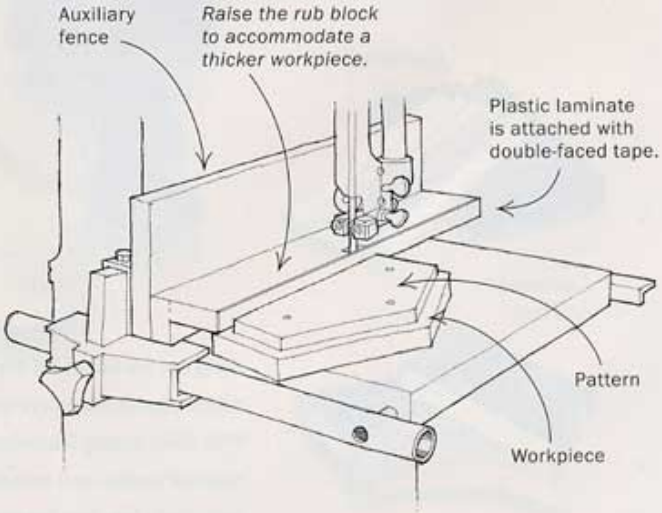
their loads. These tools are commonly available in several sizes at auto-parts stores.

When purchased, the tie-down comes in two parts: the ratchet with a short strap attached and a separate longer strap. To use as a band clamp, remove the short strap from the ratchet and replace it with the long strap. *—Jim Wallace, Cedar Park, Texas*

Quick tip: When I connected my new saw to a dust-extraction system, the amount of air leaking through various holes and slots in the saw's base was unacceptable. So I bought a flexible magnetic sheet—the kind used on car doors for advertising—and snipped out the necessary shapes with scissors to seal off the unwanted air leaks. Now the dust collection works much better, and I can easily remove the seals when necessary.

—Ruud Joling, Purmerend, The Netherlands

Pattern cutting on the bandsaw



For years I've used my tablesaw for pattern sawing using a technique described in *FWW* #47, p. 54. Recently, however, I became nervous about using the tablesaw technique when I had a workpiece that was only 2 in. on one side. It just didn't feel safe. So I

modified the pattern-cutting fixture for use on my bandsaw. The fixture is quite simple to construct (see the drawing on p. 20).

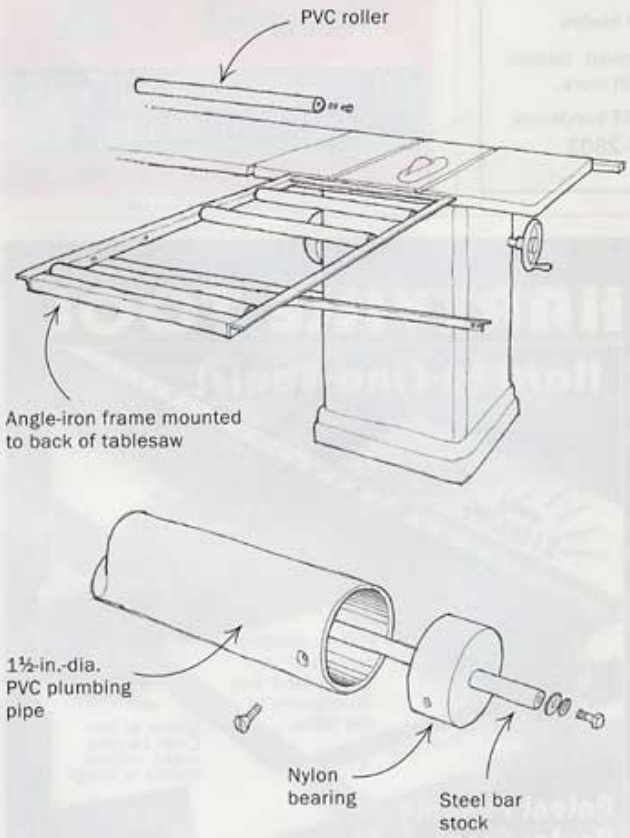
It is a good idea to construct the fixture so that the inside cutting edge of the blade is a standard distance from the outer edge of the fixture—½ in. in my case. This allows you to cut the hardboard pattern pieces ½ in. smaller than the desired final dimensions. One important part of the fixture is a strip of plastic laminate held in place with double-faced tape. This provides a continuous surface against which the pattern can be run, avoiding any snags at the cutout around the sawblade.

—Barnett C. Howard, Sisters, Ore.

Quick tip: Use flexible sewer hose designed for recreational vehicles for your 3-in. dust-collection pipes. The hose is fitted with twist locks for easy connection and can be purchased quite reasonably at RV supply stores.

—Earvin Ruddick, Westminster, Md.

Tablesaw extension with PVC rollers

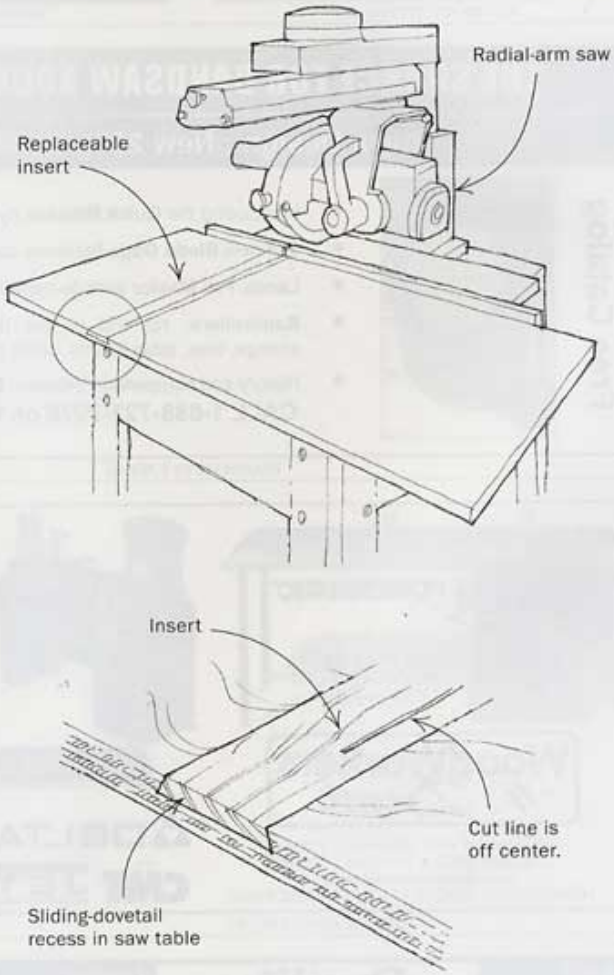


In a one-man shop, ripping sheet goods and long lumber is difficult. I decided to solve this problem by building a roller extension on the back of my tablesaw. When I discovered that the commercially available rollers cost $26 each, I went shopping. For a few bucks I bought a 10-ft. length of 1½-in.-dia. PVC plumbing pipe, a short length of nylon bar stock, several lengths of ½-in.-dia. steel bar stock and some angle iron.

I made up four rollers by cutting lengths of the PVC and fitting each end of the pipe with bearings made from the nylon bar stock. I made axles from the ½-in.-dia. steel bar stock and drilled and tapped holes in each end to attach the axles to the frame. I then made a cantilevered framework with angle iron and bolted the framework to the back of the saw as shown, so that the rollers are level with the top of the tablesaw. This extension has made the handling of large stock much easier, quicker and safer.

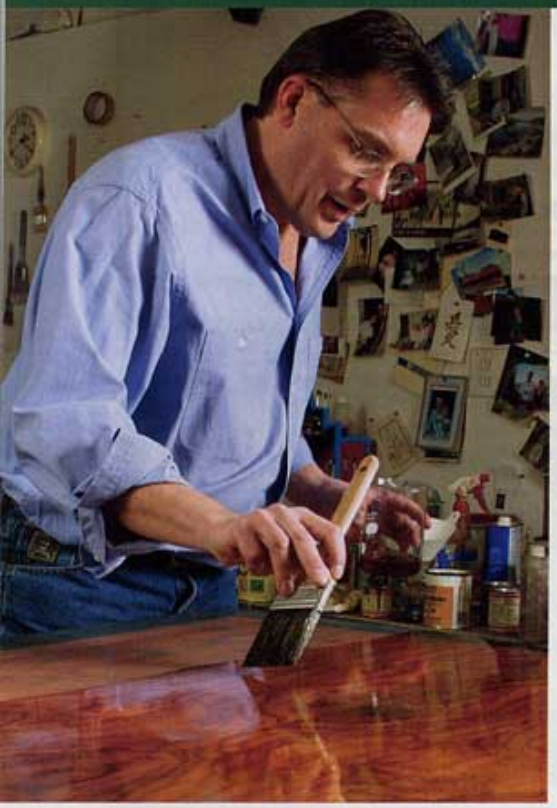
—Don Gilliem, Milford, Mich.

Replaceable insert for radial-arm saw



After a time the cut line on a radial-arm saw's table gets too worn to provide an accurate guide and a splinter-free backup for the cut. Yes, I could replace the front part of the table with a fresh piece of plywood, but this is not an economical solution.

So I devised this dovetail table insert that could be replaced as frequently as needed with little effort. The insert installs into a sliding dovetail where it requires no permanent attachment, and it can't lift out during the cut. I routed the insert's channel off center to the cut line of the blade so that a single insert can be swapped end for end and thus serve double duty. I used a router and a dovetail bit to rout the channel into the table and to bevel the edges of the insert. *—Millard B. Niver, Navarre, Ohio*



Choosing and Using Brushes

The right brush and a good technique make finishing a pleasure

BY DAVID SORG

Brushing on a finish involves considerably less expense, space and even danger than spraying. The results can be as perfect as any sprayed finish, requiring only a little more time. I earn an added bonus when using a brush instead of a spray gun. Holding the brush, dipping it into the finish and then letting it glide onto the wood brings my project to life and provides me with a unique satisfaction. Choosing the right brush can save you hours in application speed and ease of use. Proper technique will help you avoid or minimize mistakes and brush marks.

I have two rules when it comes to buying a finishing brush. First, don't buy anything with a plastic handle. I've never seen a high-quality brush that didn't have a wooden handle. Use the plastic-handled ones for staining wood or painting your shed.

The second rule of thumb is to buy the best brush you can afford. To put things in perspective, for less than the cost of a good router you can buy a set of top-of-the-line brushes that will meet all of your finishing needs. No wonder my woodworking friends are jealous.

Brushes can be divided into four broad categories: natural bristle, synthetic bristle, artist's brushes and nonbrushes, such as foam wedges and pads. I will guide you through each group and suggest which brushes will match your preferred type of finish and the piece you are finishing.

Natural bristles are the prima donnas of brushes

Natural-bristle brushes are considered the best choice for lacquer, shellac and oil-based finishes. These brushes can hold more finish than their synthetic alternatives, an important issue for flowing shellac or lacquer. With these finishes you must maintain a wet edge, and the fewer the trips to recharge the brush, the better. Natural-bristle brushes seem to transmit a better feel for even finish distribution. I can more easily sense the degree of slickness or drag beneath the natural bristles, especially when tipping off to achieve a smooth surface. But I'd be the first to admit that it may just be the fact that I've been using natural bristles for nearly 20 years.

The disadvantages of natural bristles include a faster rate of wear and breakage of the bristles (which are a pain to pick out of your finish coat, especially if it's fast-drying lacquer or shellac), and they are harder to clean than synthetics.

Synthetic brushes are getting better

A few years ago you would have used a synthetic brush only with a water-based finish. But synthetic brushes have come a long way since the early days of blunt-ended nylon bristles. Tynex and Chinex are among the brand names you'll see on better full-sized brushes. The latest addition from Purdy is Syntox. When applying alkyd varnish, a Syntox brush leaves as few brush marks as a natural-bristle brush does, and it works as well with water-based finishes as any other brush I've tried.

For smaller areas, choose an artist's brush

Artist's brushes are made from a variety of natural and synthetic materials. For $3 to $6 you can get ⅛-in. and ¼-in. brushes made from synthetic Taklon that are useful for touch-ups. A 1-in. brush is handy for small projects, such as drawers, or thin edges. The most useful artist's brush for applying shellac or solvent varnishes is the 1½-in. or

Photos, except where noted: Mark Schofield

BRUSH TYPES, SIZES AND SHAPES

NATURAL

Natural bristles are still the standard that synthetic ones try to match. Most people associate badger hair with natural bristle, but pure badger-hair brushes are too soft for applying most finishes. The stiffest bristles are hog or Chinese bristle, which come as either white or the slightly stiffer black. Most all-purpose natural-bristle brushes are a blend of hog bristles and either badger or ox hairs. Costing $20 to $30, natural-bristle brushes are expensive. And because natural-bristle brushes absorb so much water and become limp, they are not a good choice for water-based products.

SYNTHETIC

Synthetic bristles used to be confined to water-based finishes that were unsuitable for natural bristles. They have always been cheaper and easier to maintain than their natural counterparts, and as their quality has improved, growing numbers of finishers are switching to them for all types of finishes. Names of some of the better bristles are Chinex, Tynex and Syntox, but avoid bristles described only as nylon, polyester or a blend of the two.

THREE SIZES TO FIT YOUR NEEDS

A 3-in. brush, a 2½-in. angled sash brush and a 1½-in. brush with either natural or synthetic bristles cover most finishing requirements in woodworking. An angled sash brush can cover wide surfaces and get into tight spots. In general, always use the largest brush that can fit into the area to be finished. The carrying capacity of the larger brush means fewer trips to the can to reload and makes it easier to maintain a wet edge and avoid overlap streaks.

OVAL BRUSHES FOR LARGE AREAS

If you have a large surface to finish, consider purchasing a brush with an oval-shaped ferrule (the metal band between the handle and the bristles). These brushes can hold a lot of material, allowing large areas to be finished before reloading. However, it's more difficult to obtain a smooth surface using an oval brush.

ARTIST'S BRUSHES FOR SMALL AREAS

Artist's brushes can fit into tight areas. The 1½-in. wash brush with synthetic Taklon bristles will apply a final coat of thinned shellac or oil-based finish that leaves almost no brush marks. Expect to pay $25 to $55 for these brushes.

Small brushes for tight spots. *Artist's brushes can reach areas that larger brushes can't.*

SOURCES OF SUPPLY

Purdy brushes can be viewed at www.purdycorp.com and are available at most paint stores and home-improvement centers. Specialized natural- or synthetic-bristle brushes can be purchased at the following web sites: www.finepaints.com and www.homesteadfinishing.com.

Photos, this page (left, middle, top right, bottom far right): Kelly J. Dunton

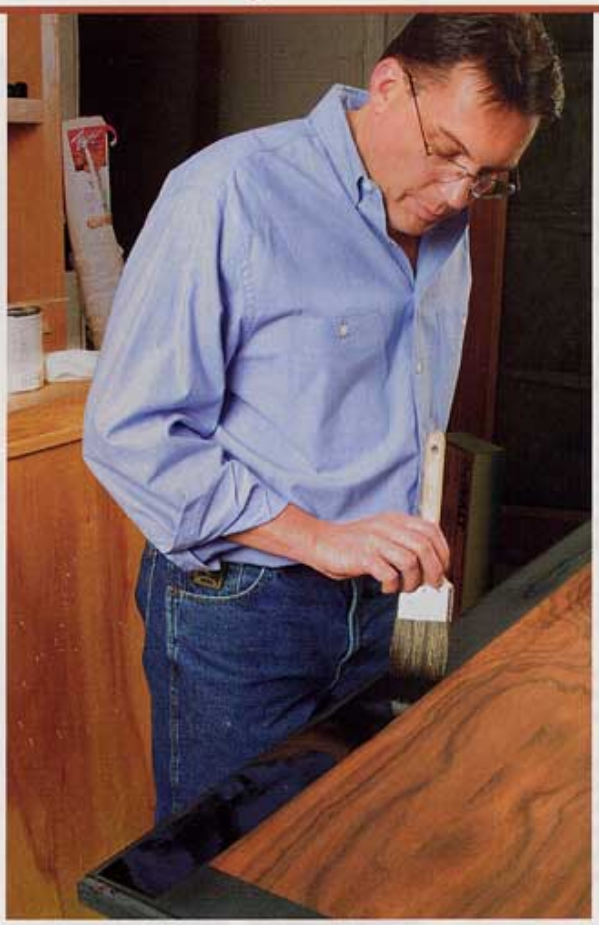
Load the brush

Strain the finish. *After a can has been opened several times, dried finish collects around the lid and bits of skimmed-over finish may be floating inside. Remove all of this debris by passing the finish through a paint strainer.*

Clearly better. *Pouring some finish into an empty container allows you to thin only the finish you'll use. Select a container that the brush easily enters, and adjust the volume to reach halfway up the bristles.*

Adjust the load. *Push the brush gently against the side of the container to strain out the desired amount of finish. Do not scrape the brush against the rim of the container because it can cause bubbles in the liquid.*

Start at the edge



Begin just inside the corner of the table. *Continue about ⅛ in. from the edge closest to you. After exhausting the finish, come back and brush off the edge where the stroke began.*

Then pull off the edge. *Short strokes with the tip of the brush finish the edge of the table. A curved profile is the hardest edge to finish because of the lack of a clearly defined boundary.*

Continue the first strip. *Start in the dry area and brush back into the feathered edge before reversing direction and carrying on to the far edge.*

2-in. wash brush. Offered by companies such as Winsor & Newton, a wash brush is a very soft blend of Taklon and natural bristles (or pure Taklon). It allows you to float or "wash" on thinned-down finishes (see "All About Thinning Finishes," *FWW* #151, pp. 86-91) with virtually no brush marks.

Use foam pads and wedges for stains and first coats

Last, and generally least, are the nonbrushes—foam wedges and pads that come on the end of a handle. These are cheap and useful for staining and applying first coats of most clear finishes where much of the product will be wiped or sanded off. But be cautious using them with lacquers, which may melt the foam. Also, the alcohol in shellac may dissolve the glue that attaches the foam to the handle.

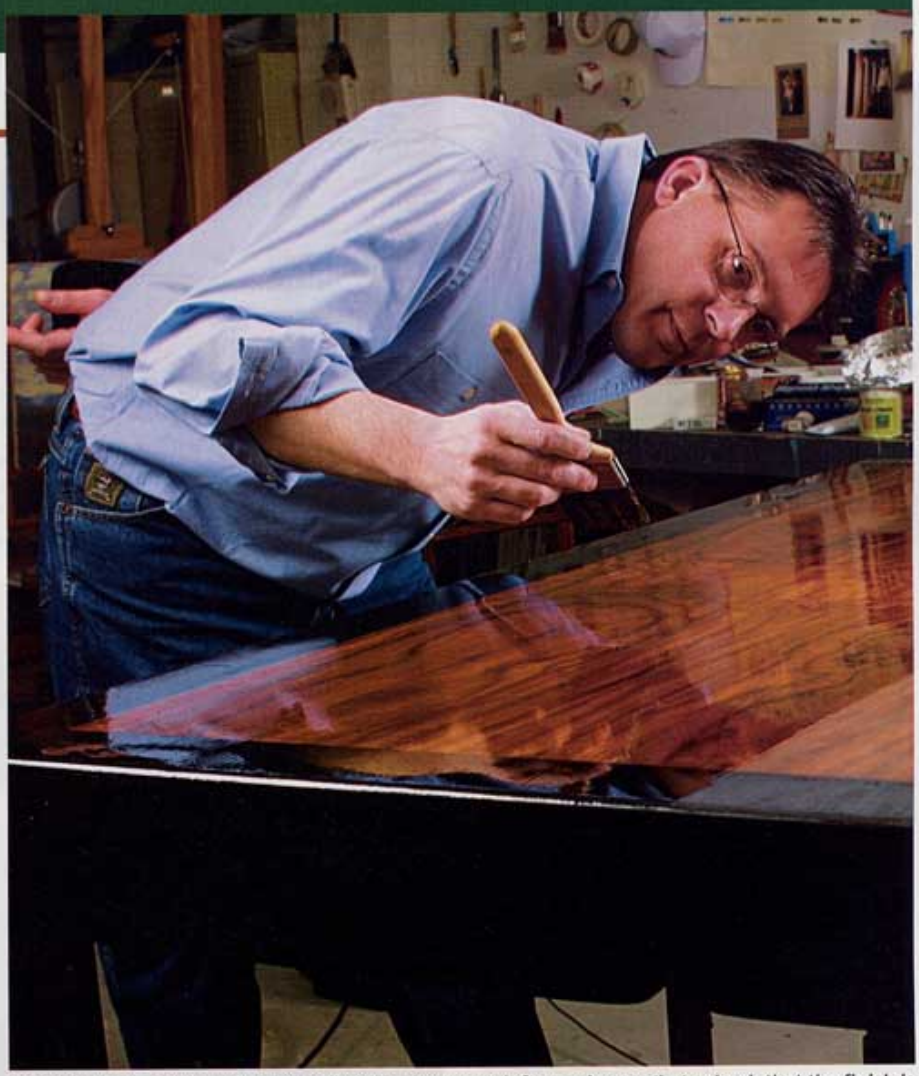
Because material from these pads is squeezed out by applying more pressure, achieving an even finish is difficult. Particularly with pieces that have lots of edges, moldings or carvings, you're more likely to get runs as you try to make the pad conform to the contours of the piece.

Don't be in a rush to brush

Much as the steering wheel of a sports car transmits the feel of the road, with experience you'll be able to sense when the brush is flowing material onto the surface at the proper rate. You'll feel the subtle differences between areas that are puddled

Prevent pooling. *With thicker finishes, leave a gap between strokes.*

Blend the lines together. *The tip-off stroke fills the gap, creating a finish of uniform thickness.*



Look out for puddles. *Occasionally look at your work from a low angle to check that the finish is being applied evenly. Slow-drying finishes can be leveled simply by rebrushing.*

too thickly and the extra drag from spots that have been skipped entirely.

Developing this feel takes practice. Make up a sample in the same wood and in some of the same profiles that appear in your project. Aside from helping you decide which brush feels right for the job, the sample will help you determine a finishing schedule; the correct stain color; how many coats to apply; whether thinning is necessary; when to sand and with what paper; and how the final finish will feel and look.

The easiest way to finish a project is to take it apart into its smallest components. It is also important to determine what order you will brush the various surfaces of your project. Dovetailed drawer fronts, in particular, are much easier to finish cleanly when not yet attached to their (usually) unstained and/or unfinished sides.

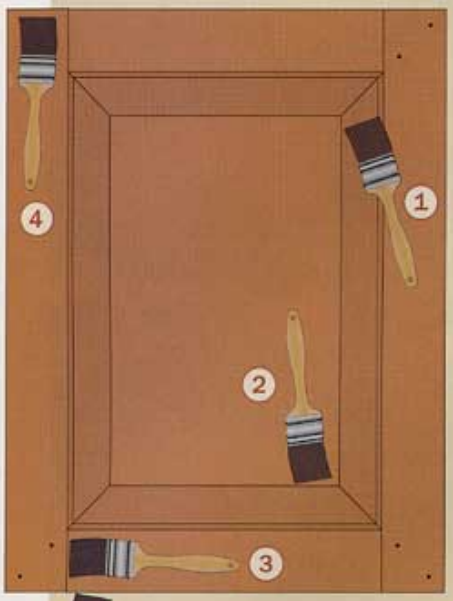
Remove all hardware or carefully mask any that must remain. In general, work from the top down, from the inside out, from a panel to its stiles and rails. The goal is to reduce the number of wet edges that you must try to keep so that the finish can integrate or melt into itself without leaving brush marks or ridges. Try to break down everything to a series of small panels, strips of moldings, or blocks of carvings.

Getting the brush wet

After straining the finish into another container and adjusting its viscosity (see the left photos on the facing page), if necessary, load the brush with the finish material. It's important to pay attention to how much finish you are placing into each brush load. Too much material, and you'll drip finish across the surface as you head for the area to be worked, or it will puddle the moment you lay the brush on the surface. If you pick up too little, it will mean more trips to the can and more time for wet edges to set up before the next brush load gets there.

Adjust each brush load for its intended surface; for instance, a flat tabletop takes all you can give it, while a ¾-in.-wide by 12-in.-long drawer edge barely needs the tips of the bristles wetted.

Start each panel at the edge farthest from you. This way, if you drip onto unfinished



Paint by numbers

Brush a raised panel in the following order to achieve a flawless finish:

5

1. Start on the panel bevel, working away from a corner.
2. Treat the panel center like a small tabletop.
3. Brush the rails of the frame.
4. Finish the stiles—brushing off, not onto, either end.
5. With the tip of a barely wet brush, finish the edge last.

1 ***Begin with the bevel.*** *Bring down the brush away from a corner to avoid pooling the finish. Brush with the grain whenever possible. Once the stroke has been completed, use the tips of the bristles to push a small amount of finish into the corner.*

2 ***Think of the panel as an aircraft carrier.*** *Land the brush inside the near edge of the panel and continue the stroke until you "fly off" the far edge.*

Watch it on the web

To see a video clip of David Sorg brushing a raised panel, go to www.finewoodworking.com.

areas, you'll be able to go right over the drips. If practical, work with the grain.

Takeoffs and landings on tabletops

On your first stroke you have two edges—one parallel to the grain and direction of the brush stroke and one perpendicular to the grain and stroke. Land the brush just in from the perpendicular edge and move it about ⅛ in. from the parallel edge until you run out of finish. Don't lean on the brush. Now return to where you started the stroke and brush off the perpendicular edge. The biggest cause of runs and drips is brushing onto an edge, which allows surplus liquid to dribble down the side of your project.

Finally, reverse the direction of the brush and lightly glide it from where the original stroke ended and go off the perpendicular edge. This process is called tipping off and should leave an even amount of finish that is as wide, or slightly wider than, the width of the brush. On a small surface, you may be able to go right off the other perpendicular edge as well. In this case, your tip-off stroke will be more like an airplane touch-and-go landing, coming in lightly an inch or so from one edge and taking off at its opposite edge.

On a larger surface, you have two choices for beginning your next stroke with a recharged brush. Some prefer to bring down the brush just inside the wet area where it began to thin out, then continue on toward the far edge. Others prefer to begin a few inches into the dry area, brushing toward the feathered edge and into it, then reversing the stroke and carrying it toward the far edge. Which technique you choose will depend partly on how fast you work; for example, with lacquer and shellac you run a risk of pulling out the drying finish if you start inside of it.

Continue your finishing pattern until you reach the far edge—spreading out a brush full of material, then tipping off to merge the stroke with the previous one.

Begin the next stroke by laying down the edge of the brush either immediately next to the first stroke or slightly separated from it. With thin shellacs and lacquers that will

Drawing: Kelly J. Dunton

3 ***The rails need special attention.*** *If the rails butt into the stiles, brush the rails first, starting and stopping as close to the joint as possible.*

4 ***Brush the stiles as you would a tabletop.*** *Start inside the near end, continuing to the far end, then come back to brush off the near edge.*

5 ***Leave the edge until last.*** *Apply a line of finish using the tip of the brush, then pull it off each edge.*

melt into each other, I usually lay up the edges to the previous stroke or even overlap them slightly. With thick varnishes, I keep the strokes separated, then blend the edges by tipping off. Water-based varnishes require this blending to be done quickly; oil varnishes give you plenty of time.

Continue until you complete the panel, checking the adjacent edges for any rollover that can be wiped off an otherwise dry surface. If the other surface is wet, it's best to let the drip dry and sand it rather than try to brush it out.

Run-free raised panels

Start with the bevel surrounding the center panel. Beginning the brush stroke right in a corner tends to cause pooling. If anything, interior corners can be starved of finish to yield a crisper look. Start the stroke ⅛ in. away and discharge the brush as you head for the opposite corner. Come back with the nearly dry brush to blend the beginning of the stroke into the first corner.

Brush the flat section of the panel the same way you would a small tabletop: Start the stroke just inside one edge and brush off the far edge. Return to brush off the first edge, and finally tip off the whole strip with a touch-and-go pattern, avoiding brushing onto either edge.

Then do the strip of molding that surrounds the panel, or the entire rail or stile if there is no decorative edge. If the rails butt into the stiles, brush the rails first, starting and stopping as close to the joint as possible (slightly over the edge onto the stile is better than coming up short of it). For these strokes, you'll want a slightly less loaded brush because you're going to stroke to a line instead of going off an edge, and you don't want to leave a roll of material. With oil-based varnishes you can just stroke right out onto the stile because it will stay wet long enough to be picked up when you brush the stile. Finally, finish the edges of the whole assembly.

Brushing narrow boards

Brushing a board that is wider than the width of your brush but not as wide as two brush widths is tricky. Brush a coat of finish down the middle of the board, stroke out to each of the three remaining edges, then tip off with a couple of strokes parallel to the grain.

If the board is narrower than your brush, turn the brush on an angle to make its effective width the same as the wood. This is where an angled sash brush is often convenient. When you are brushing edges of boards or doors, hold the brush perpendicular to the surface and use just the tip to lay a bead of finish down the center of the strip from one end to the other. Again, using the tip of the brush, spread the center roll of material to each edge across the grain. Last, do a long, light tip-off stroke following the grain.

Carvings and latticework

Carvings can be finished in shellac or lacquer by using a small artist's brush. First, coat undercuts and recesses with a lightly loaded brush, then brush the tops and primary surfaces, allowing the edges of the finish to melt together. Additional coats are usually just placed on highlights that can be lightly sanded, if necessary. Surfaces that will be rubbed and polished require more finish.

When brushing oil varnish, apply it more liberally, then pick out any pools with a discharged brush. To even out the coverage in the area, use a dry brush and work in short, vertical motions (called stippling). Water-based finishes can be worked in a similar manner, but in small sections to keep the working area wet. □

David Sorg is a professional finisher and artist in Denver, Colo.

Arts and Crafts Bed

Router templates help create smooth curves and tight joinery

BY GARY ROGOWSKI

Your mother was right. You do have to lie in the bed you made. I think you'll find this more a blessing than a curse when you make this Arts and Crafts bed. The key is to be mindful that you're building on a larger scale than is probably normal for you. Constructing a bed requires a different approach than a smaller piece does.

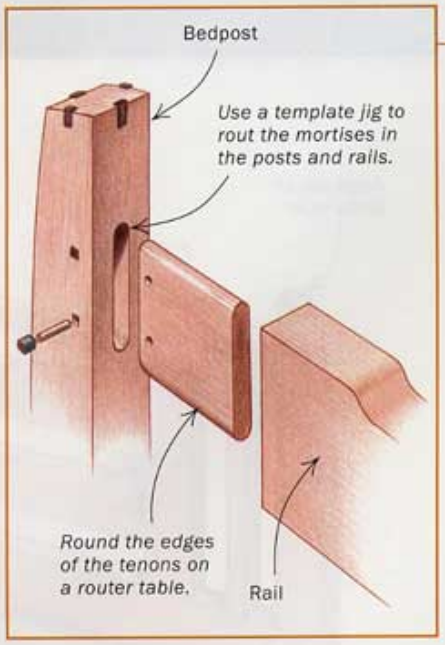
Breaking down this bed into its several parts will make planning and assembling it much more manageable. Working with a queen-sized mattress means you'll be building a rectangular frame about 61 in. by 82 in. (includes extra space for bedclothes). The ends of this frame consist of another two frames, the headboard and footboard. So frame construction, albeit on a large scale, is all that faces you.

Build the headboard and footboard frames from the outside in: posts and long rails first, then vertical pieces and finally the center rails. Working your way in from the large to the small is an important tactic for this project: You will dry-fit the outside pieces to get true dimensions for the internal members. Later, the glue-up will go in the reverse order, from inside to outside.

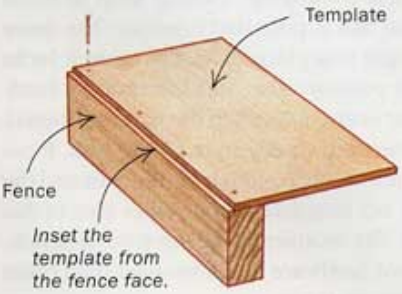
Full-sized drawings are invaluable

Certain design elements seem to fit quite naturally into this style of piece, such as the gently curved and tapered posts that meet the floor with a solid presence and the cloud lift, an element of Chinese furniture

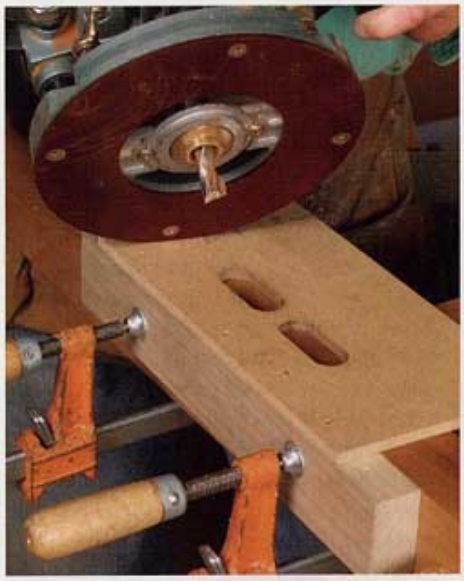
Photo, this page: Scott Phillips

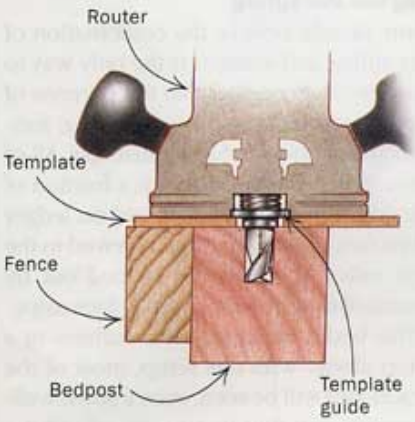


Use a simple jig for the floating tenons

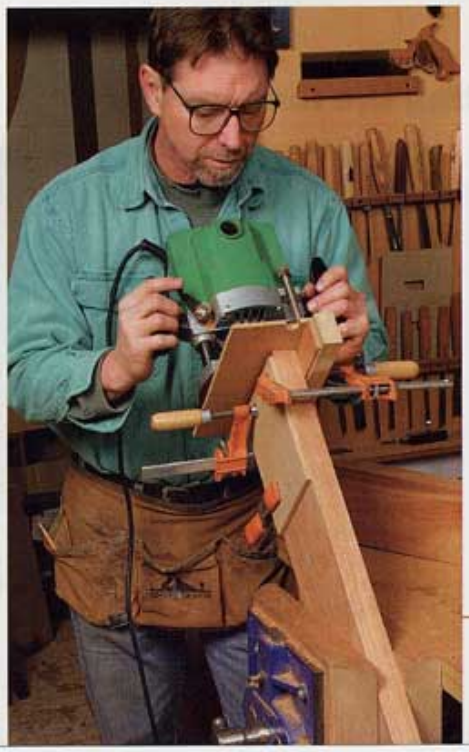


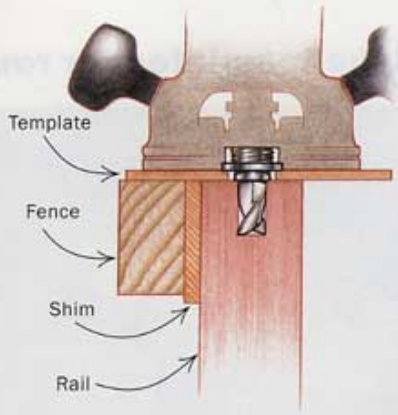
Make the template on the router table. *Attach a hardwood fence to the ¼-in.-thick MDF template, leaving it slightly proud of the edge. Lay out the slots and drill starter holes to make it easier to rout the slots.*





Mortise the posts first. *Place the workpiece in a vise and clamp on the template. Take a few passes to get down to full depth, and stop often to vacuum out the chips.*





Template routing is easy on the ends of long rails. *The rail is thinner than the post, so to center these mortises you must insert a shim between the workpiece and the template fence.*

that Greene and Greene appropriated in the early 20th century. The cloud lift—a small S-curve, combined with a long, sweeping curve—appears in a few ways in this piece.

Texture in a piece is always important. I decided that inlaying raised strips of ebony in the post tops would give a stopping point for the eye and hand. The carved square plugs would do the same where I had pinned the joints. By stepping down the thicknesses of each adjacent part toward the center of the bed, I created shadow lines, another form of texture.

I finalized the design in a set of full-sized drawings. A full-sized drawing not only gives even better information about proportion, form, balance and negative space, but it also lets you plan out the details, seeing how they will work in the piece. I also use full-sized drawings to find graceful curves—bending a thin stick of oak, using a few weights to hold it in place, and tracing against it.

Because the headboard and footboard are symmetrical around their centerlines, I only had to make half views of each. Likewise, most of the template has to cover only half of the full profile.

Knockdown hardware is best for beds

You'll need to remember one important fact: Once you build a bed, you must be able to get it out of your shop and into the

Photos, except where noted: Asa Christiana

bedroom. Therefore, it needs to be a knockdown design.

I use a wedging, locking style of hardware that is pounded together. The more weight you place on it, the more it locks into position. Also, this knockdown hardware is invisible when the parts are joined, better suiting the style of the bed. It requires mortising into both the post and the rail, but template routing takes care of this job. The mortises make this type of knockdown hardware much stronger than other screw-on types.

Note: Because end grain doesn't grip screw threads as well as long grain, use 3-in.-long screws to attach the male side to the ends of the rails.

Bag the box spring

Many people believe the combination of box spring and mattress is the only way to rest easy. But consider that the purpose of the box spring is to provide spring, support and ventilation for the mattress. All of this can be accomplished—at a fraction of the cost—by a row of slats laid on ledger strips (which are glued and screwed to the side rails). The slats are spaced out by means of dowels set into the ledger strips.

This bed is designed for a mattress or a futon alone. With this setup, most of the headboard will be seen, even if some well-meaning soul throws a gaggle of pillows across it.

If you're using a box spring and need more depth inside the rails, you can use an angle-iron ledger strip placed at the bottom of the rail to buy yourself a couple of inches more.

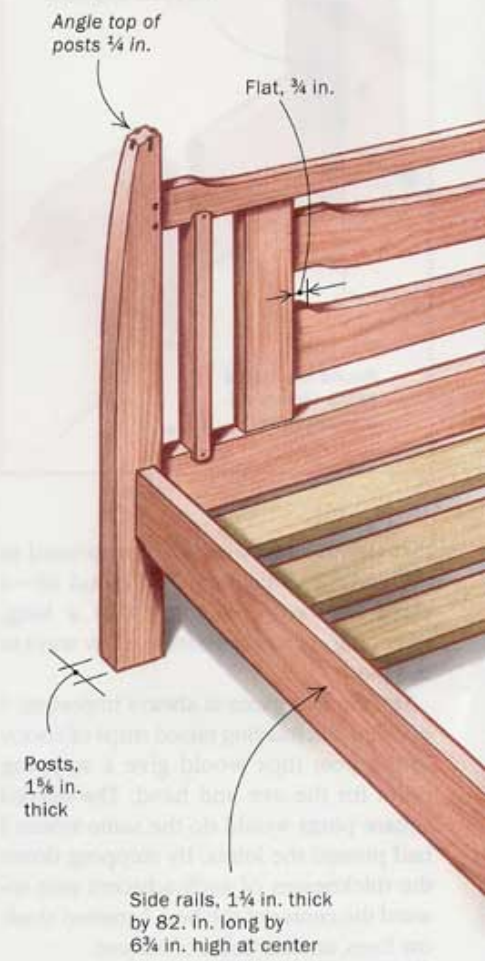
Long pieces demand special techniques

Rough-mill your stock ⅛ in. over in thickness and width and let it sit stickered for about a week to acclimate to your shop environment. Then mill it straight and flat. After cutting away the waste areas on the shaped pieces, let them sit for a while as well, then mill the square sides straight.

Accurate crosscuts—When cutting the long rails to length, use a crosscut sled with an extra board on the extension table to support the long rails. I use the insert table from my planer, which is the same thickness as my crosscut sled. Also, to index each cut, clamp a long stick to the sled with a stop attached. Be careful that the stick doesn't flex when you place the rail against the stop.

Floating tenons for the post-to-rail joint—Once boards get more than 4 ft. in length, like these top and bottom rails, it becomes difficult to cut accurate tenons in the stock. So to join the thick, heavy posts and rails, I used floating tenons, which require only mortises. I cut the mortises with a mortising template and a plunge router fitted with a guide bushing (see the photos and drawings on p. 45). This setup makes it easy to cut identical mortises into both the posts and the ends of the long rails.

I always use a double tenon in rails that

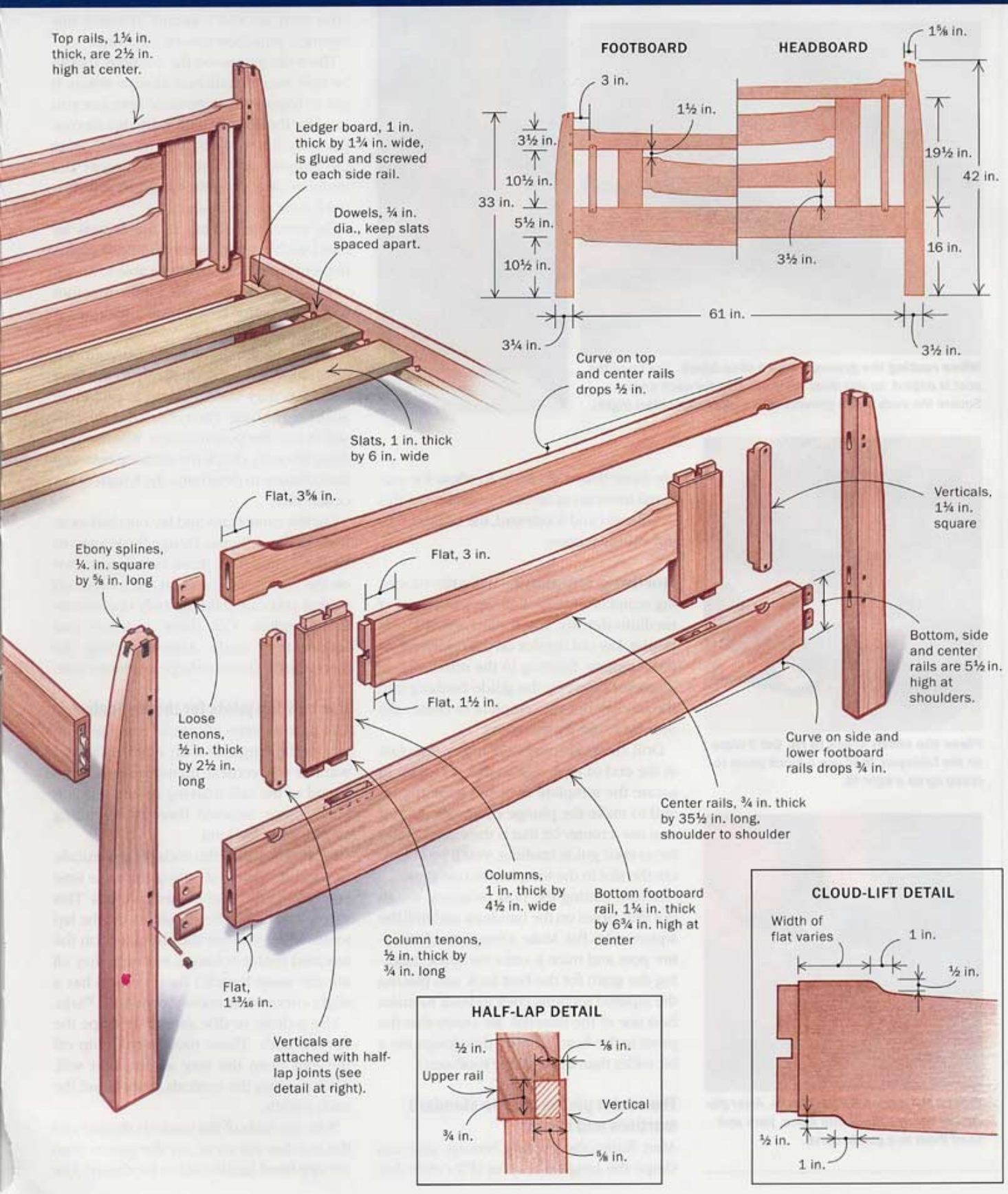


Make templates for routing the long curves

Design the curves using a flexible batten. *Rogowski lays out the curves on full-sized drawings of the footboard and the headboard. Only half of each symmetrical view is necessary.*

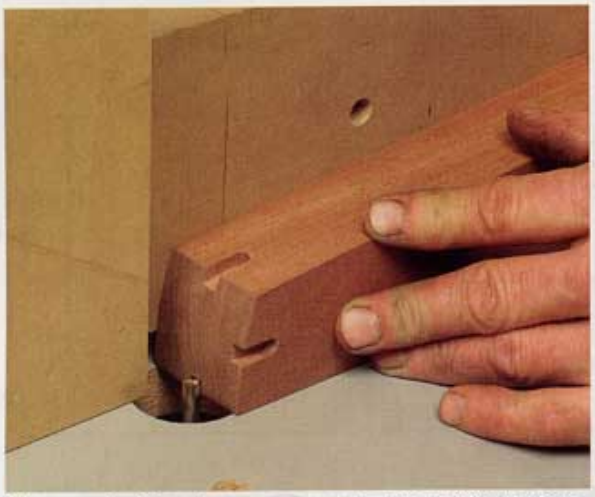
Lay out the same curve on a template. *Take the beginning and ending points for the arc from the drawings, then connect the points using the same batten technique.*

Rout the curve one half at a time. *Only a half template is needed. Use a bearing-guided bit and work downhill, with the grain. Then flip the workpiece and reattach the template.*



Drawings: Michael Gellatly

Decorate the posts with splines



When routing the grooves, use a stop block. *The tip of the post is angled, so you must reset the stop for each groove. Square the ends of the grooves with a mortising chisel (right).*

Plane the ebony stock to fit. *Get it close on the tablesaw, then use a block plane to creep up on a tight fit.*

Soften the edges with a chisel. *After gluing the ebony splines into place, pare and sand them to a gentle curve.*

are more than 4 in. wide, to allow for seasonal movement across the grain. On this headboard and footboard, the bottom rails get double tenons.

Mortising templates—Make the mortising templates for the floating tenons out of medium-density fiberboard (MDF) and poplar. Lay out the slot on the underside of the template, figuring in the difference in diameter between the guide bushing and the bit. Lay out the template to center the mortise in the leg thickness.

Drill an undersized hole in the template at the end of each slot so that it's easier to locate the template over the spinning bit and to make the plunge cut easier. Also, if you use a router bit that is the exact diameter as your guide bushing, you'll be able to cut the slot in the template in one pass.

Before cutting the post mortises, rough out the curves on the bandsaw and mill the square sides flat. Make a template of an entire post and trace it onto the stock, aligning the grain for the best look and placing the tapered sections back to back to make best use of the material. Be aware that the posts in the headboard in this design are a bit wider than those in the footboard.

The center pieces receive standard mortises and tenons

After fitting the floating tenons, you can shape the long rail curves (I'll cover that shortly), then put the frames together dry to check the distance between rails. Cut your verticals and columns to match this distance, plus their tenons, of course.

The wide tenons on the columns should be split into a haunched, double tenon. It just so happens that the same template you used for the floating tenons fits this mortise perfectly. Cut the two outer mortises using the template and a shim. Then move the template over, reset the bit depth and clear out for the center haunch.

Do your final fitting of the tenons by hand with a bullnose or shoulder plane. Remember, you shouldn't be able to knock your mortise-and-tenon joints together with your hat or have to use a hammer. A shoehorn fit is best.

Dry-fit the frame to check that your column shoulders snug up nicely to the long rails. You may need a clamp to pull them all the way home. Then check that the rails still fit into the post mortises. When everything fits well, check the distance between the columns to determine the length of the center rails.

Cut the center rails and lay out their mortises on the columns. Design these joints to be the same for all three center rails (two on the headboard, one on the footboard) so that you can make up only one mortising template. Cut these mortises and square their ends. After trimming the tenons to fit, you can shape the center rails.

Use half-lap joints for the verticals

The narrow verticals are let into the front side of the long rails with a half-lap joint. I wanted the vertical member to sit ⅛ in. proud of the rail; inlaying its end lets you leave more material there after cutting away for the lap joint.

Start by notching the ends of the verticals. (It's a good idea to do this at the same time you make the wider center columns. This way you can cut the shoulders for the lap joints while you cut the shoulders on the tenoned center columns, ensuring they all are the same length.) Each vertical has a slight curve on its ends; the radius is $^{29}/_{32}$ in.

Use a drum or disc sander to shape the curved ends. These tools won't chip off the end grain the way a router bit will. After shaping the verticals, back-bevel the ends slightly.

With the ends of the verticals shaped and the notches cut away, lay the pieces onto the dry-fitted headboard or footboard. Use

Undercut the curved tip for a better fit. *Place a thin shim under the workpiece and take light, even passes to back-bevel the end. This will make the joint easier to fit.*

a 3-in. spacer to set them the right distance away from the posts, and use a knife to lay-out the mating recesses on the rails.

Rout the rails to depth freehand, coming as close to the layout lines as you can. Use a climb cut to prevent cutting past the line and a shallow gouge to finish up the curved cuts. When you finally fit these verticals into place, the undercut tips should fill up the recesses perfectly.

Templates also handle the curves

There are many curved parts on this bed, with long, sweeping arcs and tighter cloud-lift curves. It is inestimably simpler to shape each profile just once on a ¼-in.-thick MDF template and pattern-rout the pieces than it is to draw the curves on all of the pieces and shape them individually. The only exception is the posts, where I went straight from the bandsaw to a bench plane.

Aside from the posts, all of the other curved profiles are symmetrical around a center point. So you need only half templates, which can be flipped over to cover the entire profile. Lay out the curves on your full-sized drawings and then your templates using a ⅛-in.-thick piece of oak or ash. Mark the high and low end points and use weights to hold the stick in place while you mark out a pleasing curve. Bandsaw the profile as close to the line as you can. Sand off the high spots, then smooth the long curves with a bench or block plane. Check the template often for high spots, dips or bad transitions. Use a spokeshave or drum sander to clean up the concave areas, and sandpaper on the transitions. (Make your templates smooth, and

Scribe and fit the half-lapped verticals

Use the workpiece itself to lay out its mating recesses. *A spacer block keeps the verticals parallel to the posts for layout. Use a marking knife to scribe around the ends.*

A router sets the depth of the recesses. *Use the tool freehand, staying away from the layout lines. Test-fit to check the depth.*

Pare to the layout lines for final fitting. *Use a shallow gouge with a sweep just tighter than the curve of the recess.*

Photo, this page (bottom right): Michael Pekovich

Mortise in the knockdown hardware

These plates are inlaid into the rails and posts, providing a strong, hidden joint that knocks down easily.

Rout the mortise for the hardware using a template-and-bushing router setup. *The mortise depth is critical to the joint coming together properly. After routing, square the corners of this shallow mortise.*

Lay out the recesses for the hooks. *Remember that the hooks will be inserted straight inward, but then travel downward.*

Rout the recesses freehand. *The male plate will also need slight recesses behind it, to accommodate the back ends of the hooks, which protrude slightly. Use longer screws in the end grain of the rails, where threads don't grip as well.*

you will have only minimal cleanup to do after the router operation. Time invested here will pay off many times over.)

Use the templates to lay out the curves, and then bandsaw to within 1/32 in. of the line. Attach the templates to the parts with double-stick tape or use a carriage jig like the one shown on p. 46 (bottom right photo). The jig is simply a piece of ¼-in.-thick MDF with a strip of hardwood for attaching hold-down clamps. Both the stock and the template are clamped down in one shot, and the clamps provide safe handles for controlling the operation.

Use a flush-trimming bit on the router table to shape the curves. To avoid tearout, cut downhill, with the grain. You may need to make two passes to cut all of the way down to the template.

After routing, clean up the long curves with a spokeshave and sand the tight ones by hand. Use a scraper and fine sandpaper to finish the job.

Shape the posts—The posts were roughed out before being mortised, but they may need to be trimmed closer to the pattern line with a bandsaw. Clean up the saw marks with a spokeshave or handplane. A No. 3 bench plane or even the longer No. 5 works well on this gradual curve. Use a hand scraper to remove any tearout or plane marks. Cut the curved top of each post on the bandsaw and finish up with a spokeshave and sandpaper.

Pegs and splines add detail

Small ebony details add flavor to this large-scale mahogany piece. Some of the joints are pinned, and there are short splines in the tops of the posts.

Drill for the square plugs—I pin joints in two steps. I use a thin dowel to actually pin the joint, and a separate square plug that goes in afterward. If you drill for the square plugs while the parts are still separate, you can use the drill press instead of an unsteady handheld drill.

A ¼-in. brad point set to drill ¼ in. deep is perfect. Set up a fence on the drill press and drill for all of the plugs required. You can square up these holes now with a ¼-in. chisel, but you must wait until the joints are glued up to drill through the tenons, drive in the pins and add the plugs.

I mill the ebony plug stock in long sections. First, square two edges of a stick on the jointer, using a long push stick. Then rough out the other edges on the bandsaw. Using a thinner push stick on the tablesaw, cut the stick oversized about 1/32 in. Plugs made from this stick will fill up any imperfections in your chisel work.

Add the spline inlay—The inlay grooves in the posts go in after the tops of the posts

have been shaped. Use a ¼-in. bit in the router table, and set up a fence with a stop to index each cut. Square the end of each groove with a chisel.

Mill the inlay stock in long sections, the same way you did the plug stock. When trimming these sticks to size on the tablesaw, leave the thickness oversized by a hair, so a pass or two with a handplane will fit the splines to their grooves.

Before putting in the post inlay, break the edge around the top of the post with a spokeshave. Make sure the inlay stock fits all of the way down into and to the end of the groove. After the glue has dried, trim down the inlay a bit with a block plane, bevel the edges a little with a chisel and then dome the splines with sandpaper.

Assemble from the inside out

Before assembling any parts, make sure they all fit together perfectly without any extra-heavy clamping pressure. Run through the glue-up dry so that you know where all of your tools, clamps and parts are. No surprises in a glue-up is a nice surprise. Glue the center rails to the columns first. While the glue is drying, put the columns into the rails to check that the center rails have gone in straight.

Glue in the columns to the rails next. But do another dry run first and thank yourself later on. Put more glue into the mortises—especially at the mouth of each joint—than on the tenons. Glue on the tenons tends to get scraped off. When the clamps are in place, use winding sticks to check that the long rails are not twisted. Also before the glue sets up, put the posts onto the rails dry and check across the diagonals to see that the frame is going together square.

Finally, glue the posts to the long rails. Glue the floating tenons into the rails first, one at a time. There's no pressure or rushing this way. Plus you can check if the tenons are going in straight and to full depth. Then glue the posts to the rails. Have long clamps ready to pull everything together. Also have an even longer clamp ready if you need to clamp across the diagonals. Once the clamps are on, check again to see that the frame is sitting flat.

Finish pegging the joints

I use 3/16-in.-dia. dowels to pin the joints. Drill into the bottom of the square holes you made earlier, through the tenon and into the opposite side of the mortise. Mark the bit with a piece of masking tape to set the depth. Cut the dowel to the proper length and chamfer the ends with sandpaper. Put a spot of glue in the hole and drive in the pin until it is level with the bottom of the square hole. Use a steel pin to drive the wood pin home.

Chamfer the tip of the square stock with a chisel and cut off an oversized plug. Use a toothpick to spread some glue in the hole and pound the plug straight in with a metal hammer. When the sound of the hammering changes from a thud to a ping, you'll know the plug is home.

Now saw off the plugs to about ⅛ in. proud. Plane them lightly with a block plane to remove the saw marks. To form a shallow dome on each one, first carve away the edges of the plug with a chisel. Use a piece of laminate to protect the surface of the surrounding wood. Work from all four sides of the plug evenly toward the middle, then sand it to a gentle curve.

Now the piece is ready for finishing. I used a wiping varnish called ProFin on this bed. Once you've attached the ledger strips to the side rails, assembled the bed, inserted the slats and put on your bedding of choice, you've made your bed—and you'll want to lie in it. □

Gary Rogowski is a contributing editor. He runs the Northwest Woodworking Studio, a woodworking school in Portland, Ore.

Pin the joints in two steps

Use a dowel to pin the joint, with a square ebony peg on top. *Before assembly, drill a shallow hole for the peg using the drill press. After glue-up, square the hole, then drill into the bottom of that hole and through the tenon to receive the dowel.*

Leave the peg slightly proud and break the edges. *Use a piece of laminate under the chisel to protect the surrounding wood. Finish with sandpaper to gently dome the peg.*

To take this Arts and Crafts bed to the next level, add a traditional silver inlay to the center columns, as described in this issue's Master Class (see p. 100).

Photo, this page (bottom): Scott Phillips

Sharpening Hollow-Mortising Chisels and Bits

Mortisers cut best when the chisels and bits have been properly sharpened

BY BRIAN GRAHAM

How mortisers cut square holes

A drill bit spinning inside a hollow-mortising chisel bores a round hole, then the chisel—following just behind the business end of the bit—cuts the four corners.

The mortiser is a machine designed for one purpose: cutting mortises quickly and accurately. Remarkably, it does that by cutting a square hole. Yet there's no magic at work here, just some clever engineering.

But mortisers can be finicky machines. In particular, if the cutting edges aren't sharp, this machine can give you plenty of grief. The bit squeals, the chisel cooks, and the wood chips smoke. It is not a pretty sight.

So you need to keep those edges sharp. If done regularly, it takes just a few minutes, and the techniques are pretty simple.

In the family tree of tools, the mortiser, or mortising machine as it's sometimes called, is most closely related to the drill press. The mortiser uses an induction motor to spin a drill bit. And, with the aid of a lever arm, the motor can be moved up or down to feed the bit in or out of a workpiece.

Of course, a round drill bit can't create a square hole. It takes a second tool to help get the job done: a hollow-mortising chisel, which has four sides with a lengthwise hole down the middle. With the drill bit inside the hole, the chisel and bit work in tandem. As the spinning drill bit cuts the hole, removing most of the wood, the fixed chisel travels with it, trimming the the round hole square in the process.

Mortisers can accept several sizes of chisels and bits, including ¼ in., 5⁄16 in., ⅜ in., ½ in., ⅝ in., ¾ in. and 1 in., with the size dictating the dimensions of the square hole. Keep in mind, though, that some machines don't accept every size chisel and bit.

You won't need a ton of tools to keep

all of the cutting edges sharp. I use a chisel reamer (see the photos below), four sharpening stones and some honing oil. The stones include a fine-grit flat stone, two round, fine-grit tapered stones (large and small) and an auger-bit stone (see Sources of Supply at right). By the way, before using a stone, be sure it gets a few drops of the honing oil.

Mortising chisel is a good place to start

The cutting end of a mortising chisel has four points, one at each corner. The points are created at the factory when the center hole of the leading end of the chisel is machined into a taper. The sharpening process begins with this taper.

Start by clamping the chisel in a vise at about a 45° angle. Then select one of the round, tapered stones. Use the small one for ¼-in. through ⅜-in. chisels, and the large one for ½-in. through 1-in. sizes.

Place the stone on the bevel of the chisel. You'll want the stone in contact along the full length of the bevel. Then start working the stone back and forth while slowly rotating it in your fingers.

The idea is to create a slight burr on the inside edge of the bevel. To check for the burr on the inside edge, simply run your finger lightly along the edge. By the way, to avoid creating grooves in the bevel, don't stay in one place for more than a few strokes.

All told, for a chisel that's moderately dull, it shouldn't take more than five minutes to get a nice burr all around the bevel. It will take a little longer if you have the additional task of removing grinding marks.

Now it's time to make the burr disappear. Place one side of the chisel on the flat stone, then pull the chisel toward you. After each pull, check the status of the burr with your finger. It might take a few pulls to eliminate the burr.

Use caution: You want the sides of the chisel to remain square to one another, so be sure to keep each side flat on the stone. Also, for the chisel to stay square, you need to make sure the same amount of steel gets removed from each side. That's easy to do simply by using the same number of pull strokes on each side of the chisel. Honing the outside edge will create a slight burr on the inside edge of the chisel.

To remove the burr on the inside of the bevel, slip the round, tapered stone into

Sharpen the chisel bevel. *To hone the beveled surfaces, use a fine-grit, round, tapered stone, rotating the stone as you work.*

Remove the bevel burr. *Use a fine-grit flat stone to remove the burr on all four sides of the chisel.*

A SHARP CHISEL CUTS CLEANLY

To cut properly and without effort, the hollow-mortising chisel needs to be as sharp as possible. The honing process takes just a few minutes.

SOURCES OF SUPPLY

SKARIE INC. (410) 728-6000
Sharpening stones, honing oil, reamer

GARRETT WADE (800) 221-2942
Flat sharpening stone, reamer

If honing isn't enough

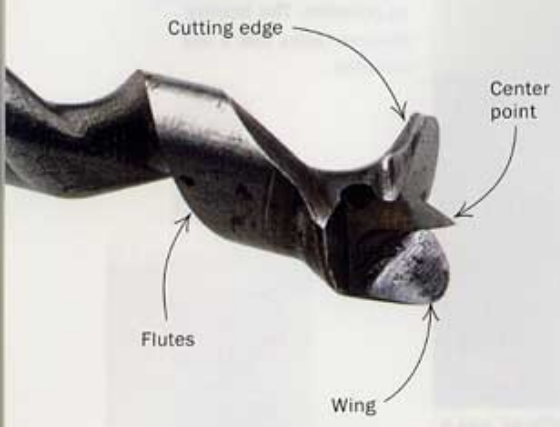
A reaming tool (below) mounted in a brace (right) quickly rejuvenates a bevel that has been sharpened out of round or nicked from a drop on a hard floor.

Interchangeable pilots. *The reamer comes with an assortment of pilots to fit various sizes of chisels.*

Photos, except where noted: Kelly J. Dunton; this page (top left, middle left, bottom right): Tom Begnal

A SHARP BIT IS A MUST

Mortisers don't like dull bits. Fortunately, it's no big hassle to sharpen a bit. All that's needed is a couple of stones and five minutes of honing time.



Start with the wing. *A few short strokes with a fine-grit auger-bit stone sharpens the wing of the bit.*

Get to the point. *Most bits also have a three-sided point that needs honing with the stone.*

On the edge. *When sharpening the cutting edge, pull the stone in one direction, working from the leading edge to the trailing edge.*

Hone the tip. *Rotate the tip of the bit clockwise on the flat stone to hone the outside surfaces. Use a light touch here.*

the center hole, then pull out the stone while slowly rotating it in your fingers. Try to avoid angling the stone as you work your way around the hole.

When the edge is nicked, use a reamer—The round, tapered stone is great for light to moderate touch-up work on the chisel. Occasionally, though, the bevel is going to need some extra work. That can happen after a bevel has been honed so many times that it ends up out of round or after a chisel gets dropped.

When the bevel needs a major tune-up, I use a hollow-chisel reamer (also called a chisel-sharpening tool). This gadget looks much like a countersink bit with a pilot added to the tip. When used with a hand brace, the reamer quickly shaves away steel, so in no time you can correct an out-of-round bevel or repair a broken tip.

The reamer is sold with several pilots of different diameters. Use a pilot that most closely fits the inside diameter of the chisel so that the countersink stays centered on the bevel. Another point: The bevel angle on these chisels isn't standardized, so before buying a reamer, check with your supplier to make sure it's suitable.

To use the tool, first mount it into a hand brace and then clamp the chisel in a vise. Slip the pilot of the reamer into the hole in the chisel. Now, slowly crank the brace, making sure the reamer stays in line with the chisel. The reamer usually leaves heavy burrs. So you'll need to use the round, tapered stone to clean them up.

Bit is sharpened in a few areas

Now that the chisel has been honed, you're ready to sharpen the bit. And for that you'll

Hone the flutes. *The flutes of the bit can be smoothed by rotating the bit counterclockwise on a flat stone.*

Photos, this page (top right, middle, bottom three): Tom Begnal

work with the auger-bit stone and then finish up with the flat stone.

The wing—Start by clamping the bit in a vise. Then hold the long, thin, tapered end of the auger-bit stone flat against the wing of the bit. Work the stone in short strokes across the wing, using care to avoid bumping into the center point of the bit.

The center point—The center point of the bit is next. Keep in mind, though, that some bits don't have a center point. Skip this step if your bit is pointless.

The center point is shaped like a three-sided pyramid. And all three sides need sharpening. The tapered end of the auger-bit stone is used here. Place the stone flat against one side of the point, then use a short, light stroke to push it across the surface. Avoid being heavy handed; you don't want to change the shape of the point. And be sure to remove the same amount of material from each side.

The cutting edge—Once the center point of the bit has been sharpened, you're ready to move on and hone the cutting edge.

Use a wide part of the auger-bit stone, and place it flat on the cutting edge. Then pull the stone in only one direction, so that it moves from the leading edge to the trailing edge. That way, as you smooth out the grinding marks left by the factory, you're also removing any burrs that form as you work the stone.

The outside—The work on the bit is almost finished. All that's required now is a little honing on the flutes. But because the tip of the bit, at the cutting edges, has a bigger diameter than the rest of the tool, it takes a couple of steps to get the job done.

I usually hone the tip of the bit first. With the bit parallel to the stone and the tip of the bit lightly touching it, it's just a matter of turning the bit clockwise (when looking at the tip).

To hone the remainder of the bit, place it on the flat stone with the cutting edge overhanging a little. Then turn the bit in a counterclockwise direction to smooth out any rough surfaces. □

Brian Graham lives in Baltimore, Md.

One thin dime. *To set the clearance between the end of chisel and bit, simply slip a dime between the shoulder of the chisel and the mortiser chuck. Then tighten.*

Raise the bit until it's flush with the chisel points. *Use a block of wood to support the tip of the bit. Then tighten.*

Readjust the chuck. *Loosen the chisel and push it up until the shoulder butts against the chuck, then tighten.*

Bit setup and cutting tips

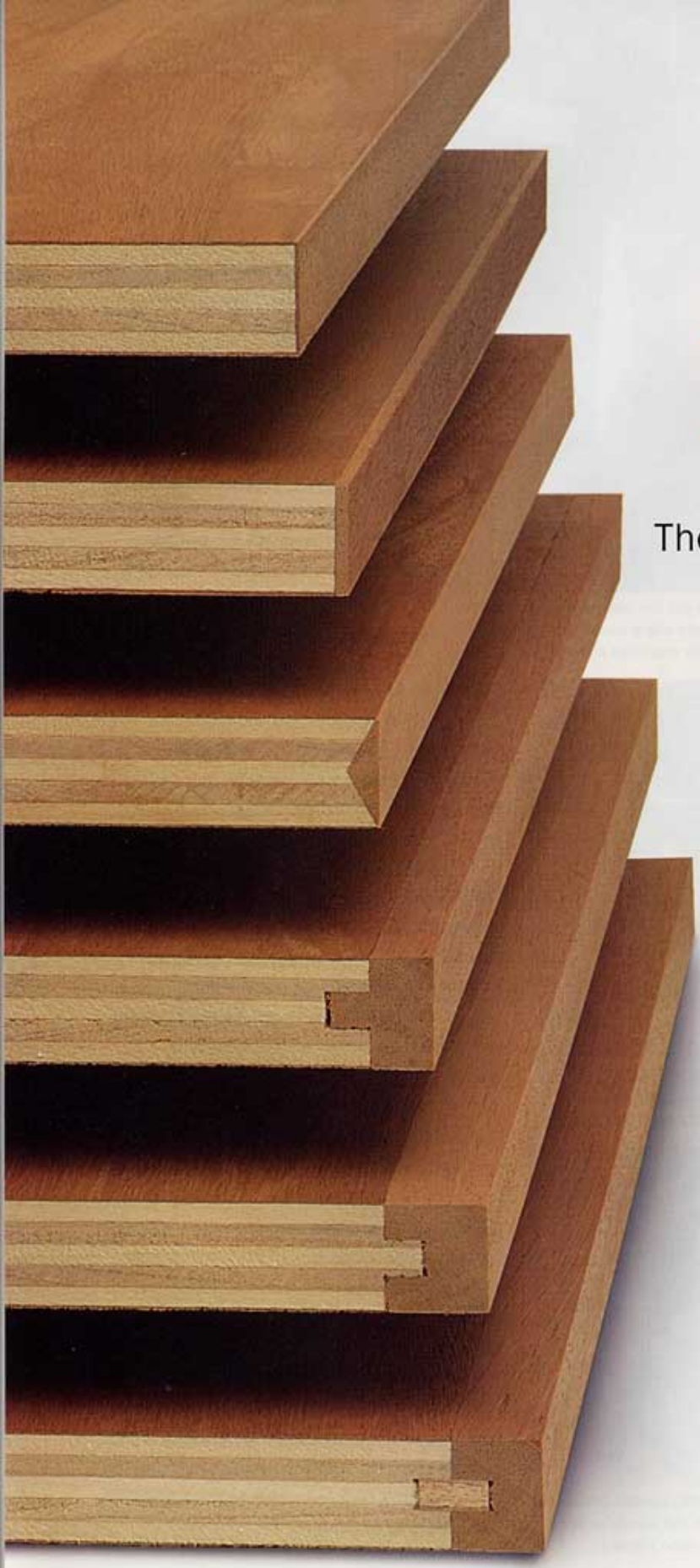
A well-sharpened hollow-mortising chisel and bit can go a long way toward taming an unruly mortiser. But sharpness isn't necessarily a panacea here. A few other things need to get done just right.

For example, if the chisel and bit are to work together effectively, there needs to be clearance between the oversized tip of the bit and the bevel of the chisel. You don't need a lot—3⁄32 in. to 1⁄8 in., or the thickness of a dime. Without clearance, the tip of the bit will rub against the bevel. When that happens, you end up getting assaulted with a high-pitched squeal that can make your teeth hurt. And, if that weren't enough, the friction that results heats the bit and gets the wood chips smoking.

I also find it important to lubricate the surfaces of the chisel and bit. A dry-film spray lubricant works well for me, and it's harmless to a finish. I spray the parts just before turning on the machine, then I respray them as needed if things start getting noisy or if the mortise begins to send up smoke signals.

It's also helpful to have the slotted side of the chisel facing in the direction of open space. For example, if you're working from left to right as you cut a mortise, the slotted side should face to the left. That way, the chips can eject into the cut portion of the mortise. If chips can't escape, they end up getting packed into the chisel. And that makes everything run hotter.

One more point. Rather than drive the chisel and bit the full depth of the mortise in one single stroke, it's usually better to make several short cuts. The upward travel of the cutters between strokes allows chips to clear, helping the cutters to run cooler.



Six Ways to Edge Plywood

The choices vary in their complexity and durability and the time they take to execute

BY MARIO RODRIGUEZ

To the world of woodworking, the innovation of plywood ranks right up there with the invention of the tablesaw. It's hard to imagine building some furniture and cabinetry without it. Plywood gives you the relative stability and flatness of a 4x8 panel, combined with the beauty of select veneers. You also get a variety of thicknesses, from ¼ in. to ¾ in. on stock items and up to 1½ in. on special orders—and you get all of this at a reasonable price. The challenge when using plywood is, of course, what to do about that ugly laminated edge. The goal is to create an edge treatment that looks like a continuation of the veneered surface without an obvious seam. You can achieve that goal with a simple layer of veneer or a more complex edge treatment that requires sophisticated joinery techniques.

The decision about how to treat a plywood edge can be influenced by a number of factors—aesthetic and design considerations (how do you want it to look?), function and durability (what kind of wear and tear will this edge face?), time and labor (how much of either do you want to spend?). The choice should depend on the planned use of the furniture piece or cabinet component. For example, a thick, solid edge would be appropriate for the exposed edge of a cabinet carcase. But for shelves contained and protected within a cabinet, an iron-on veneer edge would probably be sufficient. What follows is a look at the choices, from the easiest to apply but least durable to the more complicated versions that take longer but offer more protection. □

Mario Rodriguez is a contributing editor.

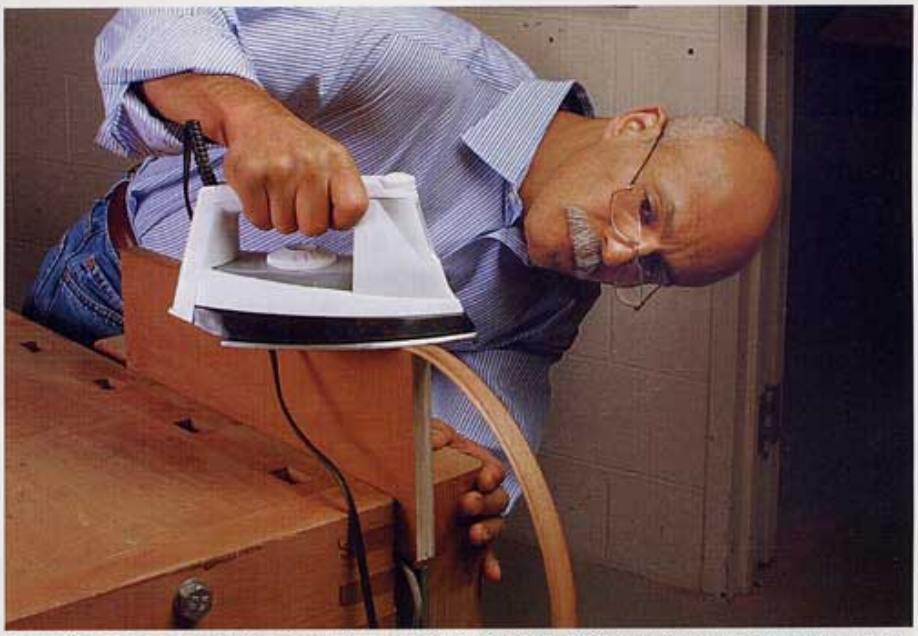
Photos, except where noted: William Duckworth; this page: Kelly J. Dunton

IRON-ON VENEER IS EASY TO APPLY

This material, also called edge tape or edge-banding, commonly measures 13/16 in. wide for use with ¾-in.-thick plywood. It is sold in rolls from 8 ft. to 250 ft. long, and it is available in a number of different woods. Birch, cherry, mahogany, red oak and walnut are fairly easy to find, but you can also buy it in ash, maple, pine, white oak, teak and just about any other species of hardwood plywood that is made. Because it's so thin, edge-banding isn't suitable for furniture components that will be subject to heavy use. But once the heat-sensitive glue has melted and cooled and the edge-banding has been trimmed, the seams are virtually invisible. Just remember that heat causes the glue to release, so don't choose edge-banding for pieces that will be exposed to heat.

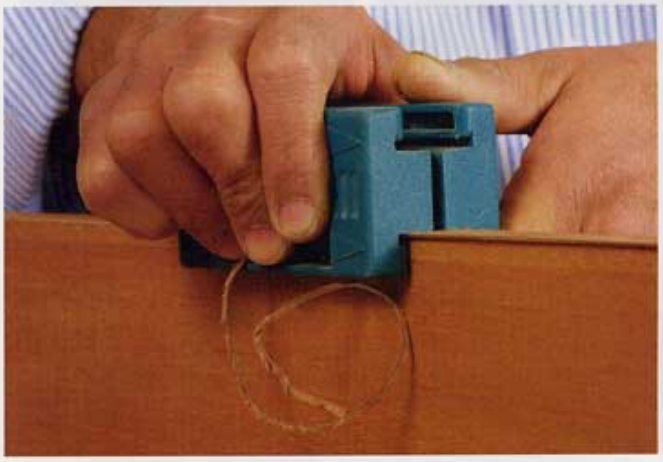
A standard household iron is the tool of choice for most people who use edge-banding. Set the iron to a medium heat level. While it's warming up, you can cut lengths of banding to size, allowing a little overhang on both ends. Move the iron slowly back and forth, applying a steady pressure until the heat-sensitive glue melts and bonds the edge-banding to the plywood. Some people burnish the banding with a scrap of wood, but I haven't found that technique necessary to get a good bond.

The glue needs to cool before you can trim the banding; otherwise, you end up with a gooey mess. You can trim the edge-banding overhang with a razor blade, a veneer saw, a file or a specialty tool designed for the job (see the photos at right).



Ironing is simple and straightforward. *A regular household iron set on medium heat is all you need to melt the heat-activated glue on the back of manufactured edge-banding. The material is available in just about any hardwood veneer that is also used to make plywood.*

Plywood guides the cut. *Rodriguez uses a sharp veneer saw to trim edge-banding on small workpieces that he can easily hold with one hand. To direct the cut he keeps the bottom of the saw flat against the plywood.*



The right tool for the job. *For trimming large quantities of edge-banding, invest in a spring-loaded edge trimmer designed for this task. The one shown here is made by Virutex and sells for about $10.*

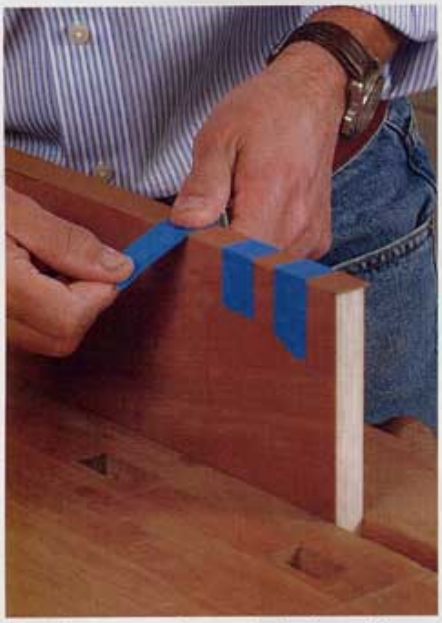
Photo, this page (top left): Kelly J. Dunton

SOLID EDGING

With solid edging you get a thicker edge than you do with iron-on edge-banding, and it requires only a little more work. For ¾-in.-thick plywood, begin by jointing a straight, square edge on a ⅞-in.-thick thick piece of solid lumber, then rip as many ⅛-in.-thick strips of lumber as you'll need.

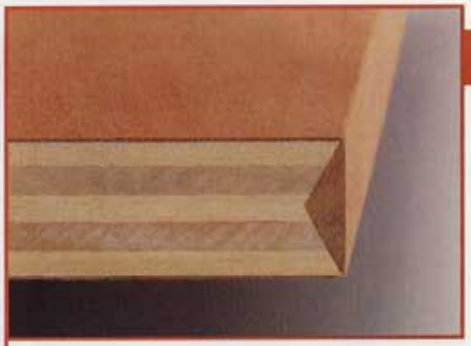
I use a sharp 40-tooth rip blade, but a good alternate top bevel (ATB) blade can also do the job. Be sure to back up the cuts with a sturdy push stick to prevent the thin strips trapped between the spinning blade and the fence from shooting back at you. Before ripping each ⅛-in.-thick strip, joint the edge of the lumber. Place the jointed edge against the plywood edge when you glue it up.

After applying a swath of glue to the plywood edge, use a good-quality masking tape to clamp the edging strips in place. Inspect each edge after you tape it. A tight seam with a little bit of glue squeeze-out along the length of the joint indicates a good job. After the glue has dried, trim down the overhang with a block plane and a cabinet scraper.



Masking tape makes a good clamp. *Numerous short pieces of masking tape provide plenty of pressure for gluing wood edging.*

Tools for trimming. *Use a block plane to trim most of the excess edging flush to the plywood surface (left). Angle the sole of the plane to achieve a cleaner cut. A cabinet scraper finishes the job (above).*



This method offers a couple of important benefits. The V shape has an extremely low profile at the seam, making it nearly invisible; and the increased thickness toward the center offers more durability than you get with edge-banding (p. 57) or even the ⅛-in.-thick treatment (left).

Shape the solid-wood edging first, using a board wider than you need, which makes the process easier and safer. First mark the exact center of the edging material with a marking gauge, then transfer that mark to the bottom edge of a sacrificial plywood fence. Set the tablesaw blade to an angle of 25°, and set up the fence so that the spinning sawblade advances into the sacrificial fence just below the scribed line. Once this setup is ready, you can shape as many edgings as you need, beveling the top and bottom of each piece of lumber by flipping and turning each board around and passing it against the sawblade.

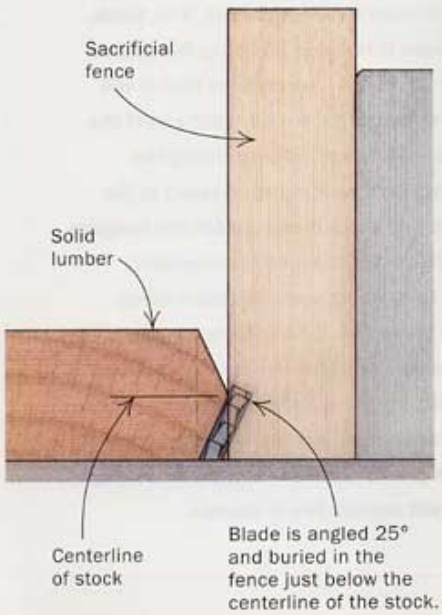
To cut the V shape into the edges of the plywood, leave the blade set at 25° and shift the fence to the other side of the blade. As with any finicky setup, it's best to have some scraps on hand to make adjustments as needed until the cut is aligned. When all of the angled cuts have been made, return the blade to 90° and rip the final pieces of V-molding from all of the lumber that you shaped. You can use masking tape to hold the V-molding in place when you glue it up. Once the glue sets, trim the edges with a block plane and a cabinet scraper.

Photos, this page (top left and top right): Kelly J. Dunton

V-SHAPED EDGING IS DURABLE AND PRACTICALLY SEAMLESS

CUTTING THE BEVELS

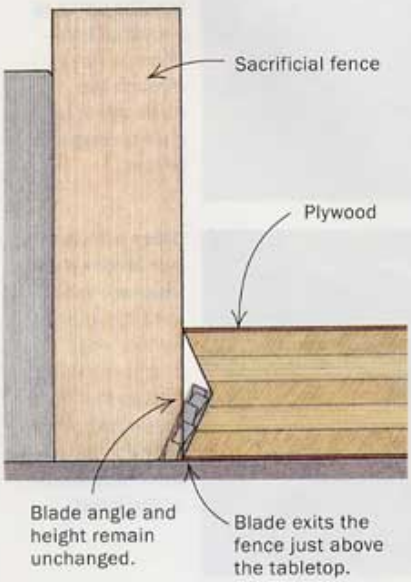
Use a ⅞-in.-thick piece of lumber to make a V-shaped edging for ¾-in.-thick plywood.



This setup is precise. *Transfer the lumber marking-gauge setting to a scrap of plywood. The scrap serves as a sacrificial fence for making the bevel cuts.*

SHAPING THE PLYWOOD

Move the fence to the other side of the blade to set up the cuts for the V-shape into the edge of the plywood.



A nearly invisible seam at the edge. *This alternative edging offers the advantage of showing very little wood at the edge where veneer meets lumber, unlike the effect you get with tongue-and-groove edges (see pp. 60-61).*

Drawings: Vince Babak

THREE TONGUE-AND-GROOVE EDGE TREATMENTS

The three common versions of a tongue-and-groove lumber edge for plywood offer the most protection for a plywood edge. A significant advantage of adding a substantial piece of lumber to the edge of plywood is that you can shape that edge in any number of decorative configurations, such as a bullnose, an ogee or a bevel.

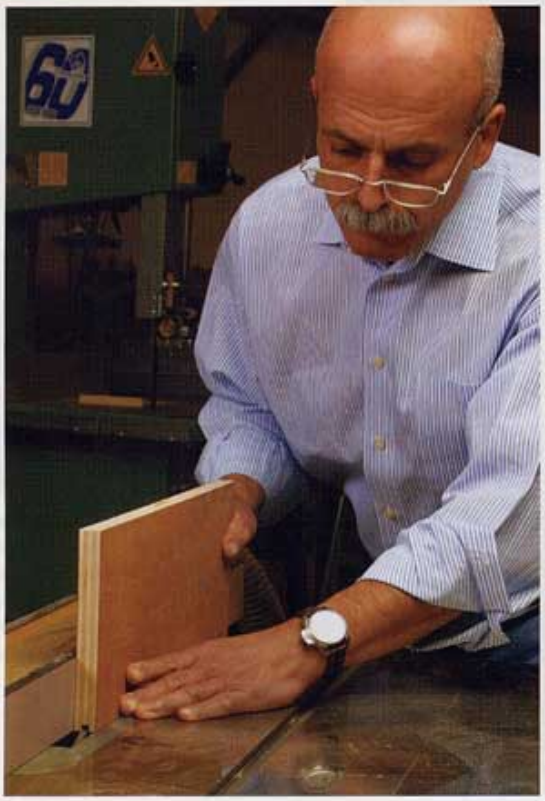
But these edge treatments have a couple of drawbacks. They are time-consuming to carry out, and each of them produces a visibly discernible seam.

You can go about cutting these joints a couple of different ways. You can buy a matched set of router bits to make the required cuts, or you can make all of the necessary cuts on a tablesaw using either a combination blade or a stacked dado set, or both. There's not a lot of room for mistakes when you're setting up these cuts—you must be precise.

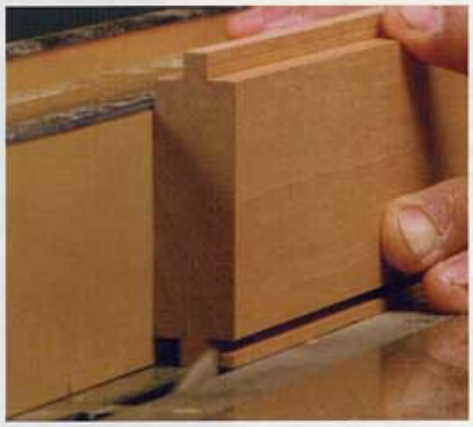
I usually begin by plowing the grooves first, using a stacked dado set. Naturally, you must be prepared to make allowances for plywood that is not a full ¾ in. thick, because it rarely is. Plowing the groove from both sides guarantees that it will be perfectly centered, regardless of the actual thickness. After plowing the grooves, clamp a plywood scrap to the fence and reposition it to cut the tongues to fit. I prefer to make the shoulder cuts first, using a combination blade for a clean cut. When gluing up any of the three versions shown here, a clamped, slightly concave batten will give you tighter seams, distribute the pressure more evenly across the span of the edge and will require fewer clamps.

1. GROOVED PANEL

This version provides the most solid wood at the center, for shaping the edge later.



Two options for plowing grooves. *A stacked dado set or a straight-toothed rip blade each works well at cutting grooves into the edges of either plywood or solid lumber.*



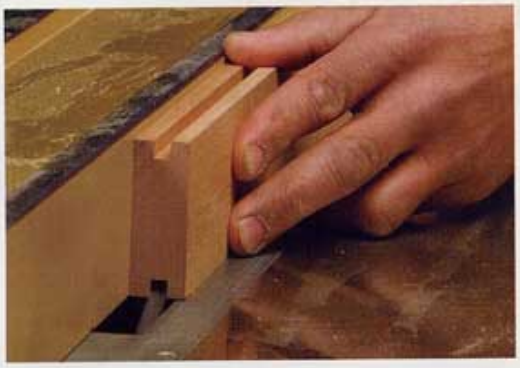
Shaping lumber tongues on the tablesaw. *Make the shoulder cuts first, with the edge stock flat on the tablesaw. Then turn the stock to a vertical position and run it through the blade again to cut the tongue to size.*

Start with lumber larger than needed. *When cutting joints in lumber edge stock, use wider boards and rip the edging down to width later, after shaping all of the joints.*

Photo, this page (top left): Kelly J. Dunton

2. GROOVED LUMBER

This method is a little simpler to make but might limit the shapes you can mill into the edge.



Same process, but the materials are reversed. *A grooved lumber edge fitting over a plywood tongue is set up and cut just like its mirror-image cousin (facing page).*

Cut the shoulders carefully. *The quality of the joint where the plywood veneer meets the lumber edge is defined by how well the two materials come together. Maintain an even, steady cut for the best results.*

3. PLYWOOD SPLINE

A separate spline serves as the tongue to join plywood to lumber.

Matching grooves. *This is the easiest and fastest of the three tongue-and-groove edge treatments to set up and cut. It reduces the joint-making time by half. Properly glued in place, the ¼-in.-thick plywood spline is plenty strong.*

Concave batten aids clamping

A concave batten minimizes the number of clamps. *A scrap of wood with a slight bow in it (above) requires fewer clamps to get even pressure along an edge being glued up. A block plane (left) makes quick work of leveling the solid wood.*

Backsaw Workshop

With the right technique, handsaws are often a better choice than machines

BY PHILIP C. LOWE

My shop is fully equipped with every power tool I need. I don't hesitate to use a power tool to save time. But there are occasions when using a handsaw is more efficient and faster. Handsaws often frustrate woodworkers who cannot get them to perform well. After 35 years cutting with handsaws, I've found that it's as important to use the right technique as well as the right saw to get good results. I prefer Western-style saws, which cut on the push stroke, over Japanese saws, which cut on the pull stroke. Western saws usually come with a pistol grip, and I prefer them for two reasons: I was trained on them and I've never met a task they couldn't handle easily.

I have three backsaws: one for dovetails and two for tenons. The blade on my dovetail saw is about 2 in. wide by 10 in. long, with 15 tpi, and is sharpened for rip cuts because dovetails are cut with or along the grain. The set of the teeth is minimal, so the kerf is not too wide.

As for my tenon saws, one is sharpened for rip cuts (the cheeks of a tenon), and the other for crosscuts (across the grain at the shoulders). Each saw has a 15-tpi blade that's 3 in. wide and 14 in. long. The wider blade allows for cutting tenons of substantial length.

Though I depend on all three saws, if I had to buy only one, it would be a dovetail saw. Its blade is wide enough to cut most tenons, and the teeth are so fine that it will cut cross-grain well enough.

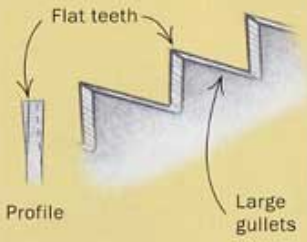
Begin with a proper grip and stance

The manner in which you grip the saw is critical. When hold-

TYPES OF BACKSAWS

The "back" in backsaw refers to the reinforcing strip along the saw's spine. But backsaws vary in shape and size and come with different tooth patterns. Dovetail saws are smaller and are sharpened for rip cuts. Larger tenon saws come with tooth patterns for either ripping or crosscutting. If you decide to buy only one tenon saw, choose one with crosscut teeth.

COMPARISON OF SAWTOOTH PROFILES



RIPSAW TEETH
The flat-top teeth act as chisels and are designed to cut with the grain. They are spaced farther apart (from 12 tpi to 20 tpi), and the gullets are deeper to clear out sawdust as you cut.

Drawings: Bob La Pointe

ing a pistol-grip saw, keep your wrist straight and point your index finger toward the blade. This keeps the saw from twisting in your hand and directs the cut. Don't choke the handle; rather, hold it as if you were holding a bird and didn't want it to get away.

Stance is also key to achieving an even, smooth action for cutting. When addressing your work, your arm and shoulder should be aligned with the cut. If you crowd the work, your elbow is forced away from your body to avoid hitting your side. You then make a sideward movement and your hand travels in an arc. If you are standing in the correct position, your shoulder, elbow and wrist are in a straight line and all pivot from the shoulder. Your feet should be positioned so that the one that is opposite your cutting arm is forward and the other behind. This allows for your back foot and arm to take any resistance that is exerted from the saw and prevents you from being knocked off balance.

Keep your eyes on the cut line during the whole cut to ensure that the kerf doesn't stray from the line. For dovetail cuts, look at the top line across the width of the board and the line down the face of the board to make sure you're cutting in a straight line.

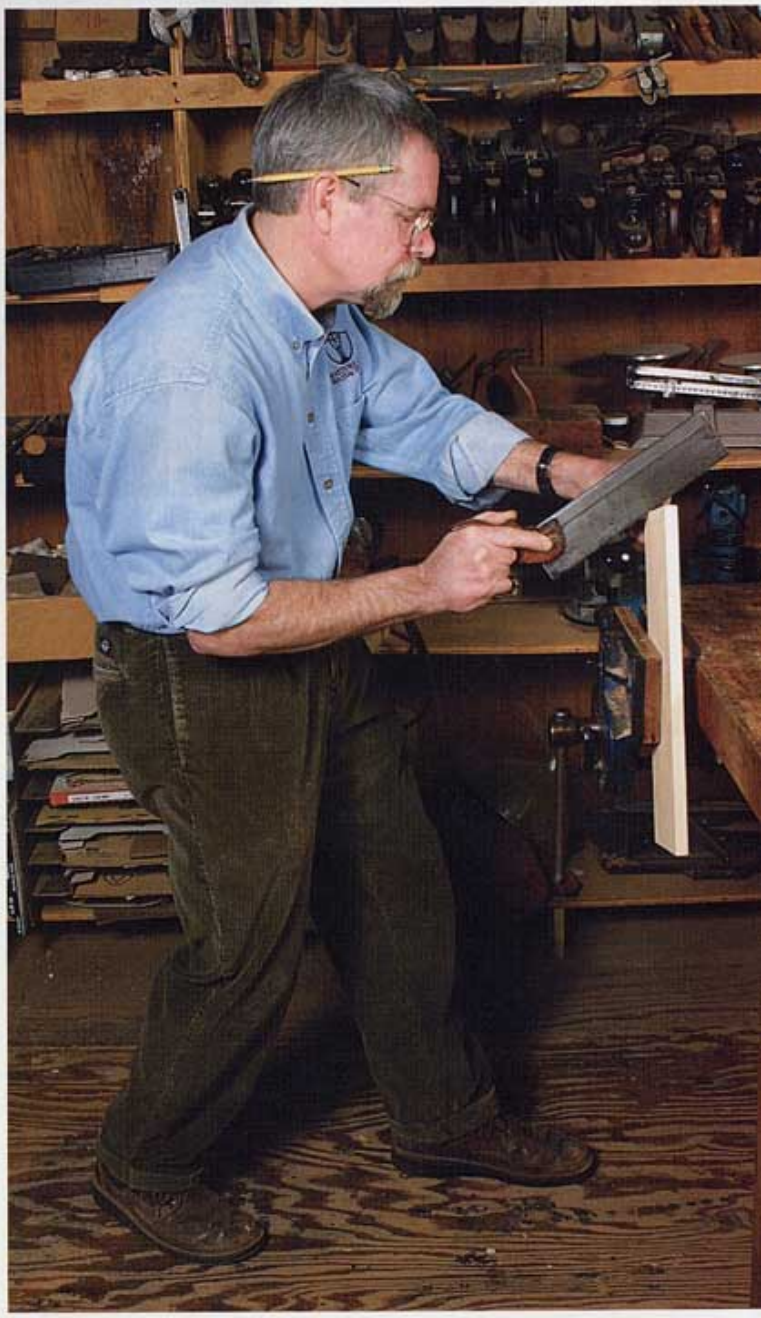
Rips and crosscuts require different techniques

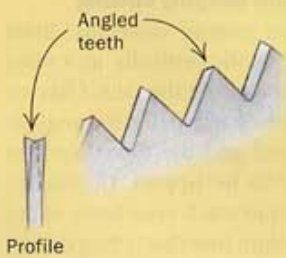
The method for beginning a cut with a backsaw depends on whether you're ripping or crosscutting. When making a rip cut for a tenon or a dovetail, place your thumbnail on the pencil or scribe mark and rest the saw against your nail. Push the saw forward with a light stroke, then follow the line as best as possible. When crosscutting, align your index, middle and ring fingers along the scribe line. When using a crosscut tenon saw, start the cut with a light push stroke. Slight pressure against your fingers prevents the saw from drifting into the scribe line.

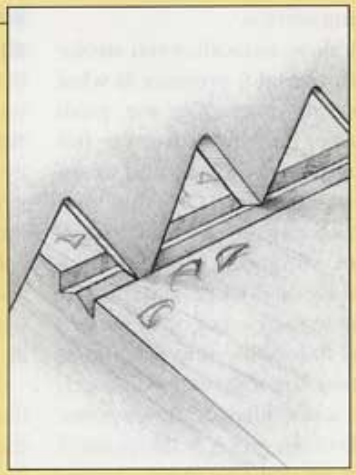
Remember that these saws cut only on the push stroke. Some people try to start a cut by making a small kerf with a pull, or draw, stroke of the saw. But if pressure is exerted on the pull stroke, you will experience excessive vibration, often even more apparent with a coarse-toothed blade. If starting the cut on the push stroke is difficult, it's probably time to get your saw sharpened. I've found that even a new saw needs to be sharpened before it can be

GRIP AND STANCE

Point your index finger toward the workpiece (left) to keep the saw straight. Keep your knees bent and your arm low and angled up toward the workpiece (below).

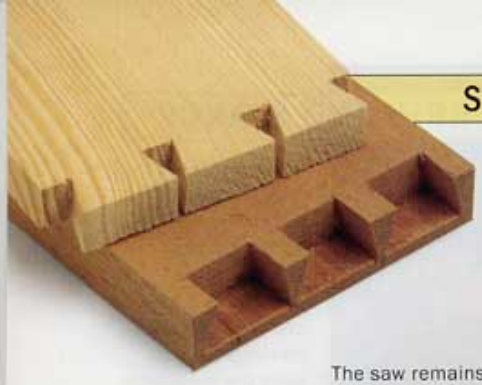


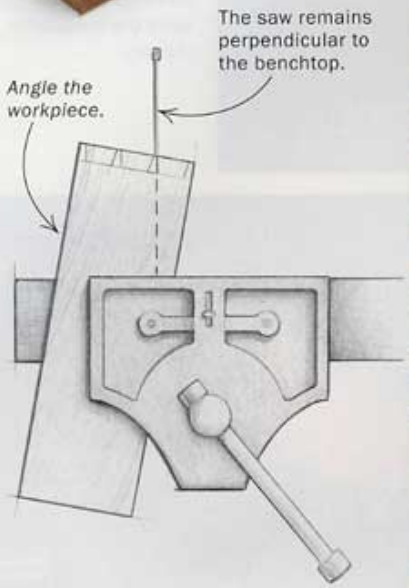




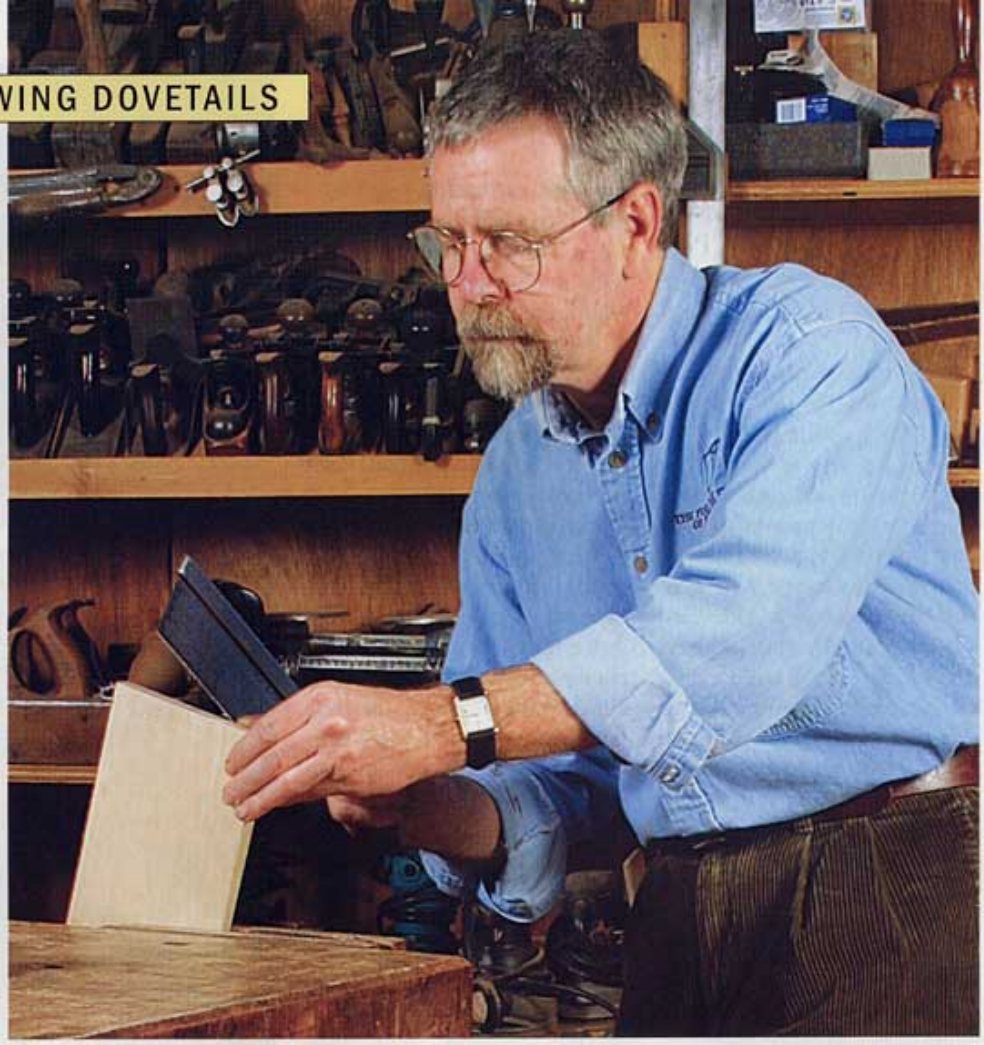
CROSSCUT TEETH
The angled teeth score the cross-grain fibers as they cut. The teeth are smaller, with 12 tpi to 20 tpi, and cut slower than ripsaw teeth.

Photos: Timothy Sams





Angle the work, not the saw, when cutting tails. *It's easier to cut a straight line if you're cutting perpendicular to the bench.*



An upward cut slices cleanly through the long grain.

Hold the work vertically when cutting pins. *Use your thumbnail as a guide and begin the cut on the push stroke.*

Watch it on the web — **For more on using a backsaw, go to www.finewoodworking.com.**

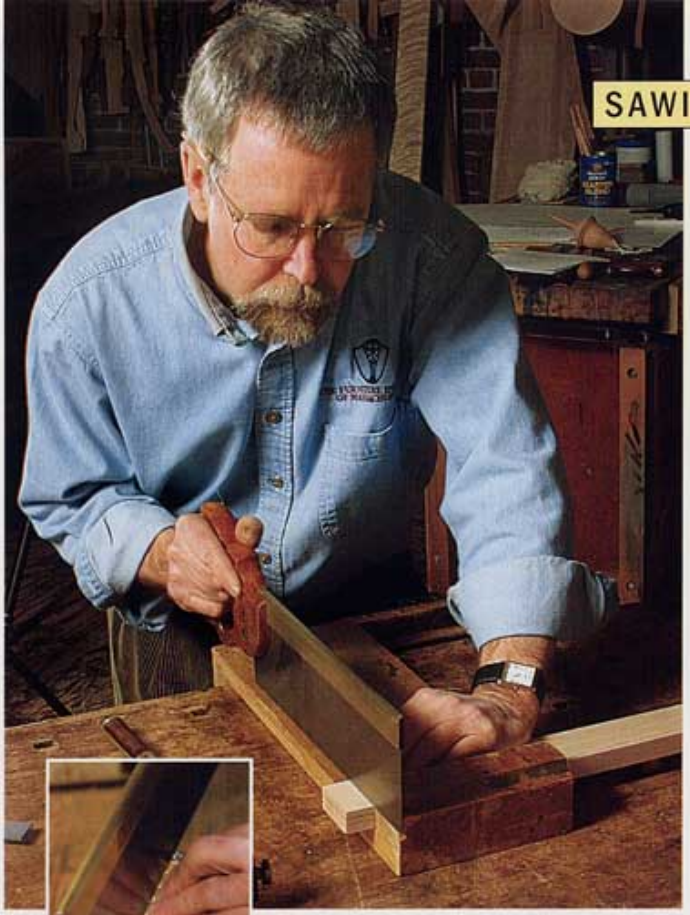
used. You can sharpen the blade yourself (for more on sharpening handsaws, see *FWW* #121, pp. 92-95, and #125, pp. 44-47), but it may be worthwhile to find a local shop that will sharpen the saw to your specifications. Also, Woodcraft (800-535-4482) offers a sharpening service.

A slow, smooth, even stroke with constant pressure is what you are after. On the push stroke, be sure to use the full length of the blade and avoid short strokes. On the pull stroke, ease the pressure to prevent vibration. When cutting tenons or dovetails, start your cuts at the corner of the board and follow the line down and across the top until you reach the scribe lines or the opposite side of the piece. At this point, if you are cutting a tenon, continue by following the kerf down the back line. It is only necessary to watch the opposite side if you are approaching a scribe line that you don't want to cut beyond. But in most cases you ought to make the shoulder cuts first.

Workpiece position should simplify cutting

When cutting dovetails, hold your work vertically in a vise. When cutting the tails, I like to tip the board so that the angle is vertical and the saw does not have to be tipped. I think it's easier to teach your body to cut a straight line that is perpendicular to your bench than to cut at an angle.

Clamp tenon stock in a vise so that you cut from the front of the vise. Ideally, the part should be positioned so that the rip



Crosscut the shoulders. *Use a bench hook to hold the work. Using your fingertips to guide the saw (inset), start on the push stroke at a very slight angle and then level out to complete the cut.*

cuts proceed vertically. This is not always possible when cutting tenons that have compound angles. When crosscutting shoulders on tenons, hold the part in a vise or with a bench hook.

Most cutting problems have simple solutions

If you are having trouble making straight, clean cuts, there are a few things to look out for. If your saw binds, check the blade. New saws have lacquer on the sides of the blade that can soften from friction and make the saw grab. Remove the lacquer with lacquer thinner and apply a coat of paste wax to the metal sides. Rust can also cause binding. Remove it with silicon-carbide sandpaper and apply paste wax.

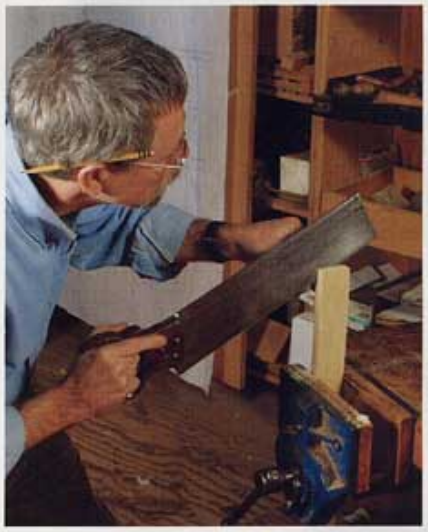
Next, examine the set of the saw. If it is too slight, the blade can't pass through the kerf freely. An uneven set to the teeth will cause the cut to wander. Dullness, obviously, is another reason. Teeth that are not jointed correctly, meaning the tips of the teeth are at different heights, will cause the saw to bounce and will not give a smooth cut. The obvious fix is to joint, reset the teeth and sharpen.

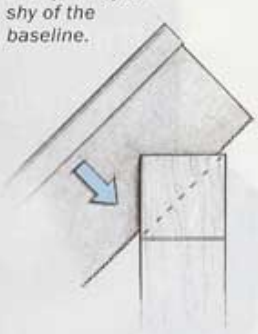
Finally, look at your technique for sawing. If you crowd the cut with your body, as explained before, your saw will be more difficult to control.

With proper setup and technique, and with a little practice, you will be able to control your saw and make accurate cuts. □

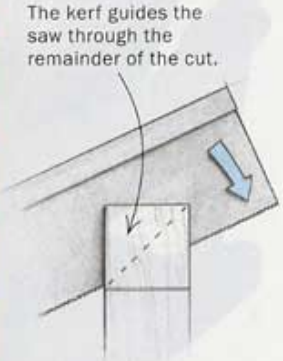
Philip C. Lowe is a furniture maker and teacher in Beverly, Mass.

Rip the cheeks. *Use your fingernail to guide the saw and begin cutting at an acute angle to the workpiece.*





Follow both lines. *Maintain the angle of the saw and sight down the scribe lines as you cut.*



Finish the cut. *Flatten out your stroke to be parallel with the floor and saw to the shoulder cut.*

Ipé

Often marketed as a teak substitute, this strong wood is good for more than decking

BY JON ARNO

A few months ago, a customer came to our lumberyard in search of some decking. We stock only treated pine and western red cedar for this purpose, but he was emphatic about wanting something more wear resistant and durable. I gave him price quotes on teak and ipé. He wisely opted for ipé, and I had the material shipped directly to him from our supplier. It was a done deal until several days later when he returned with a board in hand. He wanted to know what kind of wood they'd mistakenly mixed in with his shipment of ipé. I assured him that the lustrous and beautifully figured, chocolate-brown sample he held was every bit as much an example of ipé as the olive-drab boards that made up the rest of the load. That greenish color seems to have given American woodworkers a bad case of tunnel vision when it comes to what ipé is and what it's good for. We may think it's good only for decking, but nothing could be further from the truth. The mystery is how a single wood could vary so much from sample to sample. The answer is steeped in botany and chemistry, and this wood deserves a closer look.

Ipé comes from more than one tree

The imported wood we refer to here in the United States as ipé is cut from more than a dozen species belonging to the genus *Tabebuia*. This genus belongs to the same botanical family as our native catalpa: Bignoniaceae, usually referred to as the Trumpet Creeper family because of its many and often attractive flowering vines. While the family is not a major player in the flora of temperate North America, it is well represented in the tropics, where *Tabebuia* is its most important timber-producing genus.

Although in the United States ipé has been sold primarily as decking material, these many *Tabebuia* species are among the most plentiful and useful of all the timbers within their native range. They're used for everything from heavy construction to fine furniture veneers. These woods are so varied in their texture, density and appearance that the lumber industry sorts them into somewhat loose categories based on the properties of the wood rather than by the species that produce them.

In terms of developing a positive image, ordinary ipé decking is the worst ambassador the *Tabebuia* genus could send abroad. But virtually all members of this genus, even many of the species that normally produce the sort of grayish-green ipé, have the potential to produce stunningly beautiful woods when growing conditions are just right. The keys to beauty in this case rest with both the wood's anatomy and its chemistry.

Ipé has a somewhat unusual wood anatomy for a tropical timber. In those climates within its native range where there is a pronounced dry season, the tree becomes what is called dry-season deciduous. In other words, it sheds its leaves on a roughly annual basis to conserve moisture. With many species of ipé, this seasonal event is actually spectacular because of the flowers that follow. But more germane to woodworking, this short dry-season dor-

A good choice for outdoor furniture. *Ipé is perhaps more decay resistant than even teak, for which it has been sold as a substitute. The color from one board to another ranges from greenish hues to dark brown tones.*

Photos, this page: courtesy of SKC Ltd., distributor of Pau Lope decking (top); William Duckworth (bottom)

WHERE IT COMES FROM

Brazil accounts for the majority of ipé lumber on the international market, but timber-producing species belonging to the *Tabebuia* genus are found throughout Latin America and on many islands in the Caribbean. The trees, often among the largest in the forest, produce a multitude of beautiful, orchidlike flowers, ranging in color from yellow to coral pink.

mancy has a positive impact on the appearance of the wood, producing rings somewhat akin to the annual rings in temperate hardwoods. The second key to ipé's potential beauty stems from its natural chemistry. Ipé contains a compound called lapachol, often seen as a yellowish powder in the vessel lines on the surface of the wood. Lapachol is a mixed blessing, but on the positive side it tends to react to alkaline solutions to produce reddish-brown pigments. As a result, when grown in alkaline soil, the tree can produce fabulously colorful heartwood—often a dark reddish brown enhanced with black, marblelike veining. Logs with exceptionally attractive heartwood are converted into premium veneers or sometimes sold at hefty prices under other names such as amapa, bethabara, cortez, pau d'Arco and poui, to name a few.

Durability and density come with some drawbacks

The chemical makeup of ipé appears to give the wood its outstanding resistance to decay. Lapachol, the same compound that allows the wood to develop such beautiful pigmentation, seems to have potent antiseptic properties. The downside is that clinical tests confirm that lapachol compounds found in these woods are potentially serious allergens, capable of causing dermatitis and respiratory problems for some woodworkers.

The term durability, as used in wood technology, usually relates to decay resistance. But many factors contribute to making a wood durable, meaning that it will last a long time in abusive applications. Extreme density can dull cutting edges, but it also gives wood the ability to withstand heavy wear, and natural stability helps it resist checking and distortion. With ipé, these other factors are a bit of a mixed bag. Density is one of its assets in that the oven-dry specific gravity of the various species of ipé ranges between 0.85 and 0.97, making them comparable to the rosewoods in terms of weight and strength. This almost stonelike density surpasses that of teak and other popular decking species by such a wide margin that none of them can compete with ipé's resistance to wear.

Stability, on the other hand, is not ipé's strong suit. At first glance, ipé's shrinkage statistics fall somewhere between rather ordinary and very good. Its average volumetric shrinkage, green to oven-dry, of 13.2% is about the same as our native red oak, making it perhaps a tad high but not excessive. Its tangential (T) shrinkage of 8% and radial (R) shrinkage of 6.6% yield a very low T/R ratio of only 1.21:1. This is even lower than genuine mahogany. While the 13.2% volumetric shrinkage isn't terribly high, with a wood as dense as ipé it is high enough to create some powerful drying stresses that can cause surface checks. These checks tend to be small and numerous rather than catastrophic, and though not particularly attractive, they seldom compromise the structural integrity of the wood.

From a conservationist point of view, there is a benefit in choosing ipé as a substitute for other, more endangered tropical woods, such as teak, lignum vitae and rosewood. The many species that provide ipé lumber are plentiful and tend to grow in almost pure stands—all factors that make logging, processing and replenishment more manageable and less damaging to the environment.□

Jon Arno often graces the pages of Fine Woodworking *with his thorough and lively profiles of various woods.*

Working with ipé

Because of its interlocked, swirling grain, ipé is prone to tearout when machined. To remove tearout, sand with 80 grit and 120 grit, dust, then switch to a card scraper. If you wish to handplane ipé, choose a high-angle (60°) plane, such as one made by H.N.T. Gordon.

Surface checks are not a problem. *Drying stresses can cause hairline cracks on the surface and end grain of some ipé lumber, but these checks rarely cause structural troubles.*

Drawings: Bobbi Angell; photos, this page: Erika Marks

Learn to Turn Spindles

With only four tools, you can turn cylinders, tapers, beads and coves

BY ERNIE CONOVER

In many ways turning is the simplest branch of woodworking: All turning is a bead, a cove, a cylinder or a taper; if you can cut these four shapes, you can turn anything. Likewise, there is no need to begin with a rack full of tools: a roughing-out gouge, a spindle gouge, a V-parting tool and a skew chisel are sufficient for the novice.

Why is it, then, that the early enthusiasm of many beginners turns to frustration in the face of sustained difficulties? The answer can be summed up in two words—tool preparation. Few tools come from the factory with the correct grind, and none will be as sharp as it could be. I'll demonstrate how to put a correct grind on all of them and how to keep them sharp; then and only then can you start to make shavings.

Selecting and preparing your tools

I urge you to avoid sets of tools. They may or may not contain a good spindle gouge, they will likely have a skew chisel that is too narrow, and there will be too many scrapers. Buy high-speed steel (HSS) tools, which are only slightly more expensive than regular (high-carbon) steel tools and hold an edge longer; you cannot draw the temper during grinding, even if you overheat the tool.

Roughing-out gouge—I recommend a 1¼-in. gouge, but the ¾-in. version is a good, less-costly second choice. The roughing-out gouge can be ground with a blunt fingernail face, but I prefer it with a square face because it is easier to cut up to a shoulder. The

Photos, this page and facing page (of chisels): Kelly J. Dunton

tool can be ground either with the handle resting in a pocket holder (see the top photo at right) or simply braced against your thigh.

Spindle gouge—A ½-in. spindle gouge will be your workhorse, so invest wisely. Check the shaft to make sure the steel is from a round bar rather than from a thin section of rolled steel. A spindle gouge operates best with a long fingernail grind but is usually delivered with a short blunt grind (see the photos at right). While it is possible to grind a fingernail by eye on a bench grinder, it is difficult to do. Oneway, Sorby and Tormek all make jigs to simplify this task. You can also find a shop-built jig on p. 97 of *The Lathe Book* (The Taunton Press, 2001) and at www.finewoodworking.com.

I tend to grind a very long fingernail, which I call a high-society grind, but other turners work successfully with a somewhat more blunt fingernail. Experiment to find what length suits your turning style, but always polish your fingernail to a razor-sharp edge. This can be done with slipstones, but with a buffing wheel it's far quicker and you are less likely to miss a section.

V-parting tool—Also called a cutoff tool, the V-parting tool is used for cutting off work in the lathe. It is also used with calipers to establish sizes for duplicate parts, to create shoulders next to a bead and to make tenons. The tool works fine with a hollow grind (see the top photo, below right), and the best cross section is the diamond shape, which has much less friction during a cut than cheaper, square cross-section tools. I suggest getting either a 1/16-in. or ⅛-in. tool.

Skew chisel—The edge of this tool, in addition to being double beveled, is also skewed about 25° to 30° to its axis. The skew chisel is the one tool that should not be hollow-ground; it works much better with a flat (or even slightly convex) bevel. Luckily, all skews seem to be delivered with a flat bevel and can be honed on whetstones. If, however, your skew collides with a chuck or lands point-first on concrete, you will have to regrind it. The fastest way to do this and keep it flat is on the side of the wheel, which most grinding manuals advise against. I do it, but I use light pressure on a 1-in.-thick wheel. If you have a Tormek or other super-slow-speed wet grinder, you can use the side of this wheel with complete safety.

A skew slides more easily on the rest if you break the sharp edges of the shank. Touch the four corners of the shank to a grinder, then buff or stone them. The width of a 1-in. chisel allows much more time to judge when things are going awry and to make corrections before disaster strikes.

Mastering the basics of spindle turning

Now that the tools have been sorted out, it is time to start turning. The best way to practice is to cut a dozen hardwood billets 2 in. square by 8 in. long. Find the exact centers of the first billet using a center finder, and make a small indentation using a hole punch or a blunt nail. This aids alignment with the headstock and the tailstock centers. Set the tool rest about two-thirds of the way up the

Preparing the tools for use

Roughing-out gouge. *Rest the handle in a pocket holder and rotate the tool against the grinding wheel.*

A nautical comparison. *To reshape the blunt profile of a factory-ground spindle gouge, use a special jig mounted in the pocket holder. The fingernail profile will resemble the bow of a cruise ship.*

V-parting tool works best with a hollow grind. *To create the grind use either a 6-in. or 8-in. wheel.*

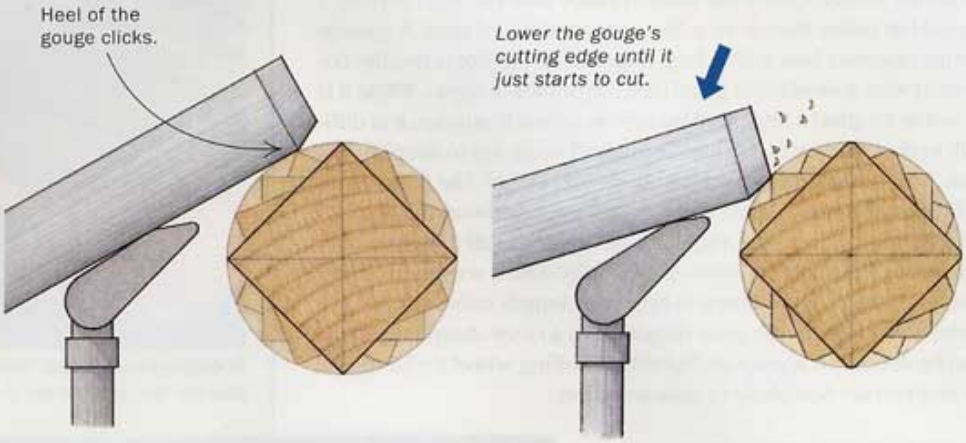
When necessary, regrind a skew chisel. *Though it's not recommended in the manual, you can use the side of a 1-in.-thick wheel. Apply gentle pressure and wear eye protection.*

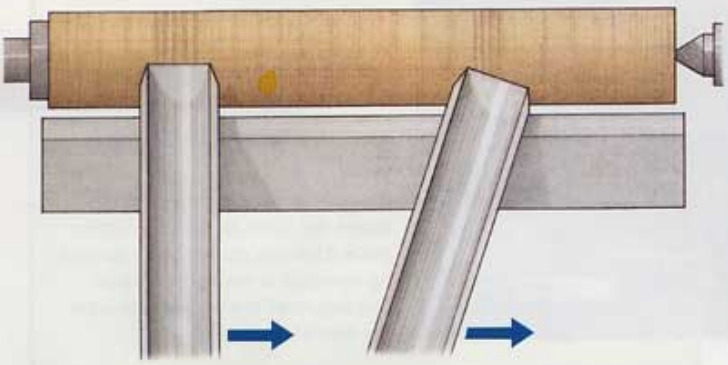
Photos, except where noted: Mark Schofield

Rounding the billet. *Take light passes with the roughing-out gouge to gradually turn the blank round.*

MASTER THE CYLINDER

Mount a square blank between centers and position the tool rest just above the centerline of the lathe. Raise the handle of the roughing-out gouge until the heel clicks on the blank.





For fast rough cuts, move the gouge laterally. Maintain the same cutting angle and keep the tool 90° to the blank.

For smooth cuts, angle the roughing-out gouge in the direction of the cut and move slowly.

CUTTING TAPERS

To cut a smooth and gentle taper, angle the roughing-out gouge in the direction you are cutting (above) and increase the pressure slightly. Use the skew in the same manner (inset).

blank just above the centerline of the lathe. Make sure the blank can turn freely.

Turning a cylinder—To make a billet round, use a roughing-out gouge. Present the gouge high (the handle low) so that just the heel of the bevel touches the work and clicks. Your right hand should be on the forward part of the handle with your thumb and forefinger on the ferrule. (Holding farther back on the handle gives you less feel for the bevel on the work.) Lower the cutting edge by raising the handle until the gouge just starts to cut. Ride the bevel in a shear cut, moving the tool laterally. Maintain the angle you have established until the work just starts to become round.

Turning a taper—The traditional tool for cutting a taper is the skew. Place the corner of the tool on the rest and present the tool high (handle low) and as square as possible to the work. Now raise the handle until the bevel rubs in a shear cut. The cut should take place over no more than half the length of the cutting edge but biased toward the heel. Once the cut has been established, slide the tool laterally, maintaining the same angle to the work. Move it with the heel leading and the toe following behind the cut. To cut in the opposite direction, turn over the tool.

The roughing-out gouge and the spindle gouge can also cut tapers. Angling the gouge slightly in the direction you wish to cut will make it easy to produce cylinders and gentle tapers.

Cutting coves—The only way to cut a cove is with a spindle gouge. Start by drawing a series of pencil lines ½ in. apart on a freshly

Watch it on the web

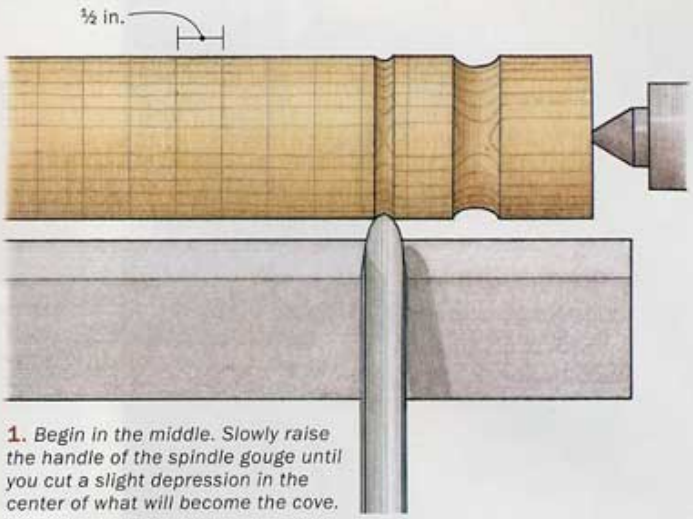
To see a video clip of Ernie Conover turning beads and coves, go to www.finewoodworking.com.

Drawings: Vince Babak

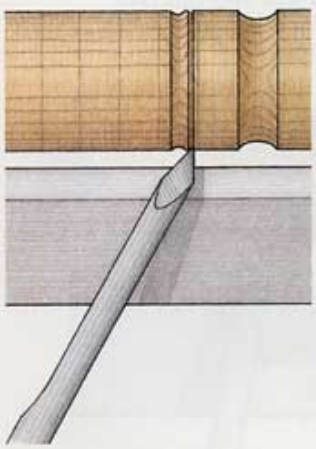
USE A SPINDLE GOUGE TO CUT COVES

Stay in touch. *Keep your left hand near the tip of the tool, and always keep the tool in contact with the tool rest.*

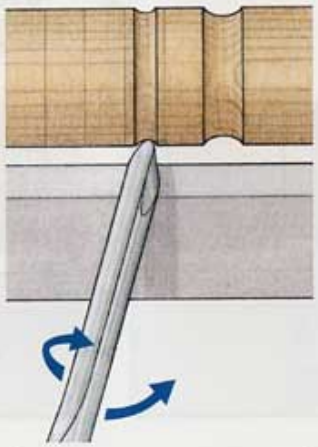
Once you have turned a few 8-in. blanks to cylinders, mark them with a series of lines ½ in. apart. Then start cutting coves.



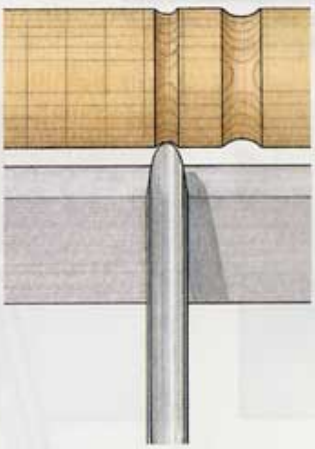
1. *Begin in the middle. Slowly raise the handle of the spindle gouge until you cut a slight depression in the center of what will become the cove.*



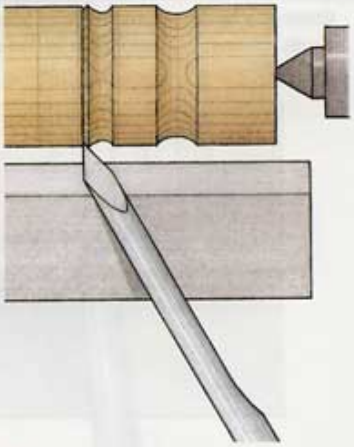
2. *Next, cut at the top of the right-hand side of the cove and work downward.*



3. *Sweep the handle back toward the tailstock while rotating the tool clockwise.*



4. *Keep sweeping until the flute is at 12 o'clock at the bottom of the arc.*



5. *Repeat the cutting process starting from the other side and moving the handle to the left.*

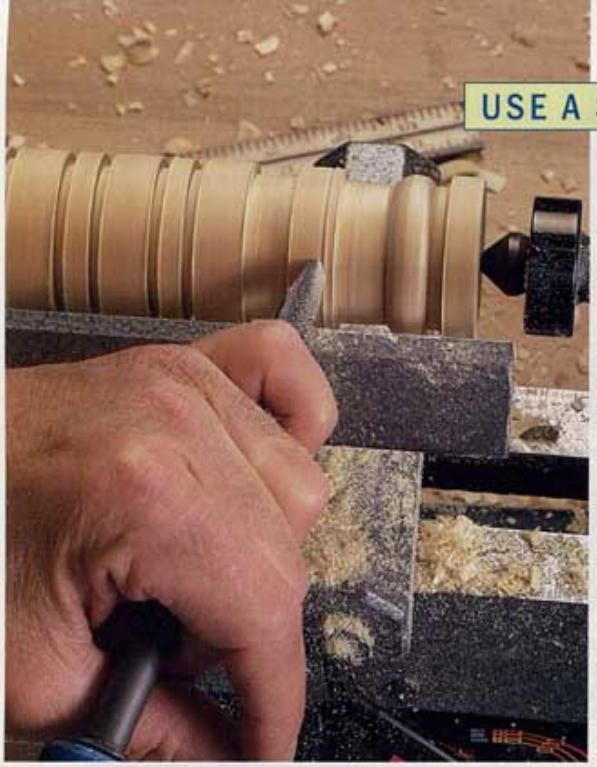
turned cylinder. Use only the very tip of the gouge during the entire process and keep the bevel parallel to the surface. Think of it as if you were mowing a ditch. If you mow along the ditch, the mower is level, but the mower increasingly leans as you move up the sides. Your gouge should roll in the same way, but think of the bevel and not the flute (shank) of the gouge as the mower. The bevel should always be perpendicular to the grain as you cut.

Your grip on the spindle gouge should be relaxed, and your hand placement should be the same as with the roughing-out gouge. Most beginners try to lock the handle against their hip; however, this holding method results in more catches because the user is trying to overpower the physics of the lathe rather than letting the machine and the tool cut as they are designed to. You cannot overcome physics—at least for very long.

Present the tool high with the heel of the bevel rubbing and the tool square to the axis of the spindle. Lower the cutting edge by

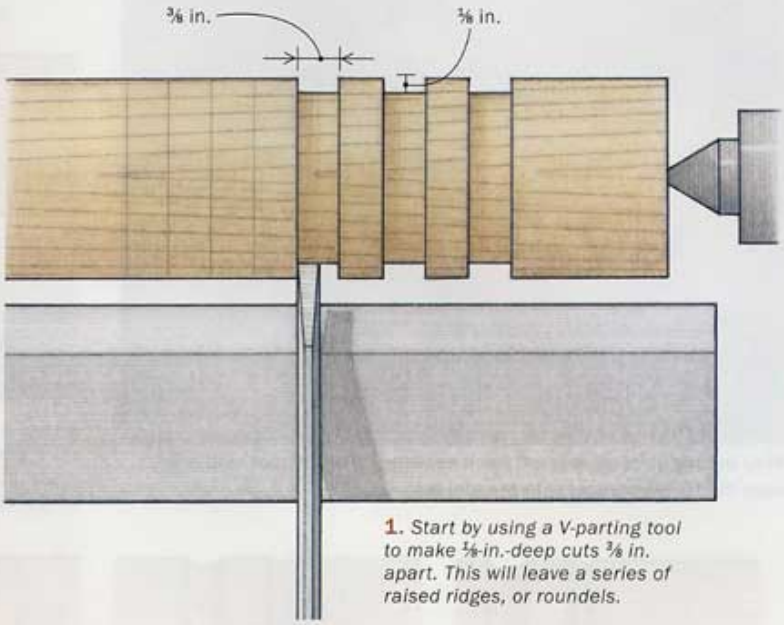
Cutting a cove is like chopping a log with an ax. *Gradually deepen the cut, working alternately from both sides.*

USE A SPINDLE GOUGE TO CUT CONSISTENT BEADS

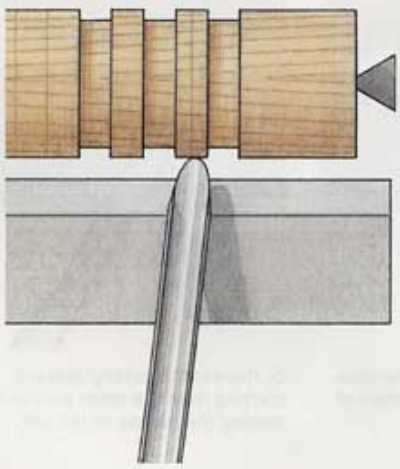


Cutting a bead. *A good-looking bead is elliptical, not a half circle. Remove the wood in a series of light cuts.*

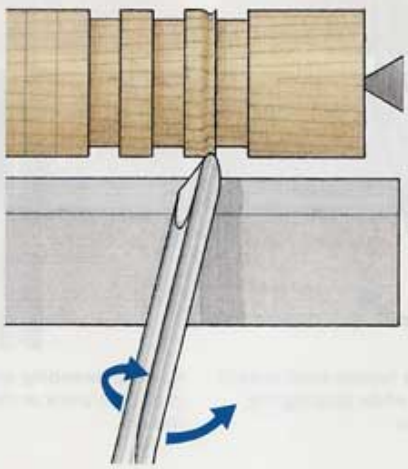
Before you can cut a bead, first remove the waste in every alternate section to leave a series of ridges, called roundels.



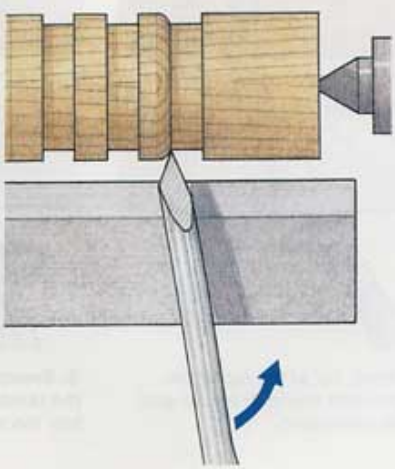
1. *Start by using a V-parting tool to make ⅛-in.-deep cuts ⅜ in. apart. This will leave a series of raised ridges, or roundels.*



2. *Next, place the gouge just to the right of the center, with the tip of the tool angled slightly to the right.*



3. *As you cut down the right-hand side, move the handle to the right and roll the tool clockwise, keeping the bevel perpendicular to the grain.*



4. *When you reach the base of the bead, the bevel of the gouge will be nearly 90° to the cylinder, and the tool handle will be to your right.*

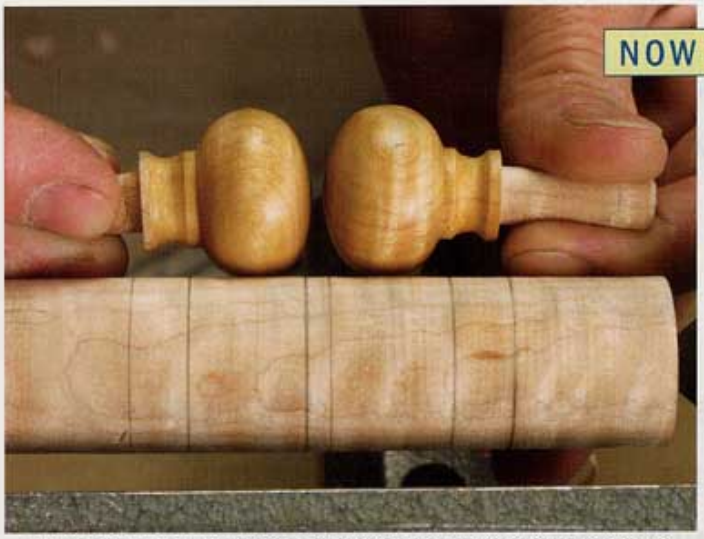
raising the handle until you cut a very small depression at the exact center of one of your ½-in. layouts.

To cut the right-hand side of the cove, roll the gouge so that the top of the flute moves from the 12 o'clock position to approximately 11 o'clock. Touch down the tip of the gouge just beyond where the right-hand side of the cove begins and sweep down to the bottom of the cove, rolling the flute back to the 12 o'clock position. This roll has to be controlled and uniform, and the handle must have room to move, so don't lock it against your hip.

Now repeat the process to cut the left-hand side of the cove, rolling the flute to about 1 o'clock and touching down just beyond the left-hand side. At the bottom of the cove, the tool will have to slide very slightly forward on the rest to get to the bottom of the cove and still have the bevel rubbing because it is a farther reach to the smaller diameter. Now go to the other side of the cove and repeat a mirror image of what you have just done, alternating between left and right but always ending up at the exact center.

You cannot cut a cove that is a lot narrower than your gouge. Smaller coves get a narrower gouge. The process is much like chopping a log in two with an ax. The cut has to be wider than the ax. You need to cut from each edge to the exact center, cutting downhill on the grain. Cutting the wrong way will likely result in a fuzzy cut or a catch. Think of it as stroking a furry animal.

Cutting beads—The opposite of a cove is a bead, and in my opinion is a more difficult task to master. It is my very strong opinion



Matching knobs. *Turning a pair of drawer pulls from the same blank not only saves time but also yields a matching pair of pulls.*

that the only way to turn beads consistently is to use a spindle gouge. Using the skew for this task has its partisans (*FWW* #145, pp. 84-87), but for the small beads normally encountered in spindle turning, it is a risky business.

A good-looking bead (at least in most furniture turning) is not a half circle but rather an ellipse. Therefore, it is not as high as it is wide. To get ready for this exercise, use the V-parting tool to make ⅛-in. cuts into a cylinder; space the cuts ⅜ in. apart. This will yield a row of ⅜-in.-wide ridges that are called roundels.

Like the cove, the bead is cut in two stages, one half at a time and always downhill. To cut the right-hand side of the bead, start at the center of the roundel with the gouge angled slightly to the right. This allows you to pick up the major diameter of the roundel without cutting into it. Cut to the right while sweeping the handle around to the left until you are cutting toward the tailstock. This also requires rolling the flute from a little past 12 o'clock until nearly 2 o'clock, sliding the tool slightly backward on the tool rest and raising the handle to keep cutting on the very point. At this point you will be about halfway to the base of the bead.

To cut the elliptical shape of the bead, you must move the handle to the right. Once you reach the base of the bead, the bevel of the gouge should be almost perpendicular to the main axis of the workpiece, with the flute facing 3 o'clock. If you were to continue pushing (very hard), you would cut right through the center of the billet. Simply trying to push the gouge forward once you reach the halfway point will result in a 45° flank to the bead.

Now repeat a mirror image of what you have just done to the left. It is quite normal for the beginner to cut asymmetrical beads, as we all have a bit of left-right bias. Practice will cure this problem. On larger beads you have to start closer to the edge of the roundel and just round the corner on the first pass. Successive passes enhance the shape. Don't try to take too much material with one pass.

The visual impact of a bead is greatly enhanced by inscribing the edges with the toe of a skew. I think this sets apart the bead from the surrounding, your mind completing the shape of the bead inside the turning on a subliminal level. □

Ernie Conover is a turner and teacher in Parkman, Ohio.

NOW TURN SOME DRAWER PULLS

The skills learned while turning beads and coves can be put to good use by turning drawer pulls.

The tenon is cut first. *Make a series of cuts with the V-parting tool using a wrench as a guide.*

Cut a small cove. *Center the spindle gouge and gradually raise the handle to increase the depth.*

Worry-free beads. *With the depth of the bead already defined on both sides by the V-parting tool, round over the sides of the bead with a series of light cuts.*

Don't be ashamed to sand your work. *Particularly with curly wood, some tearout is inevitable and is easily removed by sanding.*

Tombstone Doors

Combine machine work and handwork to create arched panel doors with 18th-century style

BY LONNIE BIRD

I've always been intrigued by the close ties between the furniture and architecture of the 18th century. Proportions, shapes, moldings and myriad other details were shared by both house joiners and furniture makers of the period. One of the most commonly shared forms was the arch. This simple, elegant shape has endured since Roman times because of its strength and beauty. In fact, many of today's kitchen cabinets feature arched panel doors, although the distinctive tombstone shape has given way to a more gentle, sweeping arch, which is easier to produce.

Building a Pennsylvania Secretary: Part III of III

The doors play an important part in the aesthetic success of the secretary featured here and in *FWW* #154 and #155. The tall panels give the case its much-needed vertical proportions, and the tombstone arch is visually appealing. As you'll learn, building a true arched panel door isn't that difficult, and it's only a bit more time-consuming than making a door with a sweeping arch.

Use straight-grained stock for the frame

I begin door construction by measuring the opening in the case. Because the doors are rabbeted along the edges to form a lip, they must be constructed to precise dimensions. Although the doors overlap the opening by 3/16 in. on top and bottom, they overlap the hinge stile by only 1/64 in. With a greater overlap, the lip would bind on the cabinet stile and prevent the door from opening. Also, the wide stile on the left-hand door creates the illusion of a center stile when the doors are shut.

Wood selection for the doors is critical. Using straight-grained stock for the frame adds strength and helps prevent warping. After milling the frame stock, lay out and cut the mortise-and-tenon joints. At this point you're ready to lay out and bandsaw the arch on the upper rail. The curve is easily smoothed with a file or a spindle sander. Once the arch is smooth, shape the 3/8-in. thumbnail sticking along the inside edges, then cut the panel groove.

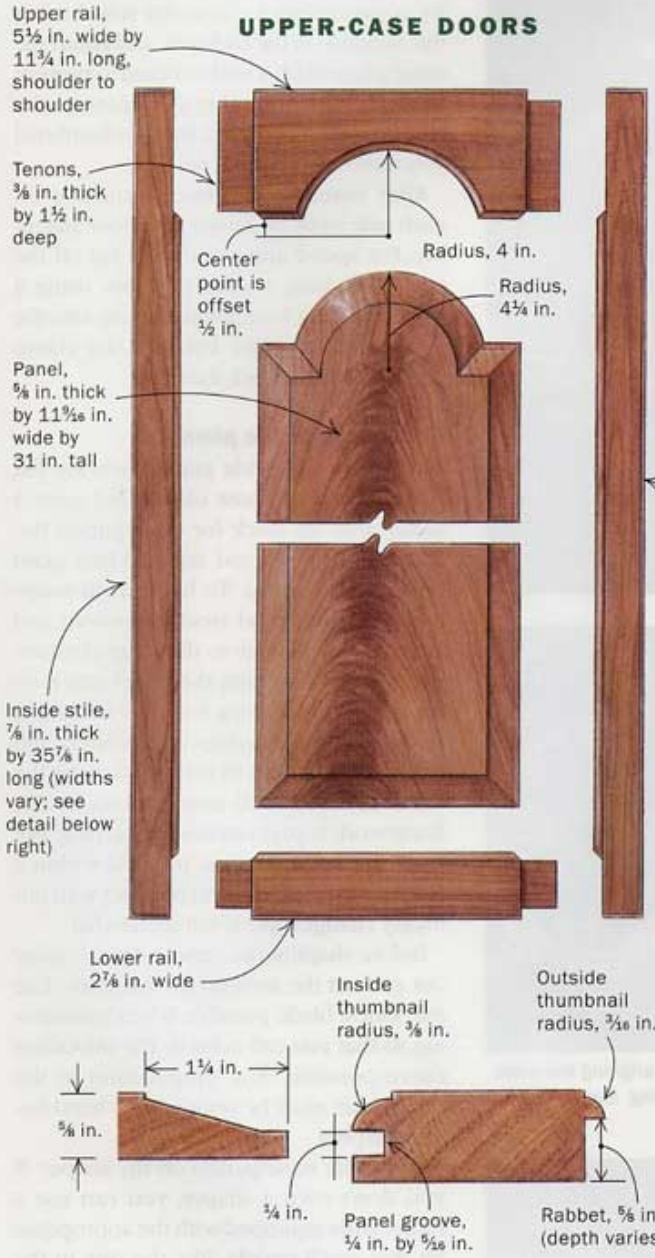
After the shaping has been completed,

Photos, except where noted: Matthew Teague

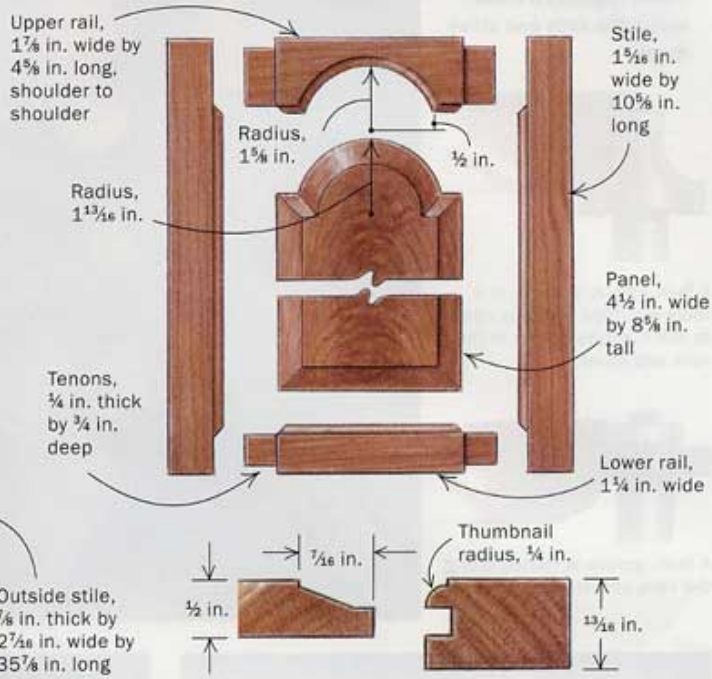
OFFSET, OVERLAY DOORS REQUIRE EXTRA CARE IN SIZING

Bird's tombstone doors are rabbeted to overlay the frame. They are also offset, meaning they close proud of the frame.

UPPER-CASE DOORS

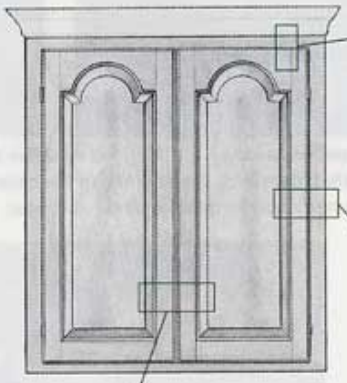


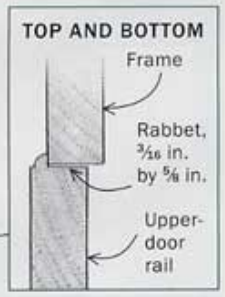
PROSPECT-BOX DOOR

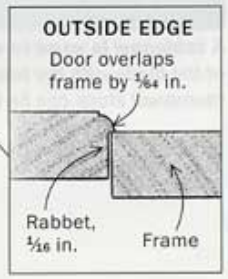


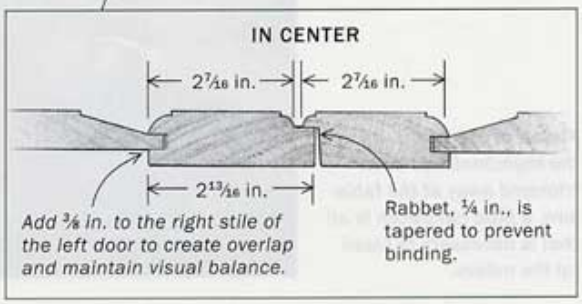
DOOR EDGE DETAILS

When cutting rails and stiles for offset doors, allow for rabbets and thumbnail profiles wherever doors meet each other or the case.



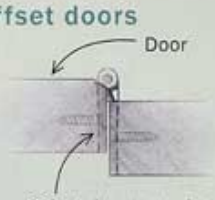






Custom hinges for offset doors

Bird buys brass 1¾-in. by 2⅝-in. hinge blanks (Ball and Ball; 800-257-3711) and bandsaws them to size.

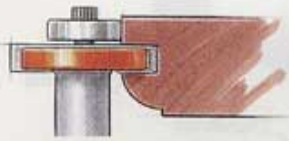


Drawings: Bob La Pointe; photo, this page (bottom left): Michael Pekovich

THUMBNAIL DRESSES UP THE FRAME

The thumbnail profile on the inside edge of the frame requires a miter where the rails and stiles meet.

A ⅜-in.-radius cove bit in a table-mounted router is used to mill the inner faces of the rails and stiles.



A ¼-in. groove is routed along the rails and stiles.

A tablesaw is used to cut miters along both the rail and the stile. *Start by aligning the edge of the blade with the tenon shoulder (left), then establish the miter by crosscutting. Excess thumbnail stock can be trimmed away by using a stopped rip cut.*

Finish off by hand. *Once the thumbnail has been trimmed away at the tablesaw, a little handwork is all that is necessary to clean up the miters.*

miter the sticking profile at each intersection (see the drawings and photos at left). This technique allows the use of deep, strong mortise-and-tenon joinery as opposed to the short, stubby tenons created by cope-and-stick router-bit sets. I miter the sticking on the tablesaw and equip the miter gauge with a backer board to prevent tearout. When trimming the miters on the rail, be sure to account for the thumbnail you removed from the rail.

After mitering, the excess sticking on each stile must be removed before assembly. For speed and accuracy, I rip off the excess sticking on the tablesaw using a stop cut. Then I complete the cut into the corner with a chisel. Finally, I dry-clamp the frames and check the fit.

Cut and shape the panel

The nearly 1-ft.-wide panels provide the perfect place to show off figured grain. I never glue up stock for door panels because the seams and mismatched grain become distracting. To help avoid warping, I cut the panel stock oversized and allow it to acclimate to the shop environment. After flattening the panel stock on the jointer and planing it to final thickness, I shape the panel edges immediately and fit the panel within its frame. Allowing the panel to lie around unrestrained by the framework is an invitation for warping. But once the wide panel is trapped within a frame, it can expand and contract with humidity changes, yet it will remain flat.

Before shaping the panel edges, first lay out and cut the arch on the bandsaw. Use the widest blade possible when bandsawing so that you can achieve the smoothest curve possible. Any irregularities in the sawn edge must be removed by hand before shaping.

I typically raise panels on my shaper. If you don't own a shaper, you can use a router table equipped with the appropriate bit. For small panels, like the one in the gallery of the Pennsylvania secretary, CMT makes a scaled-down bit (item No. 800.524.11) with the right proportions and the fillet at the edge of the field to catch light and create a shadowline. I also use the Panel-Loc (www.benchdog.com) to shield my hands from the large-diameter cutter.

The bit rounds the inside corners that flank the arch, so after shaping the panel, some handwork is required. First, lay out each corner with a sharp pencil. Next, in-

TOMBSTONE PANEL REQUIRES HANDWORK

LAY OUT AND SHAPE

Begin by marking out the panel arch (left). To avoid marring the panel surface, locate the center point over a piece of tape. After bandsawing to shape, Bird uses a shaper to raise the upper-case panels (right) and a router table for the prospect-door panel (below).

cise the shoulder at the field; a #2 sweep gouge works best to incise the curve of the arch. Then, use a skew chisel to carve the bevel into the corner. I have a pair of right- and left-hand skew chisels that are custom-ground for this purpose.

With the carving completed, assemble the doors and pin the joints. Next, cut the rabbet around the perimeter of each door. Remember that the rabbet on the hinge stile is shallow—only ⅛ in. Also, the right stile of the left door is rabbeted on the face, not along the back. After rabbeting, shape the small thumbnail profile, which eliminates the hard, square edge. To shape the thumbnail inset along the edge of the false stile, you'll need a 3/16-in.-dia. roundover bit without a guide bearing.

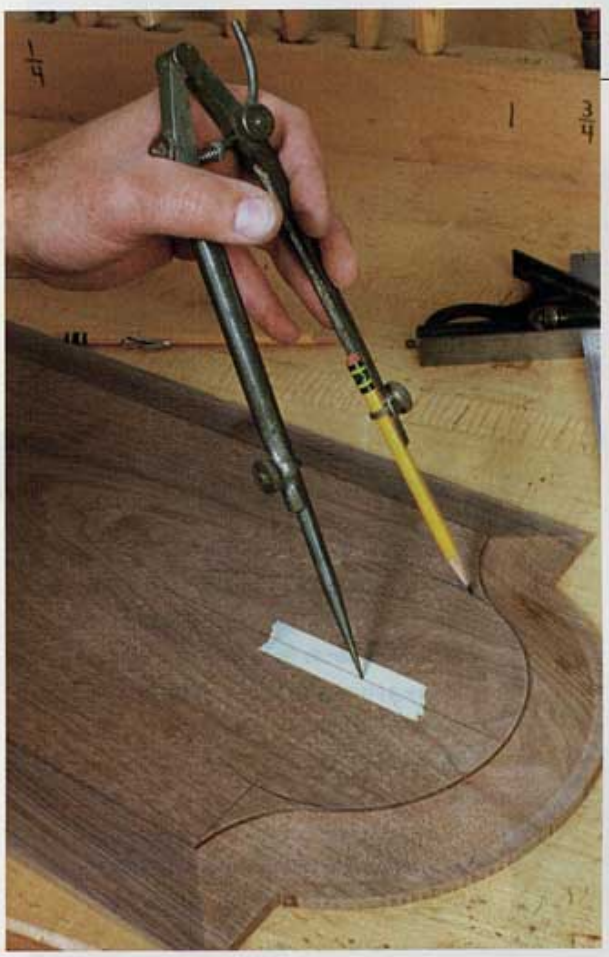
Mount the hardware

To save time when mounting hinges and locks, I rout the mortises using a laminate trimmer equipped with a straight bit. After routing, square the corners of the mortises with a chisel.

If the lipped doors are to function properly, the barrel of the hinge must be located slightly proud of the door face. Also, because the door is lipped, remember to use a hinge that has leaves of different widths.

To my eye, the tombstone doors are the finishing touch on my 18th-century secretary, but it's a look that meshes with almost any thoughtful design. □

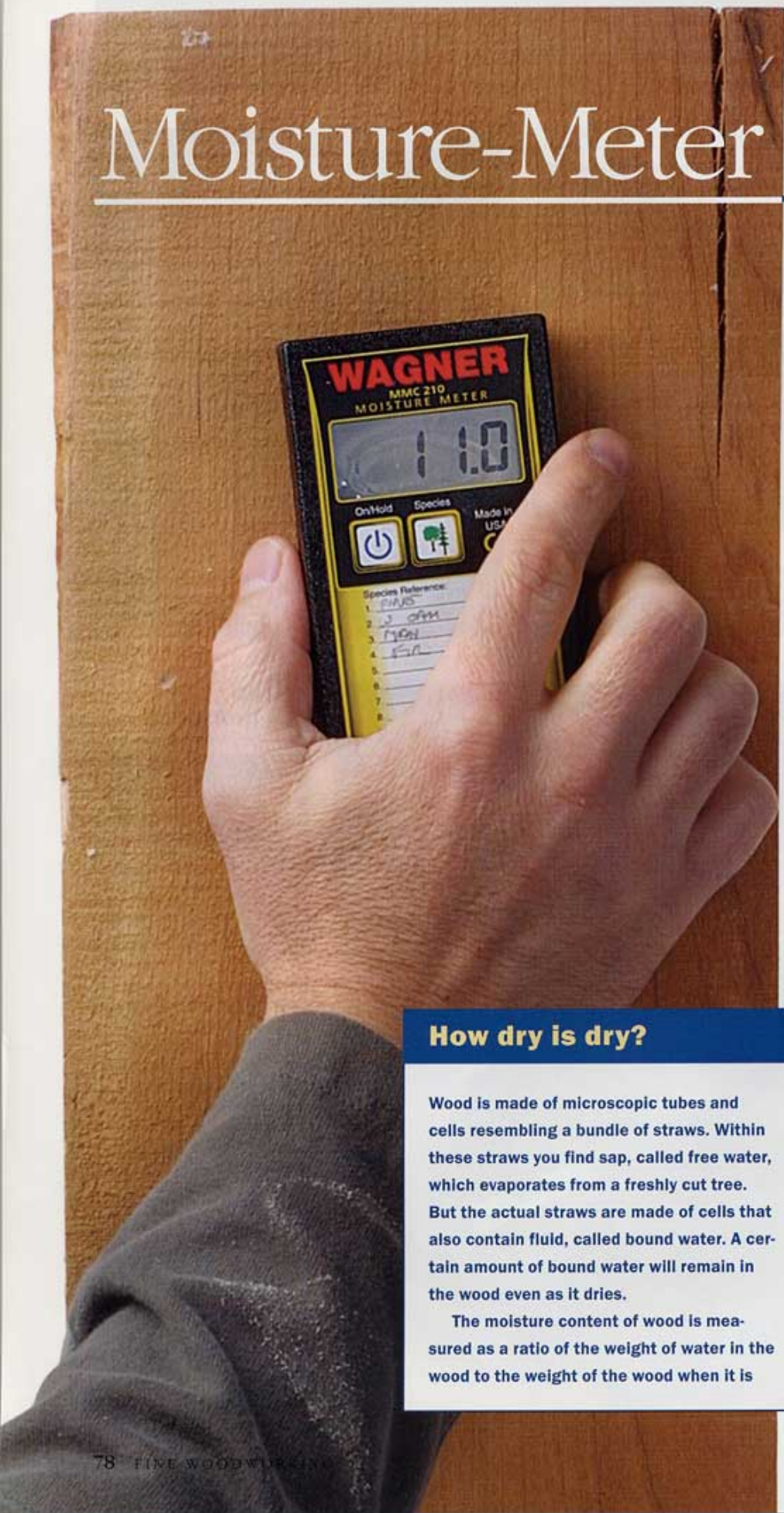
Lonnie Bird conducts classes from his shop in Dandridge, Tenn. To obtain a list of classes, e-mail him at lonniebird@earthlink.com.



CARVE THE CORNERS

Use a square and compass to mark out the corners of the arch (left). Scoring with a knife provides a solid reference line. Bird walks a chisel across the area to be removed, leaving less room for error (above). Use a skew chisel to get into the corners (below).

Moisture-Meter Survey



These compact tools can help prevent the most common woodworking problems

BY LON SCHLEINING

As wood scientist R. Bruce Hoadley says, 90% of woodworking problems involve moisture. I couldn't agree more. The most common problems caused by moisture are finishes that don't stick, joinery that breaks apart and boards that take on new and unwanted shapes after milling.

The solution to all of these problems is simple: Use wood that has been properly dried to the right moisture content (see the story below). The easiest way to see that your wood is dry enough is to use a moisture meter. Using a moisture meter, I can be sure that wood I'm about to use is at its

How dry is dry?

Wood is made of microscopic tubes and cells resembling a bundle of straws. Within these straws you find sap, called free water, which evaporates from a freshly cut tree. But the actual straws are made of cells that also contain fluid, called bound water. A certain amount of bound water will remain in the wood even as it dries.

The moisture content of wood is measured as a ratio of the weight of water in the wood to the weight of the wood when it is completely dry. This ratio is expressed as a percentage. A piece of wood that goes from 14% to 8% moisture content shrinks, and if it goes back to 14%, it expands. If temperature and humidity vary, the moisture content of wood in that environment will also vary. If you don't account for moisture content, your furniture will certainly fail—panels bust out of their frames and case pieces crack apart.

With few exceptions, you can't simply cut down a tree and start building furniture. A

Moisture meters use either pins or an electromagnetic plate (pinless) to measure moisture. Some pin-style meters take deep readings with hammer probes (far left); others take readings from ⅝ in. or less (center). Both styles leave marks. Pinless meters (right) leave no marks but require the wood surface to be smooth. Pinless meters detect moisture down to about ⅝ in.

optimum moisture content: between 8% and 12%.

A moisture meter can really help you when you're working on a project and need additional lumber to complete the job. How can you be sure the new stock has the same moisture content as the stuff that you have been working on for the last several weeks? And if you dry your own lumber, it goes without saying that a moisture meter will let you know when your stock is ready to be worked.

There are many moisture meters on the market, with features and prices to accommodate a wide range of woodworkers. I recently looked at a dozen priced from $60 to $350. I was happily surprised to find that their overall accuracy is quite good. So the choice comes down to which features you are willing to pay for and which ones you can do without.

Moisture meters come in two basic styles

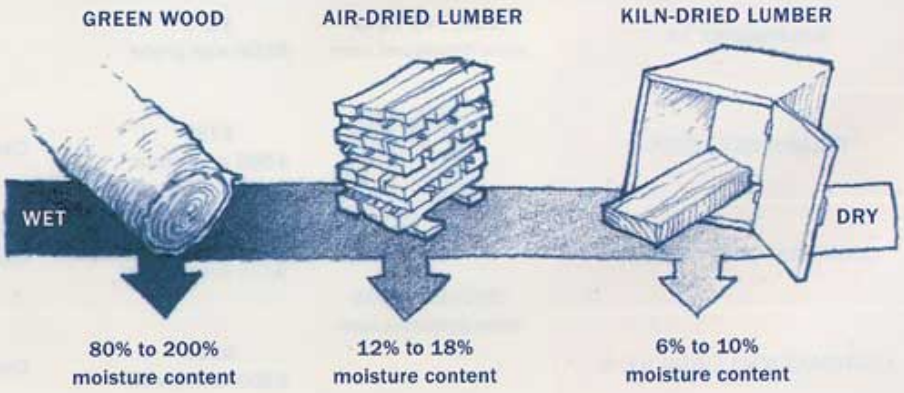
There are two styles of moisture meters: pin and pinless. A pin-style moisture meter has two pins that are pushed into the wood. An electrical charge emits from one pin to the other, using the wood as the conductor. The meter measures electrical resistance within the board and gives a moisture reading. As wood dries, the conductivity changes (decreases).

Instead of an electrical charge, a pinless meter uses radio waves to penetrate the wood. The radio waves create an electromagnetic field. As the waves bounce back from the wood, the meter measures the reaction of the waves to the moisture in the wood. The meter translates this behavior into a percentage of moisture content.

Where a pin-style meter takes a reading at a specific spot, a pinless meter takes a reading that's the size of the sensing pad (usually about 1 in. by 2 in.). All styles of

freshly cut tree has a moisture content of 80% to 200%. When it air-dries, it will be left with a moisture content of about 12% to 18%. If wood is kiln-dried, the wood will reach a moisture content of 6% to 10%.

Monitoring moisture content tells a woodworker when stock is ready to be worked. An ideal moisture content will vary depending upon where you live, but a rule of thumb is 8% to 12%.



Photos and drawings: Erika Marks

LARGE-PIN METERS

Some pin-style meters offer an optional hammer probe, which is used to get a reading in thicker wood, such as 8/4 stock. If you dry your own lumber, a hammer probe will be a worthwhile accessory.

DELMHORST J-LITE
This is a meter anyone could learn to use in five minutes. Provides a simple LED readout in whole numbers. Charts correct for temperature and species. Instructions are easy to follow. Hammer probe is an accessory.

DELMHORST J-2000
Comes with a well-written, easy-to-follow manual. Settings are complicated to use—each button is used for different functions at different times. It saves and accumulates readings. Has a built-in temperature compensation. Hammer probe is an accessory. Provides detailed digital readout.

DELMHORST J-4
Easy to use: stick in the pins and push a button. I like the analog dial a great deal. Instructions are easy to understand. Comes with a slide rule-type temperature-correction tool. Hammer probe is an accessory.

MANUFACTURER/ MODEL	CONTACT	PRICE	SPECIES CORRECTION	WARRANTY
DELMHORST J-LITE	(800) 746-7342 www.delmhorst.com	$125 $200 with probe	Chart	Three years
DELMHORST J-4		$175 $250 with probe	Chart	One year
DELMHORST J-2000		$290 $365 with probe	Chart/internal	One year
LIGNOMAT MINI LIGNO C	(800) 227-2105 www.lignomat.com	$105 $175 with probe	Chart/internal	One year
LIGNOMAT MINI LIGNO DX/C		$230 $300 with probe	Chart/internal	Three years

LIGNOMAT MINI LIGNO DX/C
The meter has a lot of settings, but it's very easy to use. Hammer probe, which is an accessory, is just heavy enough to use easily to penetrate even the hardest woods. Offers internal calibration with easy-to-change settings. Both temperature and species correction are done internally, so there's no need for conversion charts. Comes with a simple instruction pamphlet.

LIGNOMAT MINI LIGNO C
Easy to use. Provides a simple LED readout in whole numbers. Automatically turns on when the pins touch the wood. Turns off automatically. Comes with a plastic case. Has a simple two-position switch for species correction. Standard pins are ⅛ in. long, but the meter can be connected to an optional hammer probe.

meters detect the moisture content effectively; they just go about it differently.

Pin-style meters—Depending on the model, the pins can penetrate anywhere from ⅛ in. to more than 1 in. deep. Some pin-style meters come with a hammer-probe attachment that allows you to pound larger pins into the wood, providing a deeper measurement of the interior of a plank. All of the instruction manuals for the meters I looked at suggested that the pins always be parallel to the grain—that is, the pins should be in line with the grain.

Pinless meters—The main advantage of pinless meters is that they leave no marks in the wood. The pinless meters I tested performed well and were easy to use. When testing lumber, the surface should be smooth enough to allow for good contact, so a pinless meter wouldn't be my first choice for testing rough lumber. A good rule of thumb is that the board be smooth enough to run your finger over it without getting a splinter. Also, if you're checking a board at the lumberyard, these meters require you to remove the board from the pile; otherwise the meter might measure the next plank down along with the one on top. And very small pieces often are difficult for a pinless meter to read accurately. The meters I tested have a maximum scan depth of about ⅝ in. (You can get models that scan deeper, but they are more expensive.)

Pick a meter based on your needs

The meters I looked at varied, the smallest being little more than the size of a deck of cards, and the largest the size of a small

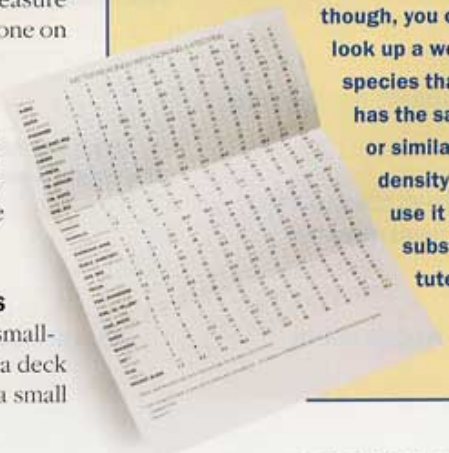
Accounting for lumber species

Woods vary in density, which can affect the reading you get on a moisture meter. Though a meter can't tell one species from another, it can correct a reading to account for this variation using a chart or a chart plus an internal setting.

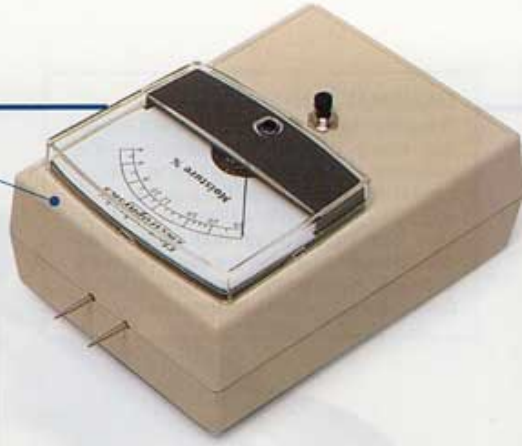
It's easy to use a meter that has only a chart. Take a reading and then look in the chart to find the species you're testing. The chart gives you a number to correct your reading by. Say you're testing pine, and the meter reading is 12%. If the chart says the correction for pine is to add 1%, the actual moisture content is 13%.

When using a meter that has a chart plus internal species correction, first find in the chart the species you're testing. Then reset the meter for that species, and the meter will provide an internally adjusted, accurate reading.

Some manufacturers provide extensive correction charts, covering lots of wood species, while others include only common ones. If a board you're testing is not in your chart (and many exotics aren't), call the manufacturer or check its web site for the correction. Usually, though, you can look up a wood species that has the same, or similar, density and use it as a substitute.



SMALL-PIN METERS



ELECTROPHYSICS MT 270
Analog dial is easy to read. Extra pins also are loose (they were simply taped to an instruction sheet). This is the only pin-type meter I looked at that lacks a guard.

PROTIMETER DIGITAL-MINI
A functional meter with very accurate calibration. Sturdy construction. Offers digital readout. Comes with a good case and a belt loop. The species correction is detailed, with many options. There are, for example, six options for oak.

PROTIMETER BLD-5700 TIMBERMASTER
Has a long and slender shape that fits easily into a pocket. Comes with a calibration device and remote sensor. Provides detailed digital readout. The only meter reviewed that comes with a remote temperature-sensing probe that automatically corrects for temperature.

TIMBER CHECK
This meter is very easy to use. It is a sturdy, functional meter and compact in size. Does not automatically shut off like some of the other meters and does not allow for calibration. Has a tight-fitting plastic cover for the pins.

radio plus the hammer probe and case. I compared the readings that each of these meters gave on four different boards. One had been oven-dried; the second had been kiln-dried to what turned out to be about 6% moisture content; the third had been partially air-dried and measured about 10%; and the fourth was very wet at about 30%. It's worth noting that the very dry and very wet boards exceeded the normally effective range of most of the meters (6% to 30%). I found that the readings did not vary by more than one or two percentage points. That's good enough for me to claim that all of the meters are reliable. What distinguishes some of these moisture meters from others are the accessories, the detail of the readings, their ease of use, including portability and how fragile or robust they would be under actual working conditions.

No matter what moisture meter you use, you're going to have to make adjustments based on the species you're testing (see p. 81). All of the meters I tested required a

MANUFACTURER/ MODEL	CONTACT	PRICE	SPECIES CORRECTION	WARRANTY
ELECTROPHYSICS MT 270	(800) 244-9908 www.electrophysics.on.ca	$110	Chart	Two years
PROTIMETER DIGITAL-MINI	(800) 321-4878 www.moisture-meter.com	$250	Chart	One year
PROTIMETER BLD-5700 TIMBERMASTER		$348	Chart/internal	One year
TIMBER CHECK	(613) 256-5437	$60	Chart	Three years

chart—for some it is to look up the corrected reading and for others it is to determine the code needed to set the moisture meter to a specific species. I like the meters that make species correction easy. The Wagner meters offer an erasable pad on the front that allows you to write the codes for the often tested species. I was also impressed at the extensive listing that some of these models had for species. For example, the Protimeter Digital-Mini had more than six species of oak to choose from.

I really like the look and feel of the Protimeter BLD-5700 Timbermaster, but it's really more meter than I need—even though I enjoyed using the temperature-sensing probe. If I ran a kiln, had an engineering background or routinely air-dried my own lumber, I would choose a meter with a hammer-probe attachment (see pp. 80-81), which allows the meter to take deeper readings, and with lots of features such as internal species correction. The Delmhorsts were certainly easy to use and had the most understandable manuals, but the meters were a bit on the bulky side to carry around.

If I were heading to the lumberyard today to purchase a load of vertical-grain Douglas fir, I'd probably take the Wagner MMC 210, which clips to a belt so it's handy. With it I can quickly and discreetly scan a stack of lumber without leaving pin holes in the boards. □

Lon Schleining is a contributing editor.

ELECTROPHYSICS CT 100
For species correction, this one has a reference chart that provides a number to set the meter to so you can get an accurate reading. The optional calibration plates are fragile and require careful handling, but they were packed in a sandwich bag. The meter could use even a simple case.

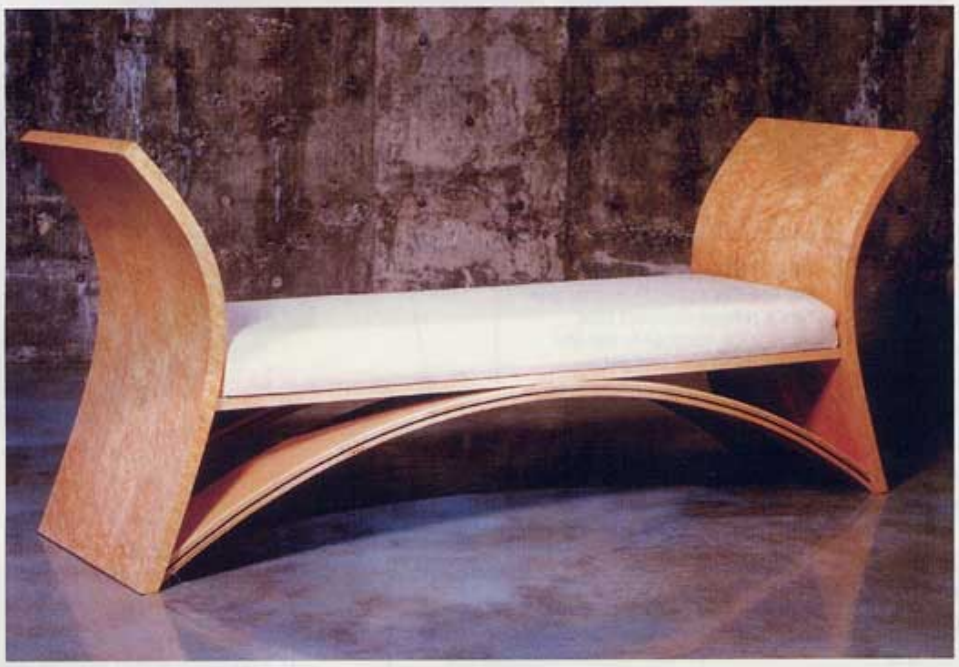
WAGNER MMC 205
This meter has nearly all of the features found on the MMC 210, except for a separate button for inputting the species code. It's accurate, easy to use, compact and ruggedly built.

WAGNER MMC 210
Has a very compact, functional design. Note pad on the front keeps track of the species correction for your most frequently tested types of wood. Comes with a case and a belt clip. The manual fits neatly within the storage case.

MANUFACTURER/ MODEL	CONTACT	PRICE	SPECIES CORRECTION	WARRANTY
ELECTROPHYSICS CT 100	(800) 244-9908 www.electrophysics.on.ca	$198	Chart/internal	Two years
WAGNER MMC 205	(800) 634-9961 www.moisturemeters.com	$195	Chart/internal	One year
WAGNER MMC 210		$285	Chart/internal	One year

Current Work

Current Work provides design inspiration by showcasing the work of our readers. For more details and an entry form, visit our web site at www.finewoodworking.com. Send photos and entry forms to Current Work, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470.



Andrew Muggleton
Denver, Colo.

Muggleton, who designs contemporary furniture, sketched out this bench (23 in. deep by 71 in. wide by 31 in. tall) three years ago when he first started woodworking. He built it this past year when he was represented by the Pismo Gallery at the SOFA exposition in Chicago. The sides and base of the bench are bent laminations veneered with bird's-eye maple. The piece is finished with high-gloss lacquer and is upholstered in Ultrasuede.

Lucinda Daly
Berkeley, Calif.

Daly and her husband are avid nighttime readers. As a result, large heaps of books and magazines accumulate on the floor by each side of the bed. These two cherry bedside tables (18 in. deep by 21 in. wide by 30 in. tall) have solved this problem. Created in the spirit of the Arts and Crafts style, the tables feature flared legs, decorative aprons and stained-glass inserts in the doors. The finish is a hand-rubbed oil.

Steven Sackmann Somerville, Mass. ▶

Based on a piece he saw in Albert Sack's *Fine Points of Furniture* (out of print), Sackmann built this table (17 in. deep by 17 in. wide by 26 in. tall) as his first project for the North Bennet Street School in Boston, Mass. Constructed of mahogany, satinwood, anegre, rosewood and a secondary wood of pine, the piece features a crotch-mahogany book-matched top and rosewood crossbanding with ebony stringing around the top and the drawer fronts. The finish is a stained glaze and French-polished shellac. Photo by Lance Patterson

Hillard Gerhardt ▲

Cedar Crest, N.M.

Gerhardt, a 60-year woodworking veteran, became determined to try something larger and more challenging after reading Patrick Spielman's *The Art of the Lathe* (Sterling Publications, 1997). This segmented turned wood vase (24½ in. dia. by 28½ in. tall) is the result of more than 600 hours of work. Constructed out of 3,410 pieces and using eight different species of wood, the vase features a Southwestern design with crushed turquoise inlays. It is finished with a rubbed lacquer.

Pete Rodrigues Kitty Hawk, N.C. ▼

After graduating from college with a degree in art, Rodrigues decided to try his hand at designing and building custom furniture. This Honduras mahogany coffee table (24 in. deep by 46 in. wide by 18 in. tall) has an elliptical top that was cut from one solid piece of mahogany. The piece is finished with satin lacquer. Photo by Ray Matthews

Top of Their Class

For the past three years, George M. Trout has sent us portfolios of his students' work. Trout has taught industrial technology at Springfield High School in Pennsylvania for 16 years. "Our woodworking courses continue to flourish despite the national trend to eliminate such high-school programs in favor of computerization," said Trout. The editors of *Fine Woodworking* noticed the impressive work being done by Trout's students and decided to devote this page to showcase some of their work. Photo courtesy of Springfield High School

Robert Addis Sophomore ▶

Addis was flipping through a magazine when a picture of a scroll-saw cathedral clock caught his eye. "I knew it would be time-consuming," said Addis, "but I made the commitment." Taking about 400 hours to complete, the cherry clock (9 in. deep by 20 in. wide by 37 in. tall) was constructed from 1,511 individual cutouts. The piece features a quartz clock movement and is finished with clear Deft lacquer. Photo by John Perkins

Jason Veriabo Senior ▲

Veriabo was looking for a challenging project that would stand out and demonstrate his skills. "In Mr. Trout's classroom," said Veriabo, "the sky is the limit." And when he saw the highboy featured on the front cover of *FWW* #117, Veriabo knew it was everything he was looking for. Taking about 300 hours to construct, the highboy (20 in. deep by 36 in. wide by 90 in. tall) is made of cherry and has a clear Deft lacquer finish. Photo by John Perkins

◀ **Brett Shaffer** Senior

Shaffer wanted his senior-year project to be a tour de force that would inspire future students. Wanting to re-create an antique piece with elaborate carvings, he chose to build this English sideboard (20 in. deep by 68 in. wide by 71 in. tall). Shaffer used Central American mahogany in the sideboard's construction. It has a Minwax red mahogany stain and clear Deft lacquer finish. Photo by John Perkins

Robert G. Twomey Ooltewah, Tenn.

Asked to make this walnut chest (20½ in. deep by 38¾ in. wide by 26¾ in. tall) for a client, Twomey found in this project the perfect opportunity to expand his woodworking talents. He decided to cut the dovetails with a bowsaw, the same way he had seen Mack Headley do it at the 2001 Williamsburg conference on 18th-century chairs. He made the bowsaw based on photos taken at the conference and cut all 52 tails by hand. "This is my first attempt at hand-cut dovetails," said Twomey, "and they all fit perfectly." The chest has an oil and lacquer finish.

Richard Green Eugene, Ore.

A recently retired University of Oregon groundskeeper, Green built this globe stand (18½ in. deep by 18½ in. wide by 24 in. tall) for a friend and former coworker. The base is made of quilted maple while the ring is constructed of layers of padauk on the outside and quilted maple on the interior. He made the ring by cutting the laminated pieces first into an octagon, then into a circle and then joining them with laminated splines. The stand is finished with 10 coats of semigloss clear Deft lacquer.
Photo by Dick Castle

David Brendel
Brookeville, Md.

Brendel presented this Chippendale tea table (17 in. deep by 24 in. wide by 23½ in. tall) to his wife to honor her on her first year of motherhood. The piece, which took about 60 hours to complete, is made of Honduras mahogany. The finish is a flat-sheen catalyzed lacquer.

Tips for photographing your furniture

1. *Clean and dust the furniture.*
2. *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.*
3. *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.*
4. *Use 35mm color print (negative) film of moderate speed (ISO 200-400). If you're using a digital camera, shoot at the highest resolution and place the image on a CD.*
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.*

BY GARRETT HACK

Designing furniture: a survival guide

Designing a piece of furniture should be fun, not intimidating. Yet I know woodworkers who think nothing of building complicated jigs or mastering difficult finishes but feel lost when it comes to designing a piece of furniture truly their own.

The most important thing you can do is to train your eye. Look at furniture you like. Look in books, or go to museums, galleries and new or antique furniture stores. Discover what appeals to you and why. In my previous article on designing a chest of drawers (*FWW* #151, pp. 54-57), I talked about absorbing ideas from the past and synthesizing them into your own vision. Jot down your discoveries as you make them. Measure the back of a particularly comfortable chair or the height of the seat. Keep a sketchbook of inspiring ideas; you never know how you might use some detail or rough sketch later.

Gaining confidence as a designer is more subtle than, say, learning to cut dovetails, but it's just another skill. I'll give you the loose process I follow when designing furniture and some tools and techniques that will help you along the way.

Start with what you know

A good place to start a design is with the givens—there are always some. Say you're designing a piece with drawers. What are you going to store and how much space does it take up? This might mean measuring a stack of sweaters or sizing up particularly useful drawers you already use. If you're designing a table, consider whether it will be used next to a sofa or a bed or worked at while standing or sitting. How large does the top need to be?

Where to start. *Furniture design books and architectural standard guides are good places to look for practical measurements based on average body types and ergonomic factors.*

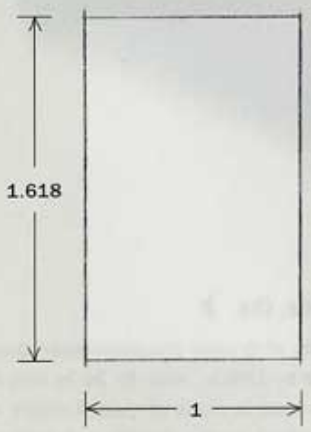
Architectural Graphic Standards (John Wiley & Sons, 2000) is one place to get the starting points for a design. This book gives practical dimensions for a wide range of furniture.

Work out the lines and proportions

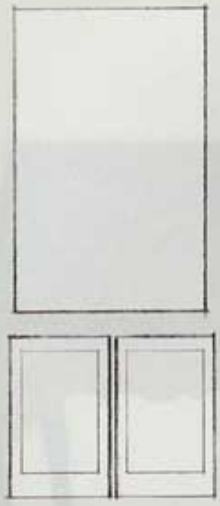
Now, armed with (or saddled with, depending on how you look at it) the practical dimensions, work on the overall proportions and lines of the piece.

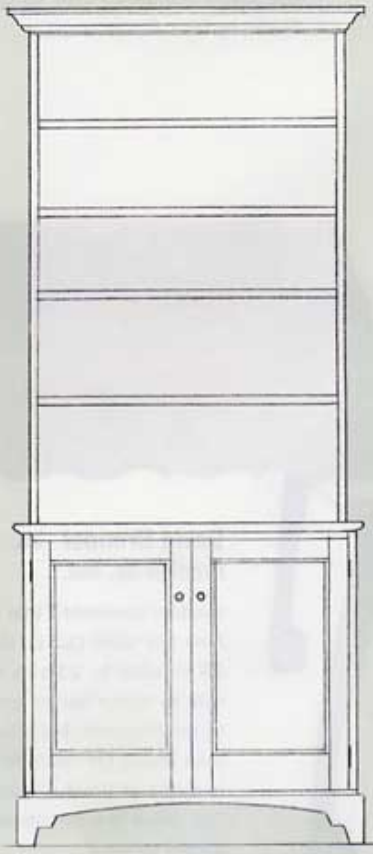
Proportion is the size relationship of the parts. It's the width of a table compared with its length or the height of each drawer face compared with the ones above and below it. But don't think only about the proportions of parts you can see; the negative spaces formed between the parts are also important. Tables and chairs create lots of negative spaces, interesting ones that can mirror and

THE GOLDEN RECTANGLE



A useful proportioning rule is the golden rectangle, or golden mean, a ratio of roughly 1:1.6. It's a pleasing proportion for cabinet doors, tabletops, the front or sides of a chest of drawers, anything rectangular. You can use it to proportion the panels of a large multipaneled door, as well as the door itself. And you can stack multiple golden rectangles together—for example, a cabinet one high and two or three long.





The golden rectangle was used to proportion the doors, the door panels and the upper case of this cabinet.

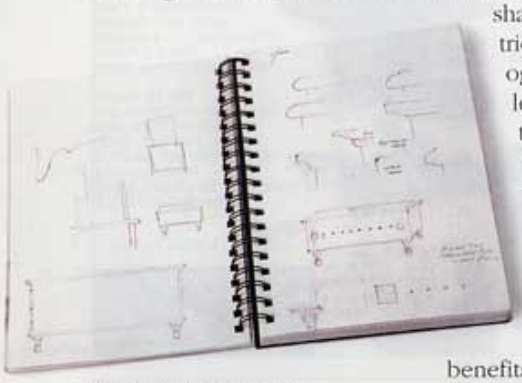
Drawings: Michael Pekovich; photos, except where noted: Asa Christiana

reinforce the positive, as is the case with the shapely curved back splats of 18th-century chairs.

A useful rule is the golden mean, a ratio of 1:1.618, also called the golden rectangle. It's a classical proportion for anything rectangular, such as cabinet doors, tabletops and the front or sides of a chest of drawers.

Avoid the tiresome stock lumberyard dimensions ¾ in., 1½ in., and 3½ in. in door rails and stiles, dividers between drawers, table aprons and other highly visible parts. A variety of sizes and proportions is the most visually stimulating.

Drawings and mock-ups—Typically I make lots of small sketches to get a sense of my design before making accurate full-scale drawings. Drafting full scale is always best for working out the shape of curves, details or tricky joinery, and for recognizing potential problems before you get there. It's a useful way to see exactly what you're designing and whether the shapes and proportions are pleasing.



Designing a blanket chest. *Hack works out proportions and details in his sketchbook before moving on to full-sized drawings.*

A full-sized drawing offers other benefits. You can transfer angles and dimensions (such as shoulder lines) directly from the drawing to the parts, making fewer errors than reading measurements off a tape. Once you get curves and contours the way you like them, you can make patterns directly from the drawing.

Drawings, however, often aren't enough to help you visualize a three-dimensional piece of furniture. At some stage a mock-up of all or part of the piece might be the best way to visualize the design. Tape together cardboard cutouts or nail together some scraps. Stand back and look at your mock-up (and drawing) from different angles. Work on something else and come back to your design with a fresh eye. Use your eyes—not your tape—to work out the dimensions of parts, such as the thickness of a tabletop, the height of the table or the width of its apron.

Once you know what works, you can break some of the rules. Exaggerate dimensions: Design a long, narrow table or a strongly vertical chest of drawers. Instead of a progression of deepening drawers down the front of a case, add a couple of smaller ones toward the middle. Keep in mind, however, the balance of the piece. It might be solid on its feet but feel unsettling to the viewer.

Keep construction in mind

Aside from the practical dimensions that the design must accommodate, construction is another real-world consideration. The most ingenious design is no good if it's incredibly difficult to build. It's better (and more profitable) to build something simple that looks complicated, rather than something complicated that looks simple. So think about construction early in the design process.

Insight into how to design the joinery and build a piece often comes from experience—if you have it. If I had never made a gateleg table, I'd look at as many examples as possible to see other makers' designs and solutions. There is no one way to build anything, but there are easier and harder ways to do it. Some ways are stronger, too.

Choose appropriate woods

Wood choice is both an aesthetic and technical consideration. Wood color, figure, hardness, how primary and secondary woods enhance or contrast each other, and how your wood will age are all concerns. A piece made of ash or oak, both of which have very strong grain, will be very different from the same piece made of quieter cherry or flashier bird's-eye maple. Harder woods will take fine details and hold up to wear and tear, but you may want the patina that softwoods develop with everyday use. Think through the various parts and the availability of stock wide or thick enough to make them. Of

Variations on a theme. *Square pegs and rectangular wedges made of ebony work together visually in the base of a trestle table (above). A black-and-white checkered pattern is repeated in the stringing and banding on the legs of the demilune table below, and the motif is echoed in the border of the oval inlay.*

Photos, this page (right—top and bottom): John Sheldon

course, wood selection sometimes comes down to what you have on hand or what you can get.

Get down to details

While choosing woods, refining proportions and devising construction strategies are important aspects of a design, the details are the most important—and the most elusive. These are the small touches that draw your eye and delight your senses. Some details are purely practical: a chamfer to blunt and thus protect an edge from wear. Others are purely decorative: an inlay line around a drawer. Great details can do both; for instance, beads disguise the gap around a door, round an edge prone to wear and add a nicely molded outline. Some designs are rich with details. Others rely on beautiful woods and surfaces alone.

> Details are hard to see on paper but easy to mock up.

The challenge is not finding details you like—they are everywhere you look—but using them in a way that enhances rather than clutters your design. Don't give your viewers so much variety that they feel confused and overwhelmed. Treat details as variations on a theme. Use similar woods, colors, patterns and repeating shapes and sizes to create unity in the piece. In a cherry cabinet you might use dark rosewood to pin the joints on the doors, for the knobs and perhaps for cock beading on the drawers. A part of the crown molding could echo the bead shape.

Details are hard to see on paper but easy to mock up. Wondering about a molding shape or how big to make a chamfer? Go cut some. Test samples also give you practice making a difficult detail, can be sent to a client and can be saved for future reference.

Nothing like the real thing. *These models of edge treatments are for the chest in the sketchbook on the facing page.*

Part of the thrill of making something unique is leaving some things to be discovered as you build. Give yourself the flexibility to let the design evolve. Curve an edge that was to be straight, refine a leg to a more pleasing taper, deepen a rail where you can now see you need it. Even mistakes can add something to the fun; they'll force you to come up with creative solutions you just might use again. □

Q&A

Breadboard-end basics

What's the purpose behind using breadboard ends on a tabletop, and why couldn't I just biscuit-join a cap on the end? —Pat Houghton, Shreveport, La.

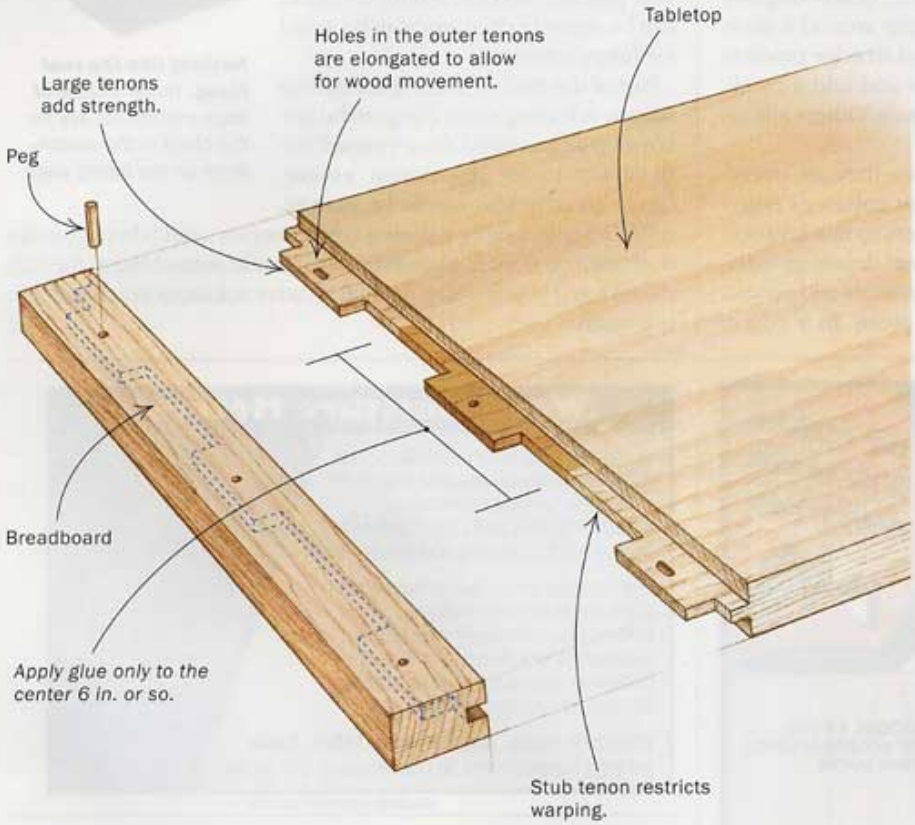
Michael Pekovich replies: Breadboard ends have been used traditionally to keep wide table ends flat yet also allow the top to move seasonally. The breadboard end is a dadoed end cap that is placed over tenons and secured with pins.

short stub tenon helps minimize any cupping of the tabletop.

The breadboard is glued only to the center 6 in. or so (including the center tenon), which allows the top to expand or contract independently from the breadboard. The breadboard is further secured with pegs through the tenons.

The peg holes (except for the one in the center tenon) must be elongated to allow for movement. The easiest way to do this is to dry-fit the breadboard to the top and

DESIGNING TRADITIONAL BREADBOARD ENDS



Biscuits would work fine if you were attaching breadboard ends to something stable such as plywood. But solid wood can move quite a bit with the seasonal changes in humidity, so a different method of attachment is necessary.

A traditional method, and the one I like to use, involves joining the breadboard to the tabletop with a series of tenons connected by a continuous stub tenon. The longer tenons (usually three or five but always odd in number) offer support when lifting the table by its ends. The drill for the pegs. Then remove the breadboard and elongate the holes in the tenons with a file before gluing and pegging the breadboard in place. [Michael Pekovich is the art director and a furniture maker.]

How to fix veneer blisters in old furniture

A client of mine recently found pea-sized blisters popping up on her veneered furniture. The pieces had been sent to the United States from France in a cargo ship and left in storage for nine months. Her furniture is typical French style with curved sides and drawer fronts. The veneer is oak, but the specific species is unknown, and the finish is a high gloss. How do I repair this damage? —Dale H. Coffed, Greensboro, Ga.

Roland Johnson replies: Repairing lifting veneer without damaging the finish is a very tough challenge. If the furniture is old (pre-World War II), the veneer is probably held in place with hide glue. Furniture in storage often experiences low humidity and fluctuations in temperature—both detrimental to hide glue. Old hide glue that has lost its adhesion can be reactivated with the application of heat and moisture. I use a damp cotton cloth and a clothes iron set at the cotton setting to heat the veneer and glue and iron it back down. The drawback with this method is that it will ruin the finish on the repaired areas.

If the glue is a modern resin glue, the only way to readhere the veneer is to puncture the blisters with either a razor knife or a syringe, squirt a tiny amount of glue under the blister and then clamp or weight the veneer to flatten it into the glue. Again, the chance of damaging the finish is high, especially a gloss finish.

For small veneer repairs, I often use cyanoacrylate glue injected through a tiny puncture or slit. Cyanoacrylate glue has a very low viscosity and tends to pull itself into tight confines, completely coating any slight separation between the veneer and the substrate. The best method to apply the glue is to place the tip of the glue bottle tightly against the puncture and slowly allow the glue to fill the bottle's tip until the glue contacts the veneer. Keep just slight pressure against the veneer, and let the glue pull itself into the void. The glue has a short drying time, so you can hold the veneer in place by hand, eliminating the need for clamps or weights. Cyanoacrylate glue will eat into a finish quickly, so again the risk of damaging the finish is high.

Keep in mind that resin glue will not adhere to hide glue. Resin glue would be a temporary fix at best if the veneer were attached with hide glue. Cyanoacrylate glue seems to adhere to any

Drawing: Melanie Powell

glue, so if you're unsure of the original adhesive, cyanoacrylate would be the best glue to use.
[Roland Johnson is a furniture maker in Sauk Rapids, Minn.]

Problems with a burl turning

The bowl I turned from a black walnut burl has some checks in it. Should I close these? If so, what should I use?

—Robert M. Eldon, Phoenix, Ariz.

Richard Raffan replies: Depending on the size of the checks, you have several options. Very small end-grain splits typically resulting from aggressive sanding are best hand-sanded until the surface feels smooth.

Larger, more obvious splits can be filled with dust, shavings and cyanoacrylate glue and accelerant (see the photos at right). First squirt cyanoacrylate accelerant into the gap to be filled. Then pack dust and/or shavings tightly into the gap using some sort of ramming device. I use old dental tools, but small, wedge-shaped offcuts do just as well.

Next, add a few drops of cyanoacrylate glue and spray with accelerant. The resin instantly percolates the packed dust and shavings, and the accelerant causes it to set rapidly from all sides in about two seconds. Finally, scrape and sand the excess fill until it is smooth and level with the surrounding surface.

To disguise large splits along the grain, use a few long, fat shavings or even wood slivers aligned with the grain and packed in fine dust.

Larger splits can be a design opportunity ready for dramatization, especially if they allow you to see through the bowl wall. By sanding the splits smooth and rounding the edges, you can create an asset from a defect.

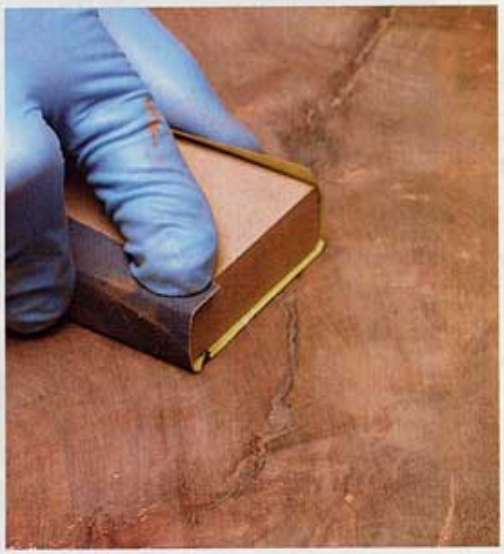
Splits across the grain are more difficult to hide, so consider making a feature of them using a contrasting dust or even some color. If you like the idea of bright color, use powdered paint mixed with epoxy resin. A contrasting wood dust and cyanoacrylate glue make

REPAIRING CHECKS

Small cracks can be filled with cyanoacrylate glue and sawdust.

Spray cyanoacrylate accelerant into the gap. *This prepares the check for a fast-drying repair.*

Pack, fill, spray. *Fill the gap with sawdust using a wedge of wood to pack it down (left). Add several drops of cyanoacrylate glue (middle), then spray accelerant on top of that (right). The accelerant hardens the glue instantly, making it ready to be worked.*



Scrape and sand until the surface is smooth and level. *After the cyanoacrylate glue has dried, sand to a smooth finish. Wipe with a solvent to check the fit of the repair.*

Photos, except where noted: Kelly J. Dunton

a more subtle effect. I keep jars of fine dust pulverized in a coffee blender for this purpose. I favor African blackwood and cocobolo dust, both of which set very quickly, even without an accelerant.

[Richard Raffan is a professional wood turner in the Far South Coast of New South Wales, Australia. He has written several books for The Taunton Press.]

Lightening the stain of an antique

We inherited a number of production pieces of furniture, probably from the 1940s, which all have a dark stain. We would like to lighten them. Please tell us the best way to turn dark-stained furniture into light-stained furniture.

—Sylvia and Joseph Franklin, Richmond, Va.

From dark to light. *By using a stripper, a darkly stained piece (left) can be lightened (center). If an even lighter tone is desired, the piece may be bleached (right).*

Jeff Jewitt replies: Aside from painting, there is no way to lighten dark furniture without stripping it down to bare wood and refinishing. There are four steps to refinishing. Remove the finish, sand and repair the surface, color it and then apply the finish.

Furniture from the 1940s is probably lacquer, and old lacquer strips easily. You can use any commercially available stripper or pay someone to do it. You'd be surprised how cheap a pro can do it compared with the time and money you'd invest in the same activity.

Also, be sure to neutralize the stripper. I use lacquer thinner. After the wood is dry, sand it. If the surface is badly damaged, start with 120 grit and go up to 180 grit. If it's not damaged, a light 180 grit will suffice.

Deep gouges and missing wood should be repaired with putty or real wood. I always try to replace wood with wood (such as veneer chips and small pieces of molding). To remove dents and small dings, you can use steam from a wet rag heated with the tip of an iron.

Now wet the wood with mineral spirits. If the color is right, go onto finishing. If the wood is still too dark, you will have to lighten it with chlorine bleach to remove dye stains. If it's too light you will have to stain it the color that you like. Most likely, some parts of the piece may be of a secondary wood, such as poplar or maple, and stained and glazed to match the primary woods used on the top and sides. If this is the case, seal the secondary wood with a thin coat of finish, then wipe on different-color pigment stains to simulate the color of the primary wood. This is a technique called glazing (See *FWW* #148, pp. 48-49).

Now finish with the topcoat of your choice. The closest to the factory original will be nitrocellulose lacquer, but shellac and oil-based varnish will work as well.

[Jeff Jewitt is a frequent contributor to *Fine Woodworking* on finish-related topics.]

Making tack rags

Tack rags are very useful for removing sanding dust before I spray a finish on my work. But I use them continually, which makes them expensive. Do you have a recipe to make tack rags?

—Dave Bell, Cox's Bay Auckland, New Zealand

Chris Minick replies: To make your own tack rags, here is an age-old formula. In a clean 1-gal. bucket, add 2 oz. or 3 oz. (four to six tablespoons) of a slow-drying alkyd varnish to one pint turpentine. Stir this mixture until homogeneous, then add about ½ yard of lint-free, open-weave cheesecloth. Once saturated, remove the cheesecloth and squeeze out as much of the liquid as possible. The objective is to end up with a rag that is slightly sticky but will not leave any residue on the surface. The leftover liquid can be stored in a tightly sealed jar for future use.

Homemade varnish-based tack rags have some limitations not found in commercial rags. First, spontaneous combustion is a real hazard and should not be taken lightly. Store the used rag in a small, tightly sealed jar to minimize the hazard. Better yet, after use, lay the unfolded rag on the shop floor to dry, then dispose of it in the trash. Tack rags by their nature leave a small amount of contamination on the wiped surface. Varnish-based tack rags are okay for varnished surfaces; however, they may cause adhesion problems when used between coats of solvent-based lacquer, and fisheyes when used with water-based finishes. Given these limitations, plus the hassles of making your own, I think buying commercially prepared automotive-grade tack rags is a wise choice.

[Chris Minick is a consulting editor.]

Sticker-stain blues

I have some bad sticker stain in some myrtle that I am air-drying. Should I be using a special type of wood for stickers, and is there any way to lift the stain or

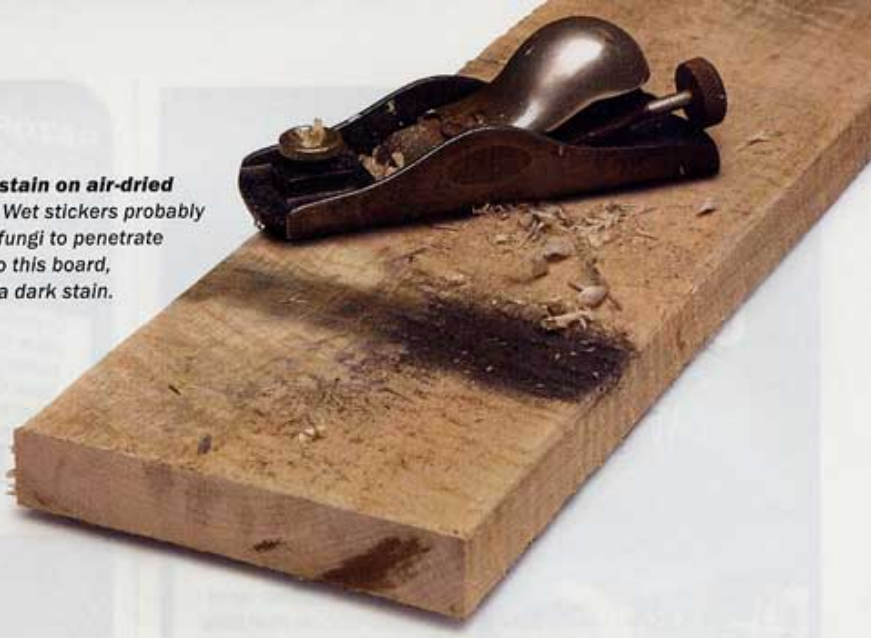
Photo, this page: Timothy Saitis

cover it up? Milling and planing is not an option.

—Bud Tippet, Rogue River, Ore.

Jon Arno replies: Sticker stain is usually caused by moisture trapped between the sticker and the surface of the lumber, which allows fungi to get established. The species of wood used for stickers is less important than making sure that the stickers have very low moisture content, preferably kiln-dried stock. There is also such a thing as chemical stain, which comes from stickers that are of a species that contains water-soluble (fugitive) pigments or a natural chemistry that might interact with the species being dried. These are usually acid or base interactions, but I can't recall reading any research that thoroughly covers this latter topic to the point of defining what species combinations to avoid.

As for helping you with your staining problem, I'm afraid you're sheets-to-the-wind on this one. It sounds like you used wet stickers and the stain is caused by deeply embedded fungi (i.e., virtually indelible). Strong bleach (oxalic acid) not only lightens the stain, but it also removes pigments from the wood. Bleach might help on a wood like holly or maybe even maple, when you want to achieve an almost white color anyway, but with myrtle you want to retain its natural gray-brown pigmentation. If milling and planing are not options, I suspect you now have a load of roof boards. Wish I could offer more positive feedback. [Jon Arno is a wood technologist.]

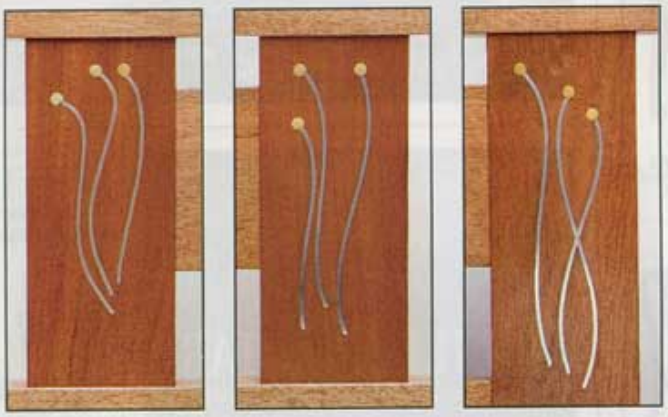


Sticker stain on air-dried lumber. *Wet stickers probably allowed fungi to penetrate deep into this board, causing a dark stain.*

Send your questions to Q&A, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506 or e-mail it to fwqa@taunton.com.

BY GARY ROGOWSKI

Silver inlay adds refinement to an Arts and Crafts bed



When is a piece of furniture more than a piece of furniture? The answer is when it sings, when it shows the handwork and detailing of a careful craftsman. The details of a piece can make or break it, separating fine furniture from run-of-the-mill work.

The bed project in this issue (pp. 44-51) can be further refined with silver inlay. The stylized floral inlay fits the Arts and Crafts idiom, but it also just looks good. A bed headboard, with its wide spaces, provides a broad canvas for embellishment.

I'm a sucker for the Scotch. Not the 16-year-old kind, although that is nice, but the 100-year-old work of Charles Rennie Mackintosh. His design work in furniture, architecture and fabrics is a fascinating mixture of geometric shapes and naturalism. Strong tapering shapes are accented with stylized flowers, stalks, seed heads and willowy waving-in-the-wind shapes. The floral patterns that occur regularly in his very masculine work gave me the inspiration to combine the heft of the bed with a series of waving stalks in the headboard and footboard. The ⅛-in.-square sterling-silver wire cost about $1 an inch, or about $100 total for the four columns on this bed.

Four columns, four slightly different designs

My design process started with a series of small, rough sketches on brown kraft paper—an effort to get the flavor before deciding on exact shapes or sizes. The idea of early sketches is to play with ideas and shapes without constraints. For one thing, try not to criticize your drawing skills. This stage can take several hours or several weeks as you try new shapes or proportions, searching for the right combination.

Next I started working to scale. I cut the paper to the exact size of the column. After hours of drawing practice, the lines flowed

BEGIN WITH SKETCHES

Rough sketches, with an emphasis on creativity and freedom, coalesce into a series of variations on a theme. Then the best of these are drawn as full-scale patterns. To see how the patterns work with each other and with the bed, Rogowski tapes them in place on the actual piece during the dry-fit stage.

Photos, except where noted: Michael Pekovich; this page (bottom row): Asa Christiana

ROUT FOR THE INLAY

One template for each stalk. *Transfer each stalk shape onto ¾-in.-thick MDF. Bandsaw the template edge, then drum-sand to the line. After drilling for the seed heads, tape down the pattern, allowing the necessary offset for the template guide bushing.*

from my pencil. I isolated the patterns I liked, then worked out the sizes of the circles at the top of the stalks.

I cut out these paper columns and taped them to the bed to see how the patterns looked in place.

When I had four slightly different patterns I liked, I used carbon paper to trace the designs onto ¼-in.-thick medium-density fiberboard (MDF). I cut the shapes on the bandsaw, then smoothed the curves with a drum sander. Each stalk needs its own router template, but I used the same stalk shape in a few different patterns to reduce the number of templates.

Template-routing the grooves

Curved inlay can be done with wood, but I wanted silver wire for this design for its luster, color and, I hoped, flexibility. Also, 8-gauge square wire matched pretty closely a ⅛-in. router bit, so I could rout all of the shapes using templates.

I mounted my smallest template guide in the router base and used a ⅛-in., down-spiral bit (to minimize tearout). I made a practice workpiece in mahogany to try the routing process.

Before routing I drilled out the seed-head circles with a ⅜-in. brad-point bit about 3/16 in. deep. Then I attached the templates with double-stick tape, not clamps, which would have gotten in the router's way. Next, I determined the proper offset for the template that would center the inlay groove on the seed-head hole. I marked this offset onto my workpieces for each groove.

This inlay would be done on workpieces I had already mortised and tenoned. Any mistakes would cost time and money. So I used double-stick tape to attach some ¼-in.-thick MDF shims onto the bottom of my router base to keep it level while cutting. The shims were the same thickness as the template, and they rode the workpiece to prevent the router from tipping and ruining the groove.

I began my routing at the seed head and moved to the right, allowing the cutting action to draw the router and the template guide toward the template. I had marked the end point of each stalk with a perpendicular line that I could see through the router base. I set the depth at slightly less than ⅛ in. to leave the wire about 1/64 in. proud. With the routing complete, I chiseled out the ends of the grooves. I angled each one slightly to give the sense of cut flowers, or maybe just because it looked good.

Start inside the seed-head area and move from left to right. *The cutting action will keep the guide snug against the template. Tape pieces of MDF onto the base to keep the router level.*

Cutting and placing the silver

Next I had to see how the silver worked. I learned how to anneal (soften) it from a friend who's a jewelry smith, but the wire was flexible enough already. But I had to avoid working it so much that it became work-hardened. If you do need to anneal your silver, lay it on a cinder block and heat it evenly with a torch until the silver glows dull red. Annealing will leave a dull film on the silver that can be sanded and polished off. To

Use a mortising chisel to finish the ends of the grooves. *Rogowski cut each end at a slightly different angle, then sawed and filed the silver inlay to match.*

Photos, this page (top row, middle row): Asa Christiana

INLAY THE WIRE

Prebend the wire. *Rout the pattern into a scrap hardwood block. Then pound in the silver slowly, bending it as you go. Next, set the silver into the actual workpiece and mark where it meets the seed head. Carefully remove the silver and trim it to length.*

shape the end to the right angle, I used a disc sander and file. I back-beveled the end of the wire so that it would fill gaps as it went deeper into the groove. I also filed the bottom edges of the wire so that it would enter the groove more easily.

I discovered a problem when working the silver into the grooves. On the tight curves, the edges of the wire tore the wood edges. Because I didn't want to damage my good workpieces, I inlaid each shape first into a forming pattern routed into a piece of cherry. That way I could preshape each piece of inlay, pull it out of the form and flatten it along its horizontal plane in a vise before working it into the mahogany column.

I placed the silver at one end of its practice groove and started pressing and pounding it in place. I used a deadblow hammer against a scrap of MDF so that I wouldn't deform the silver. I started bending the wire well ahead of any curves to get the silver headed in the right direction.

With a few router passes under my belt, I took on the real column. I drilled and marked it out, then routed the groove. I then worked the silver into the groove up to the round seed head. There, I marked the outline of the circle onto the silver.

To cut the inlay to length, I removed it carefully from the workpiece. With a knife edge on the bottom edge of the silver and a pad of laminate underneath the knife to protect the wood, I was able to pry up the silver without tearing up the edges of the groove.

I filed the top end of the wire as closely as I could to the curved shape of the seed head. Then it was time to epoxy the silver in place. I put enough epoxy in the groove to coat the walls lightly, figuring that any extra would get pushed into the bottom of the groove. I used a deadblow hammer, then C-clamps and blocks of MDF to drive the silver wire fully into its groove and hold it there. With slow-setting epoxy, I had time to clean up most of the squeeze-out using a rag dampened with vinegar.

Final details

I let the epoxy set up and cleaned up the rest of the squeeze-out. In the seed-head hole at the top of the inlay, epoxy had pooled. I also had a bit more shaping to do to the end of the wire to make it match the round edge of the seed head that was going in next. I used a rotary tool with a small cutting burr to clean up the epoxy and shape the end of the wire. I also used a round file here.

Mix up some 20-minute epoxy and hammer the inlay home. *A small block helps guide the inlay around the curves. Use C-clamps and MDF blocks to press down the silver wire.*

The silver wire was left slightly higher than the wood. I rounded over it with 220-grit sandpaper followed by 400 grit and a final polishing with 0000 steel wool. This gave the silver an even, burnished look.

I decided the seed head would look good in yellowheart, so I cut out some ⅜-in. tapered plugs on the drill press. I glued in each plug, then sanded it using 220-grit paper to give it its final look: slightly domed and raised, interesting to the eye and to the hand.

Trim the inlay to fit the circular seed head, then glue in the wood plug. *Rogowski uses a rotary tool freehand to trim the wire end, and a tapered plug cutter to make the ⅜-in.-dia. circles.*

Before sanding the wood plugs, I masked off the nicely burnished silver with tape. Along with the ebony pegs and splines, the silver inlay gives this bed some of the organic, mixed-media, hand-crafted flavor that is so appealing in Arts and Crafts furniture. □

BY TERI MASASCHI

Prevent blotching when staining

There is nothing more disheartening than to ruin a finely built piece because of poor staining. Coloring certain woods can be very challenging to a finisher: Pine, cherry, birch, poplar and sometimes maple can quickly absorb stains, yielding uneven, blotchy results. By recognizing the high risk of this happening and preparing the wood ahead of time, disaster can be avoided.

The term stain controller, or conditioner, describes any product or method that will pretreat and condition the wood to control the absorption of a stain. They accomplish this by either filling the cells of the wood or leaving a thin film over them. These controllers can be divided into three groups: the first is the use of a thinned coat of clear finish applied before the stain. The second group includes controllers designed to manage the wood's absorption of the stain. Last, stain control can also be achieved by different finishing processes, such as sanding to very fine grits or spraying dye stains or tinted lacquers as opposed to brushing or wiping them.

Pretreat the wood with a thinned finish

This is the largest group of stain controllers and the one that most woodworkers have heard about and perhaps tried. Already likely to be found in most workshops, they are easy to apply. A washcoat of shellac and thinned oil-based finishes both penetrate the wood and leave a thin film over the cell structure. The gel varnish relies more on filling the pores.

Washcoat of shellac— The typical washcoat is a 1-lb. or 1½-lb. cut of dewaxed shellac. The choice of shellac color is up to the finisher. Blond shellac will not add a tone to the work, but an orange or buttonlac shellac will dramatically alter the base tone of the wood. Apply the washcoat evenly by brushing or spraying, let dry and scuff-sand with 320- or 400-grit paper. As with all thinned finishes, a washcoat of shellac on end grain prevents the dark appearance that is often found on areas such as tabletop ends. As with all stain controllers, a lighter stain tone can be expected because of the reduced absorption.

Recommended stains to use with this conditioner are pigment stains or oil- and water-based dyes, which all can be applied by hand or sprayed.

Thinned oil-based varnishes and urethanes—Oil-based varnish or urethane in a 1:1 ratio with a solvent is a good starting point for porous woods such as pine. Thinner solutions, perhaps 1:3, would be adequate for hardwoods such as cherry. In either case scuff-sand the surface after the controller has dried. Recommended stains are oil-based pigment stains or gel stains. The final topcoat might pull a little of the stain if it is being brushed. To lessen this risk, work quickly without manipulating the topcoat excessively.

Gel varnishes—By nature gel stains are unable to penetrate deeply. However, with woods that will blotch, first wipe on a coat of clear gel varnish. Let the varnish dry and then scuff-sand. Recommended stains are gel stains and oil-based pigment stains.

Danish oil—Using this finish as a stain controller is very similar to using a

THINNED FINISHES

Clear finishes are easy to use as stain controllers and are more than likely already in your shop. Use shellac on areas most prone to blotching.

Photos: Mark Schofield

thinned varnish. Recommended stains are oil-based pigment stains and gel stains that are oil- or water-based.

Ready-made stain controllers are easy to use

A simple alternative to making a stain controller from scratch is to purchase it. Minwax Pre-Stain Wood Conditioner works in a similar way to Danish oil, entering the wood to control a subsequent stain's penetration. Apply the controller with a brush or cloth, wait a few minutes and then wipe off the excess. Minwax recommends using only an oil-based pigment stain, and it must be applied within a two-hour window.

The Minwax water-based Pre-Stain Wood Conditioner for water-based stains is a film-forming type of stain controller. Brush it on and let it dry for about 30 minutes. Then scuff-sand with 320- or 400-grit paper and stain the wood. This product worked well on a pine sample with water-based aniline dyes, Clearwater gels and various pigmented water-based stains.

Zinsser offers a new product, called Bulls Eye SealCoat, which is essentially a 2-lb. cut of dewaxed shellac. When used as a stain controller, the recommendation is to cut the product with denatured alcohol in a ratio of two parts SealCoat to three parts alcohol, which yields about a 1-lb. cut.

Glue size is generally sold as a concentrated product that the user dilutes with water. Examples include Franklin's Glue Size, Moser's Wood Prep and generic hide glue. When diluting the product with water, it is important to try the strength of the mix on a test piece. A ratio of three parts water to one part glue size may be fine for a hardwood, but pine may require closer to a 1:1 ratio. Apply evenly with a brush, let dry and scuff-sand with 320- or 400-grit paper. This is a particularly good conditioner for end-grain application. An added benefit achieved by the size is that it stiffens the wood fibers as it dries, and scuff-sanding shears them off, leaving the surface ultra-smooth. Recommended stains to use with these controllers are oil-based pigment stains and non-grain-raising stains.

You may not need a stain controller

There are a couple of ways to achieve an evenly stained appearance without resorting to the use of stain controllers. You can sand the wood to a high grit or use spray equipment.

Hardwoods, such as maple or birch, respond well to sanding. By sanding up through every grit from 120 through 400, or even 600, the wood cells are closed and the grain is polished, uniformly reducing the absorption of stain. Any stain can then be used with this method, but a lighter tone is to be expected. This process does not work on softwoods.

To spray dye stains or tinted lacquers, be sure to use a spray gun or an airbrush that is set up for a very dry mist. This will add successive light coats to create a uniform color on any difficult wood without penetrating and blotching. Pine responds very well to this method. The key is the light layering of color applied several times until the desired affect is reached.

And the winner is...

When deciding which method to use, consider what stain and topcoat will be used. For instance, a washcoat of shellac would never be used under an alcohol-based dye, because the dye would soften the shellac and grab, leaving an uneven result. A glue size would not be the first choice when using a water-based pigment stain. If it's not wiped quickly and has time to set, the water-based stain will soften the glue size and grab. A better conditioner for water-based stains is a washcoat of shellac. Thinned finishes and the manufactured stain controllers (with the exception of shellac) are best confined to those woods with less risk of blotching.

For woods most prone to blotching, shellac and glue size are the best insurance of an even stain. On large pieces it is hard to brush on glue size evenly and be certain that you haven't missed a bit—a better method would be to spray it. The main drawback of sanding to control stain is the time involved. If you have spray equipment, layering mist coats of stain or tinted lacquer give you the most control in the least amount of time. □

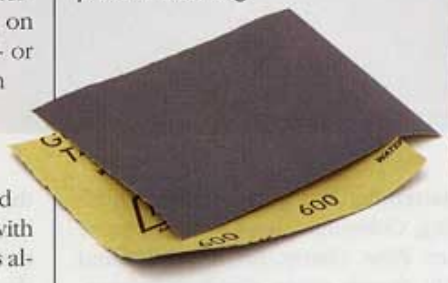
OVER-THE-COUNTER STAIN CONTROLLERS

Each of these ready-made stain controllers suits different needs. Glue size is best on end grain; a water-based controller suits water-based stains; and an oil-based controller is for oil-based stains.

SPRAYING AND FINE SANDING

Spraying is the quickest form of stain control. *Light mist coats of stain will lay on the surface without penetrating or blotching. Simply apply additional coats until the desired color is obtained.*

Sanding is another alternative. *Six-hundred-grit sandpaper polishes the wood, leaving a surface that won't absorb stain so easily or be prone to blotching.*



Anniversary Desk

Twenty-five years ago, shortly after John and Nancy were married, they bought a country-style ladies desk (left) at auction. The piece held great memories for the two of them, but after seeing Ted

Blachly's work at an annual exhibit held by the New Hampshire Furniture Masters Association, John decided that an updated, more elegant piece would make the perfect 25th-anniversary gift. The couple contacted Blachly, of Warner, N.H., who worked closely with them to create the design for a new desk. "They were kind people with a keen sense of design," said Blachly. He had just begun working on the piece when John unexpectedly suffered a heart attack and died. The project was put on hold for several months until Nancy asked Ted if he would continue the work. "That was what John would have wanted," she said. Eight months later, Blachly delivered this personalized desk made of figured mahogany with a blistered-maple interior. It features three small drawers below, with a silver-heart inlay (above) in the center drawer.

Photos (clockwise from top left): Charley Freiberg; Dean Powell Photography; Charley Freiberg; courtesy of Ted Blachly