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Fine WoodWorking

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READER SERVICE NO. 134

Fine WoodWorking®

DEPARTMENTS

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On the Cover:
Portland, Ore., furniture-maker Gary Rogowski with a mahogany sideboard he designed and built in the style of Charles and Henry Greene. Construction starts with the carcase, p. 36. Photo: Jim Piper

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Bandsaw follow-up—Robert Vaughan's bandsaw tune-up article (*FWW* #124, pp. 76-80) is the most illogical article I've read in *Fine Woodworking* since becoming a charter subscriber more than 20 years ago.

Mr. Vaughan's technique is to align the blade to the guide post, which may require a lot of work. Because he starts off with the wrong premise, his suggestions virtually guarantee poor performance with the wide blade required for ripping or resawing. All tune-up articles start with a reference point and the place to begin with the bandsaw is not the guide post. That is usually the last thing adjusted.

The standard approach used by American bandsaw manufacturers is to control the blade with a pronounced crown on the top wheel. The wheel is angled to position the blade in the middle of the tire. This approach is very easy to do and works with blades ¼ in. and smaller, even if the wheels are twisted or misaligned. These smaller blades are flexible and tolerate wheel misalignment. The downfall of the saws with the pronounced crown is that it is much harder to track a wide blade for resawing.

My technique was first published in the *Band Saw Handbook* (Sterling, 1989). The wheels are aligned (coplanar) with the widest blade used on the saw under normal tension. Wide blades are tracked without tilting the top wheel, but ¼-in. blades and smaller are center tracked in the usual way. This technique is easy to do and provides good performance for every type of saw and blade width.

The best solutions are often the simplest ones. Mr. Vaughan's article is misguided and overly complicated.

—Mark Duginske, Merrill, Wis.

ROBERT VAUGHAN REPLIES: There is no reason to perpetuate mechanical folklore as if it were fact. Mr. Duginske may think that aligning the blade to the guide post is wrong, but he doesn't give any reasons why this approach guarantees poor results. I've read the information he refers to and found that it simply is not effective. There was, however, an inconsistency in my discussion about lining up bandsaw wheels. The article would have been better had it said wheels "should be" in parallel planes, not "must be."

An undeserved slam—I was particularly disappointed by Robert Vaughan's flip comment about "plastic guide blocks" in his article on bandsaw tune-ups. It seems like a slam at all non-traditional, non-metal blocks.

Cool Blocks pioneered an alternative to traditional soft steel guide blocks. Many tens of thousands of sets of Cool Blocks are in use.

Cool Blocks are not plastic. They are made of a graphite-impregnated, canvas-based phenolic. They have, however, attracted a number of copycats that are not the same at all. Cool Blocks are patented as a product. These supposed clones are inferior, as users often quickly discover.

—Garretson W. Chinn, Garrett Wade, New York, N.Y.

What about the Sears saw?—Just a quick question regarding the review of contractor's tablesaws (*FWW* #123, pp. 54-61). Good article, although I wish it were twice as long and informative. It was useful, nevertheless, because I am in the

Writing an article

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market for one. The timing was perfect.

Would it not have been useful to include the best of the Sears-Craftsman line as a benchmark for value, even if its quality has eroded over the years? The company has a saw and fence that lists for $800. It would have been an interesting and informative comparison.

It would appear from your article that the Jet saw is a well-calibrated and finished saw at this level of manufacture. I called Ryobi asking about the problem with its underpowered, "non-rated" motor, and the company said it is a 3-hp motor (no-load, undoubtedly). Sounds like a very nice product with a weak heart.

—Seymour Remen, Ann Arbor, Mich.

EDITOR REPLIES: We tried to include a Sears tablesaw in the review, but the company was phasing out one model and didn't have its new one ready at the time. Emerson Electric, which makes the saws, has since shipped us one. We'll let you know what we find.

Another way to joint boards—In reference to your article "An Edge-Jointing Primer" (*FWW* #124, pp. 46-51), there is a third method that is simple and almost always produces superb results.

I use my router with a ⅝-in., carbide cutter with a top bearing and metal straight edge as a guide. I adjust the router speed depending on the type of wood and the direction of the grain.

—Walter H. Prince, Windsor, Ont., Canada

First rule: Make it reversible—I was somewhat distressed to read Garrett Hack's suggestions for reattaching brass inlay (*FWW* #123, pp. 18, 20). He recommends (correctly) using a flexible adhesive for resecuring the brass into the inlay groove. He then suggests a slow-set epoxy, which cures by chemical reaction into a tough, non-reversible medium. This method does not provide the required degree of flexibility, and should never be seriously considered for repairs to antique furniture. Reversibility should be the first priority.

A better solution would be to use a modified hide glue. A mail-order supply of hide glue will typically be of 251-gram strength. This can be mixed in a 2:1 ratio by weight with water. A small percentage of glycerol (glycerin) can be added to the warm solution (about 5% to 10% maximum, by weight, to dry weight of glue solids) to plasticize the glue film and add flexibility without compromising film strength. This will allow movement of the wood under the metal while still maintaining a glue bond. A more brittle glue film will typically fail.

For additional open time, a small proportion (about 1 tablespoon per ½ pint) of either urea or table salt (sodium chloride) can be added to the warmed glue as a gel suppressant. This method is fully reversible and, while not foolproof, will allow future treatment as needed. Epoxy will not.

—Tim McCall-Judson, Asheville, N.C.

Building guitars *is* time-consuming—I was delighted to read the "First Person" article "Building a guitar" (*FWW* #123, p. 122). I, too, have been badly bitten by the guitar building bug and was coincidentally in the process of applying the final French polish touch-ups to my first classical guitar when I read the article.

To put it mildly, the craft elevates one's natural tool and material addictions to an alarming height. With the exception of food and other bare essentials, I completely stopped purchasing anything that was not tool related for an entire year!

I am in the process of planning my next classical instrument and expect to begin construction this month. After all, I must put all my fine tools and special clamps back to work. At this point, I do not claim the title of luthier, but I wear the holes in my shoes proudly. Who knows, 10 guitars from now, I may reach the level of perfection that entitles one to this badge of woodworking honor.

—Bert Heinzelman, Tenafly, N.J.

Don't forget the safety goggles—The article about bleaching wood (*FWW* #124, pp. 62-65) is missing an extremely important safety warning. Mr. Jewitt mentions wearing safety glasses, but no one should use hydrogen peroxide without at least wearing goggles. It's not clear what strength of peroxide he was using, but above a strength of 30% or so, peroxide blinds permanently. Washing it out will not help, and doctors can do absolutely nothing to help patients regain their sight.

In addition, sodium hydroxide (also know as caustic) will dissolve the lipids that make up the cornea and other parts of the eye. You have more time to wash it out, but losing sight is also a distinct possibility. Please, always wear goggles when using these chemicals, not just glasses, and consider wearing a face shield. *—David W. Norman, Wilton, Maine*

Bronze mallets are fine, for metal—With reference to David Calvo's letter about the bronze mallets he sells (*FWW*

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#124, p. 8), I also like a well-controlled and weighty impact. However, when the weighty hammer is applied to the end grain of a wooden chisel handle, the handle will be damaged. People are amazed at my chisels—their beautiful handles are decades old because they have only been hit with wooden mallets.

The only carvers I have seen using metal mallets were in Asian countries like Japan and China. You will notice that Asian chisels have metal protection rings around the top, the alternative being the liberal use of duct tape. Metal hammers should be used on metal tools, like stone carving chisels. I can recommend Mr. Calvo's well-crafted mallets for stone lettering because I bought one myself for that very purpose.

—Ian Agrell, San Francisco, Calif.

Burning wood is just a waste—I was disappointed to see an article like "Build it, and then burn it" in *Fine Woodworking* (*FWW* #124, p. 112). After all of the articles about the depletion of the forests, I am very aware of wasting any kind of wood. Today it is exotic woods that are being lost. Tomorrow it may be any kind of wood. The article didn't mention what kind of wood was used, but to a woodworker who saves scraps for future use to avoid waste, the thought of destroying it just for the fun of it was disgusting. We all did destructive things as children, but we grew up.

—Shirley Weismann, Rolling Meadows, Ill.

How *not* to repair furniture—The increasing use of auto-body filler in furniture fills me with great dismay. As a retired cabinetmaker and restorer with some 54 years experience, I find this practice is typical of those who are incapable of recarving, remaking joints or repairing frames in wood. These people should not be allowed to ruin furniture in this way and destroy the heritage of these pieces.

Diane Welebit was correct in her advice about getting furniture ready for reupholstering (*FWW* #123, p. 20). Another method I was taught as an apprentice is to coat the damaged areas with slightly diluted Scotch [hide] glue, rubbing it well into the holes. Cut hessian or calico into strips to suit the shapes, soak in hot water and wring out. Press the strips to the pre-glued frame, and apply further hot glue to penetrate thoroughly, wiping off the surplus with a wet cloth. Let it dry for 24 hours. It will dry rock hard and take tacks or staples without a problem.

Note that this method only works with Scotch glue. Calico can be used where frames and tacking strips are thin or delicate in the same way and will give the same results.

—Peter V. Coxall, West Sussex, England

Violin market isn't all bad—In regard to your article on violin restoration (*FWW* #122, pp. 90-93), I enjoyed reading something about our rather obscure art in your magazine. Most people don't even know that this aspect of fine woodworking exists.

I was a bit appalled to read Neil Hendricks' response to the article (*FWW* #123, p. 6). Evidently, he has eaten a sour grape, or he fails to understand the basis of violin restoration. The exactness and precision of the craft are perhaps unsurpassed.

The somewhat generic references to wildly inflated prices, fraud and scam seem to reflect a limited knowledge of what drives the violin market. These "inflated prices" are what people are willing to pay for the art value of an original masterpiece. Art and antique value are largely the driving force behind escalating prices of precious instruments.

Mr. Hendricks seems to imply that restoration destroys or at least takes something away from the original masterwork. Unfortunately, inept repairmen have done inalterable damage to some precious instruments, but this is not restoration.

—Rodger A. Stearns, Canton, Ohio

It works for me—I have read and enjoyed all the letters about *Fine Woodworking*. They are better than the annual *Sports Illustrated* swimsuit issue.

When I was 4 or 5 years old, I first noticed my grandfather's lathe. I begged him for almost 20 years to teach me how to use it, with no luck. A year before he died, he gave it to me saying, "You have it. And you'll need this (a 1940s Porter-Cable router), too." That was it.

Five years ago, while helping my mom's sister pack, I came across a Bailey plane and a small toolbox with a set of mid-19th-century Buck Brothers chisels. "You see what you can do with them," she said. "They must have been my great-grandfather's. If you don't want them, I'll put them up in the tag sale." I took them.

I do not make money at woodworking, nor do I have the time or money to take a few weeks to take a series of full-time classes or to go to the North Bennet Street School for several years. I turn to you. You've taught me how to take a tree and make a table, a china cabinet or just a lot of shavings with that jointer, my other hand tools and a small tablesaw. You've taught me how to read the grain after I taught myself what tearout was. You have taught me what is so special about the Krenov, Stickley and Goddard styles. You've taught me what to look for in woodworking equipment when I can afford to upgrade.

Readers who have been taught in school or grew up with a woodworker cannot appreciate what someone like me gets out of your magazine. I just wanted to say, "keep it up and thanks."

—David Blake, North Attleborough, Mass.

Errata—A review of the Freud 10-in. Teflon-coated combination blade (*FWW* #124, p. 96) misstated its price. The blade sells for a discounted price of about $62. The price quoted in the article was for the non-coated version.

As several readers pointed out, we erred in describing how to lay out a five-pointed star (*FWW* #124, pp. 30, 32). Start with a radius of 4¼ in., not 4½ in.

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.

—Scott Gibson, editor

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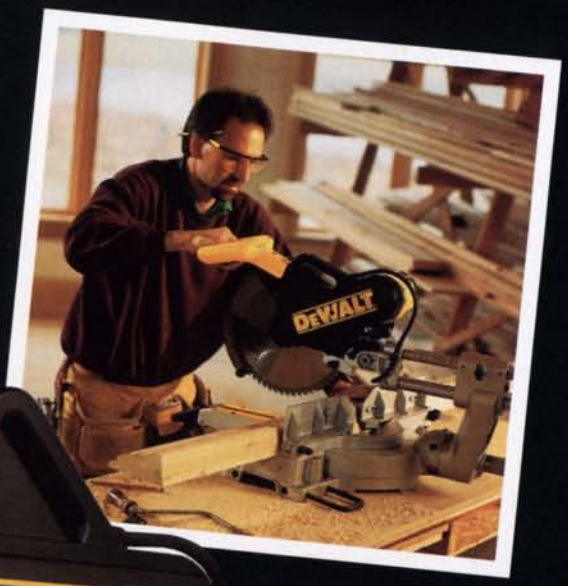

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Making tapered octagonal bedposts

I would like to build a pencil-post bed. I have limited tools and experience. What's the best method of cutting the tapered octagonal posts for one of these beds? —James Brehm, Myrtle Beach, S.C.

Chris Becksvoort replies: There are a number of ways to make tapered octagonal bedposts. Because I make quite a few pencil-post beds, I've developed a jig for the tablesaw to speed the operation. With just a bandsaw, plane and chisel, however, you could still make these posts quite efficiently.

The process has three main steps: tapering the post blank, chamfering each of the corners to create a tapered octagon with identical facets, and cleaning up the transition between these chamfered facets and the straight part of the leg where the rails intersect it (see the drawing).

Lay out the basic taper first. You can make a pattern and trace it onto the bedpost blank, or simply lay out the taper directly on the blank. For the 80-in. posts I use, the pattern tapers from 2⅝ in. (the dimension of the blank) to 1¼ in. at the top and to 1½ in. at the bottom.

Bandsaw tapers on opposite sides, and flip the post 90° and repeat. Run the four bandsawn sides (both upper and lower) over the jointer (or plane them by hand) to give a smooth four-sided tapered post. Next lay out an octagon on the top and bottom of the post (see the drawing). Also mark where the octagonal facets end at the square part of the bedpost. Draw lines to connect these layout marks with the corners of the octagons at the top and bottom. Use a block plane to create the chamfers, starting an inch or two from the square portion of the post, working with the grain.

The transition into the square section can be carved with a chisel, drawknife or spokeshave and then cleaned up with a scraper and sandpaper. I use the nose of a belt sander for this job, but I wouldn't recommend trying it on a first project. (For a thorough description of how to build a pencil-post bed, see *FWW* #76, pp. 32-37.)

[Chris Becksvoort builds custom furniture in New Gloucester, Maine. He is a contributing editor to *Fine Woodworking* and is currently working on a book on Shaker furniture.]

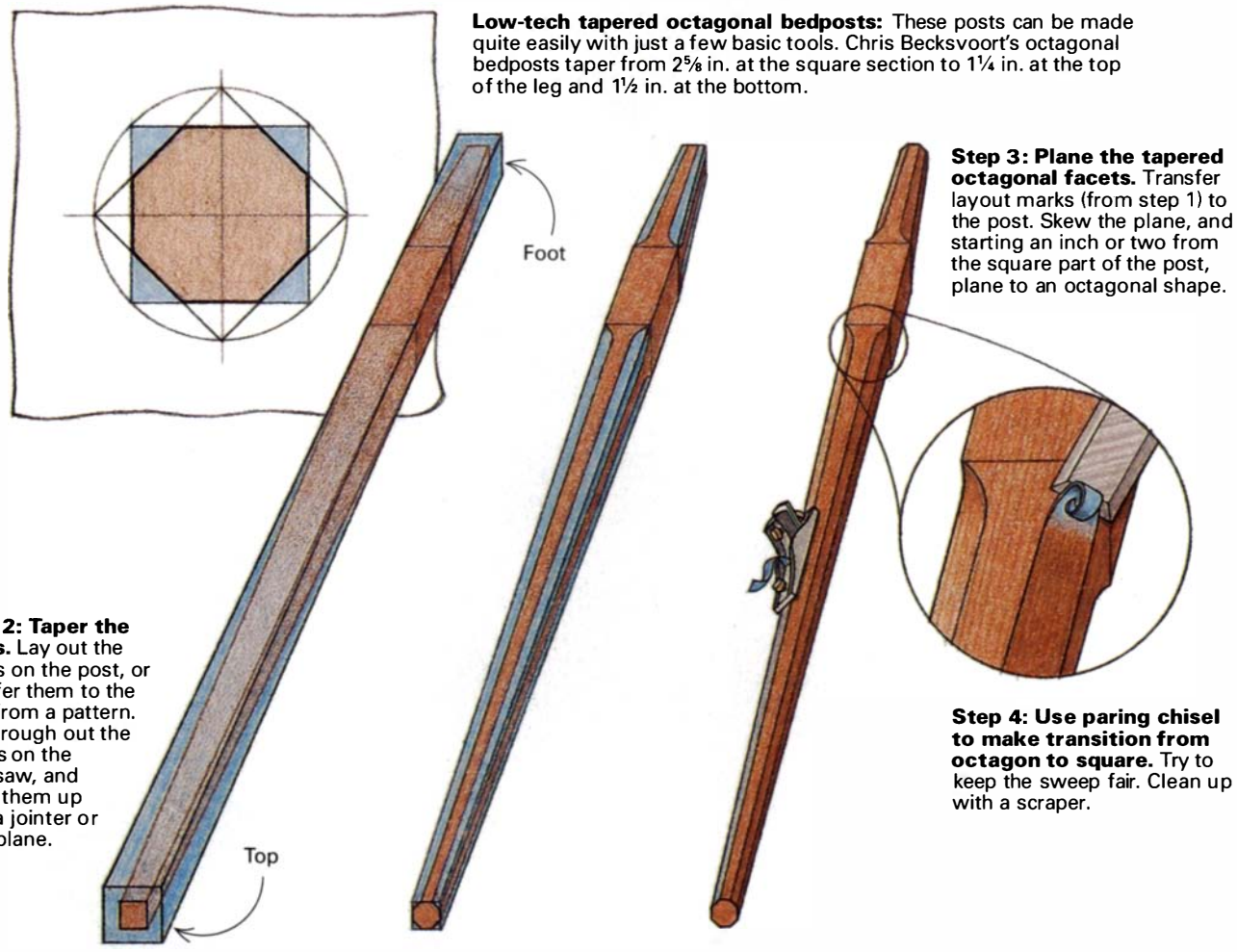
Replacing cord on a bowsaw

I recently found occasion to use my new bowsaw, after several months of unassembled storage. However, after 30 minutes of intermittent use, the tension cord frayed and snapped. What should I replace the old cord with? Do you know what Tage Frid uses for his bowsaw?

—Kevin Waddell, Lawrence, Kan.

Vincent Laurence replies: I called the Rhode Island School of Design, where Tage Frid used to teach, to find out what he used for cord on his bowsaw. Roseanne Somerson, director of their

Low-tech tapered octagonal bedposts: These posts can be made quite easily with just a few basic tools. Chris Becksvoort's octagonal bedposts taper from 2⅝ in. at the square section to 1¼ in. at the top of the leg and 1½ in. at the bottom.



Step 1: Lay out the octagons. Draw a square the size of the post's footprint (in blue at right), bisect it horizontally and vertically and circumscribe the square with a circle. To create an octagon, connect the points where the bisecting lines pass through the circle.

Step 2: Taper the posts. Lay out the tapers on the post, or transfer them to the post from a pattern. Then rough out the tapers on the bandsaw, and clean them up with a jointer or handplane.

Step 3: Plane the tapered octagonal facets. Transfer layout marks (from step 1) to the post. Skew the plane, and starting an inch or two from the square part of the post, plane to an octagonal shape.

Step 4: Use paring chisel to make transition from octagon to square. Try to keep the sweep fair. Clean up with a scraper.

furniture design program and a former student of Frid's, said Frid used natural gut. That's the same material traditionally used to string tennis racquets.

A call to a local tennis club revealed that enough gut for a racquet is a little pricey—about $40. I don't think you'd need that much, but that's how it's sold.

Somerson also said that jute could be used, and I suspect that even braided nylon cord would do the job.

[Vincent Laurence is an associate editor of *Fine Woodworking*.]

From logs to lumber

I have a standing, dead red oak on my property that's straight, about 24 in. dia. and about 40 ft. tall. I'd like to harvest the tree for use in my shop, but I'm not sure how. Can I have it rough-cut into planks right away, or should I leave it in logs to season? If so, do I need to cover the ends with preservative? Any advice would be appreciated.

—Jeff Schmaling, Libertyville, Ill.

This winter, a neighbor let me harvest a black walnut tree he wanted removed. I sawed it down, hauled it home and sealed the ends with hot wax. What do I do now? My current plan is to slice it myself with a chainsaw milling attachment. Should I do this as soon as possible, or let the log age for a while? My first thought is to slice it into 8/4 slabs to cure. Is 8/4 the optimum thickness? The projects I have in mind for this wood will use boards no thicker than 3/4 in., and I may want to slice some of it into veneer. I have tools to resaw and mill rough lumber up to 12 in. wide. After slicing it into slabs, should I rip it into 12 in. widths as soon as possible or let the rough slabs cure? How should I dry the boards? ***—John Norris, San Jose, Calif.***

Redmond Manierre replies: Logs are perishable commodities, and warm weather, bugs and humidity can cause deterioration very quickly. The rate of degradation varies greatly from species to species, even from log to log depending on storage conditions.

I have never had much luck sawing red oak that's been dead on the stump for more than a few months. The sapwood breaks down rapidly as microorganisms feast on the sugars, and the dead tree becomes susceptible to insect infestation. If you see fungal growth on the side or ends of the log, the decay inside is quite advanced.

Even so, sapwood can be edged off at the mill, rotten parts can be trimmed away and even an insect-infested pile of lumber can be fumigated. You just have to ask yourself, "Is this lumber worth it?"

Unlike red oak, black walnut trees that are dead on the stump may remain in near perfect condition for years and often gain a rich reddish-brown color. A friend of mine who built a house on his family's farm in Maryland told me about a walnut tree that he sawed for paneling in his den. It had been standing dead in the middle of a field for at least 10 years before finally falling over. His father dragged it to the edge of the woods with a tractor and left it in the shade where it lay for another 15 years before being sawed into boards. The bark and sapwood had completely rotted away, but the heartwood was as good as the day the tree had fallen.

Regardless of the species, seal the ends of a log as soon as the tree is felled to prevent excessive checking. I use Anchorseal, a wax emulsion paint (U-C Coatings; 888-363-2628).

Chainsaw mills consume an incredible amount of wood with each pass, so I recommend calling Wood-Mizer Products (800-553-0182), a company that manufactures bandsaw mills. The company may be able to provide referrals to local sawyers who own their mills. A bandsaw mill will yield up to a third more lumber from a given log than a chainsaw or circular saw mill.

Your next decision is how to have the wood sawn. You basically have three choices: sawing for grade, quartersawing and flitchsawing.

Sawing for grade involves opening up all four sides of the log and picking the clearest face to saw until it is no longer the clearest. Then you flip the squared log (it's called a cant) to the next best face, saw that face, and so on. Your sawyer will continually look for the highest grade board to pull from the log.

In red and white oak especially, quartersawing reveals a lovely medullary ray flecking. I quartersaw oaks that are reasonably clear and at least 20 in. dia. on the small end of the log.

In flitchsawing, also called sawing through and through or sawing ***en boulle***, the sawyer starts on one side of the log and saws the boards in succession. This might be the best choice for the walnut because there is a considerable premium attached to the wide boards this method produces. If their width exceeds your planer's capacity, you can always find someone with a wider planer, surface them by hand or rip them down when you're ready to use them.

There are two potential problems with cutting stock thick and then resawing it. First, doubling the thickness of a piece increases its drying time by 250%. Second, if you take your boards to a kiln for drying, the likelihood of introducing stresses increases with the thickness of the stock. I suggest sawing the lumber a fat 1/4 in. thicker than your anticipated finished dimension.

Drying is tricky. There's a lot to learn. Two excellent introductory books on the subject are *The Conversion and Seasoning of Wood* by William H. Brown (available from Bailey's Woodsman Supply; 800-322-4539) and *Fine Woodworking on Wood and How to Dry It* (The Taunton Press; 800-888-8286).

[Redmond Manierre owns and operates Landmark Logworks, a small specialty sawmill in The Plains, Va.]

Preventing router bits from burning wood

Recently, I was routing a 3/4-in.-wide, 1/4-in.-deep dado in mahogany. After routing about half the dado, I smelled wood burning, yet the dado was clean with no sign of scorching. The sawdust, however, looked like it had been sprinkled with black pepper. Several spots about 1/16 in. to 1/8 in. dia. began to glow, so I rushed to get a pan of water, which took about 45 seconds. When I returned, the spots were glowing rings about the size of a quarter. The water quenched the burning sawdust, but I was shaken by the thought of what could have happened. As for the router bit, only the tip of one edge was a little brown. What happened?

—Frederick Eckart, Hatley, Wis.

Jeff Greef replies: Several things can cause burning with a router bit. A dull bit

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causes friction as it rubs against the wood because the cutting tip is rounded and no longer shaves a clean slice. This is more common with steel bits, though, than with carbide.

Moving too slowly through the wood—even if the bit is sharp—also can cause burning because the bit has time to heat the wood to its burning point. Last, if you try to take too deep a cut, chips may clog around the bit and heat up as they rub against each other, the bit and the wood. Burning is a possibility.

I would only rout a ¼-in.-deep, ¾-in.-wide dado or groove in one pass with a 3-hp router. A router this powerful will let you plow through the wood at a speed that will avoid burning. Even so, when making such cuts, it's best to make them in several passes or to hog out the bulk first with a dado cutter on the tablesaw. Plow the dado on the tablesaw to within 1/16 in. of its final depth, and then use a sharp router bit to clean up the cut and take it to depth.

[Jeff Greef is a writer and woodworker in Davenport, Calif.]

Aromatic cedar prevents varnish from drying

Recently, I used varnish to finish a cherry blanket chest I made for my son and his wife. I let the finish dry for 10 days before delivery. The case and a lift-out tray were lined with cedar, which I left unfinished.

A few weeks after delivery, I got a call. The underside of the lid, as well as the cherry tray itself, had become sticky. I called the finish manufacturer and was told that they were familiar with this problem. Evidently, the cedar aroma contains a solvent that prevents varnish from curing.

I was instructed to take the lid off, let it dry in the sun for a day, then seal it with a coat of shellac. For the tray, the advice was to strip it and refinish with shellac. I'd like a second opinion.

—Phil Sharman, Annandale, Va.

Chris Minick replies: Aromatic cedar contains several chemicals that are harmful to many common finishes. Among these are chemicals used for paint stripping and others that have been used as plasticizers for nitrocellulose and acrylic finishes. A plasticizer can be thought of as a slow-evaporating solvent. They are added to finish formulations to increase the flexibility of hard or brittle resins. As you might expect, too much plasticizer in the system will cause any finish film to become sticky. This is what happened to your blanket chest. One of the plasticizers (2-hydroxycamphene, the chemical that makes cedar smell like cedar) vaporized and was absorbed into the finish film, turning it into a sticky mess.

Shellac may have been a better choice for your chest because it's one of the most readily available plasticizer-resistant finishes. Plasticizer-resistant does not mean, however, plasticizer-impervious. Even shellac will become sticky when exposed to cedar vapors for a long time. Perhaps the best choice for this hostile environment would be a good-quality paste wax. Sand the raw wood to 400-grit or finer, and then apply a few coats of paste wax. Most waxes are immune to the ravages of cedar vapors but require periodic renewal to maintain that finished look. I've found when it comes to aromatic cedar, the best strategy is avoidance, I don't finish the inside at all. No finish, no problem.

[Chris Minick is a finish chemist and amateur woodworker in Stillwater, Minn. He is a contributing editor to *Fine Woodworking*.]

Identifying a finish on store furniture

I've noticed a fairly thick, transparent finish on tabletops and dressers in many furniture stores. I'd be interested in finding out what it is.

—Edward Mullikin, Roanoke, Va.

Chris Minick replies: Identifying a finish without seeing the piece of furniture is sort of like performing surgery blindfolded: You take a stab and hope for the best. The finish used on production furniture depends on the quality of the furniture, country of origin, the manufacturer, type of furniture, intended final use and many other variables. Therefore, the only correct answer to your question is, it depends. That said, I suspect the finish you describe is a high-solids, two-part polyester finish. This type of finish is common on low-end production furniture. As a rule, if you can see the finish on a piece of furniture, you're looking at low-end furniture.

Two-part polyester finishes are available from distributors who sell to professional cabinet and furniture shops. These finishes are not suitable for home workshops. They generally require specialized spray equipment as well as curing and drying ovens. A code-compliant, industrial spray booth is also required to spray these finishes. Without this equipment, you can't use this finish.

Looking for *Der Möbel Bau*

In the article "Woodworking Libraries" (FWW #121), Alphonse Mattia mentions the book Der Möbel Bau ***by Fritz Spannagel. I have looked in several book shops in Austria and Germany for this book, but no one seems to have a copy or to know of it. I would very much like to obtain a copy. Can you help me locate a source for this book or point me in the right direction? No U.S. book dealer—not even on the Internet—has a listing of books published in German.***

—Gary Shouse

Vincent Laurence replies: Since publishing that article, we've received a number of requests for information on *Der Möbel Bau*. Fortunately, one of our contributing editors, Chris Becksvoort, has family in Germany and was able to get a copy of the book. He passed this publishing information on to us. *Der Möbel Bau*, written by Fritz Spannagel, is published by Th. Schafer GmbH. The publisher can be reached at the following address: Verlag, Th. Schafer GmbH, Postfach 54 69, 30054 Hannover, Germany. It was originally published in 1954 and was revised and reprinted in 1995. The ISBN is 3-88746-062-6.

Homemade tack rags

Most of my finishing is done with spray varnish, and over the years I've used up thousands of tack cloths. My brother recently told me I could salvage the cheesecloth and make my own. Of course, he couldn't recall just how to do this. I've tried a few methods, but they've either not worked well or left a residue. Maybe you can enlighten those of us who sand enough to leave dust—unlike my brother!—Patrick Bates, Irving, Texas

Jeff Jewitt replies: I've experimented with different recipes for making tack

rags over the years and have used everything from linseed oil to varnish to make sticky rags that pick up dust. The recipe below is what I use now and comes pretty close to the commercial rags sold in paint stores.

Dissolve 2 to 3 oz. of rosin in 1 qt. of denatured alcohol. Rosin is available from Olde Mill Cabinet Shoppe (717-755-8884). Take some cheesecloth or other type of lint-free, loose-weave cotton cloth and squirt a few thimblefuls of the dissolved rosin solution onto the cloth. Work it into the rag with your hands. Fold the cloth and store in a resealable plastic bag to keep it from drying out.

[Jeff Jewitt builds, restores and conserves furniture in North Royalton, Ohio.]

Should antique furniture be "fed" linseed oil?

I have an old book written by Thomas H. Ormsbee and published in 1949 called Care and Repair of Antiques. ***In it, the author advises that old furniture be "fed" raw linseed oil to renew the supposedly dried out wood. Is this practice still recommended?***

—Bruce Philips, Columbia, S.C.

Jeff Jewitt replies: Using linseed oil to restore old finishes caught on in the 1940s. Although there were slight variations, the process involved applying linseed oil thinned with turpentine (and sometimes vinegar) to old finishes and letting the mixture stand. The process caused crazed, brittle and flaking finishes to become bright and new-looking again.

In the 1970s, furniture conservators realized that this treatment could cause serious problems. Furniture in several major collections had become very dark. The surfaces were sticky. The culprit was the linseed oil.

Though linseed oil can be an attractive finish when used on new, unfinished wood, it is not recommended for use over film-forming finishes such as shellac, lacquer or varnish.

Linseed oil dries to a soft, gummy film on surfaces that it can't penetrate and becomes a dust and dirt magnet. It darkens considerably, and research has shown that it does so even more in the absence of light. But worst of all, it eventually polymerizes and bonds to the original finish, becoming impossible to remove without destroying the original finish. This makes it unsuitable for use in conservation.

Most old finishes can be given a face-lift by cleaning them. Old film finishes like lacquer, shellac or varnish can be wiped gently with mineral spirits and then given a fresh coat of furniture paste wax. This simple procedure will do wonders for most old furniture. For a more detailed explanation of cleaning antique furniture, see the article "The Finish Crack'd" reprinted in *Best of Fine Woodworking: Finishes and Finishing Techniques* (The Taunton Press; 800-888-8286).

Do you have a question you'd like us to consider for the column? Send it to Questions & Answers, Fine Woodworking, *P.O. Box 5506, Newtown, CT 06470-5506.*

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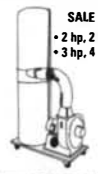

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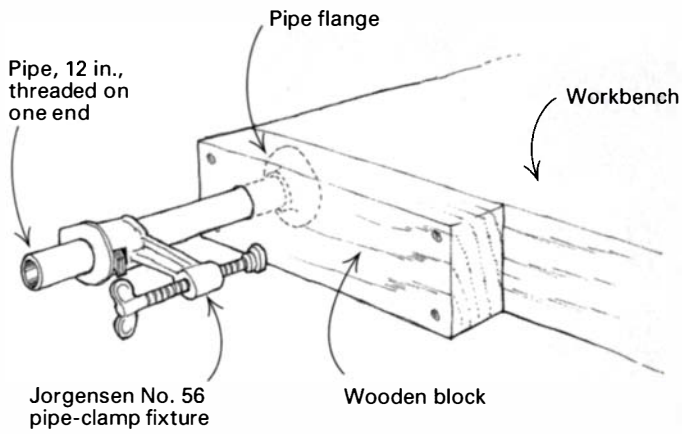
edited and drawn by Jim Richey

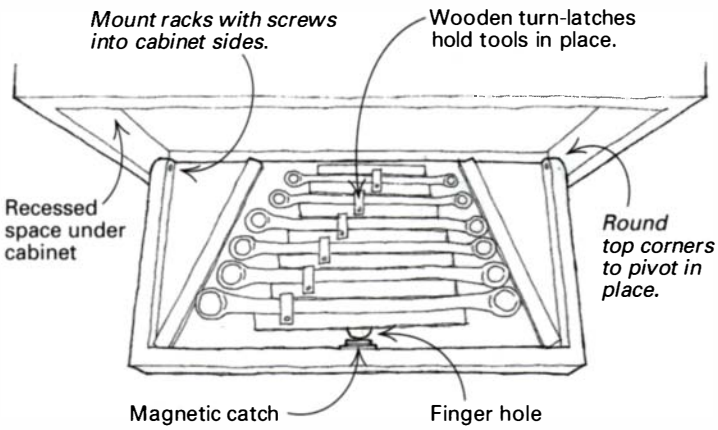
Inexpensive bench vise



This inexpensive substitute for a left-handed workbench vise allows you to clamp a panel all the way to the floor, if necessary. It has no guide rods or screws to interfere with a vertical workpiece, as with a metal vise. It probably doesn't match the quality of a left-handed vise from a top-end woodworking bench, but it is surprisingly useful and easy to build.

To make the vise, first secure a pipe flange to the bench edge. Use long screws because the vise exerts a lot of pressure. Fit a 2-in.-thick block over the flange, as shown. Screw the block to the workbench. A 12-in. pipe threaded on one end and the movable end from a Jorgensen No. 56 clamp fixture complete the assembly. If desired, you can attach a wooden block to the end of the clamp screw pad to gain more surface area and even out pressure. Take care not to walk into the pipe. *—Anthony Guidice, St. Louis, Mo.*

Fold-away tool racks

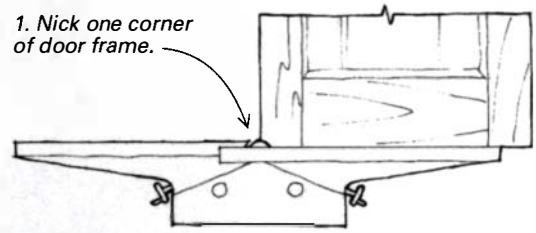


Upper kitchen cabinets are usually constructed with a 2-in. or so recess in the bottom. When I built cabinets for my workshop, I used this space to install pull-down tool racks. The racks are ideal for holding relatively thin and commonly used tools, such as chisels, wrenches and screwdrivers.

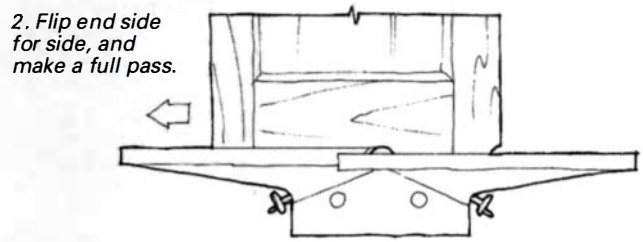
Pin the back corners of the rack to the cabinet sides with wood screws, and shape a radius on the top corners to allow clearance for the racks to pivot. Bore a finger hole to open the racks, and install a magnetic catch to keep them closed when not in use. Hold the tools in place with suitably spaced strips of wood and wooden turn-latches.

I'm in the habit of closing the racks when all the tools in the set have been returned. So an extra bonus is seeing at a glance if any tool has been misplaced. *—Adrian Jones, Youngsville, N.C.*

Avoiding end-grain tearout



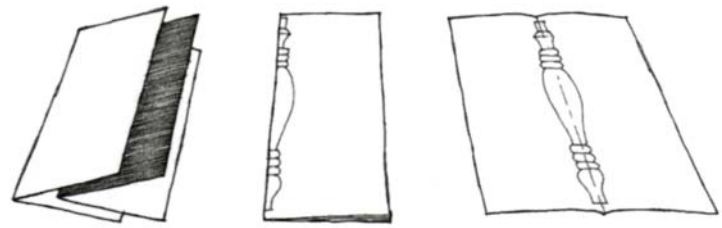
(Depth of cut exaggerated for illustration)



In our sash and door shop, we use a jointer to clean up top and bottom edges of frame-and-panel doors. To avoid end-grain tearout, nick approximately ¼ in. of one corner of the end-grain edge at the jointer setting to be used. Then flip the piece, side for side, and make a full pass along the edge. After the end-grain sections are jointed, you can joint the long edges with the grain. This sequence will produce crisp corners.

—Chip Minck, La Mesa, Calif.

Symmetrical drawings



Insert carbon paper, ink side out, at fold of drawing paper.

Draw half-image of design pattern.

Open to see full symmetrical pattern.

Here's a simple method for drawing an intricate turning to see what the finished product will look like. It also works great for drawing symmetrical patterns often used in wood carving or scroll

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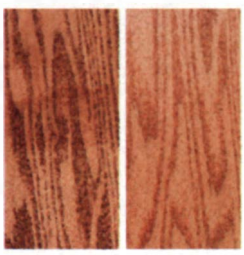
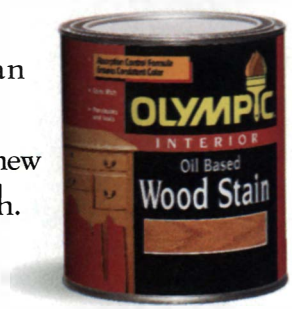


Ordinary stain Olympic



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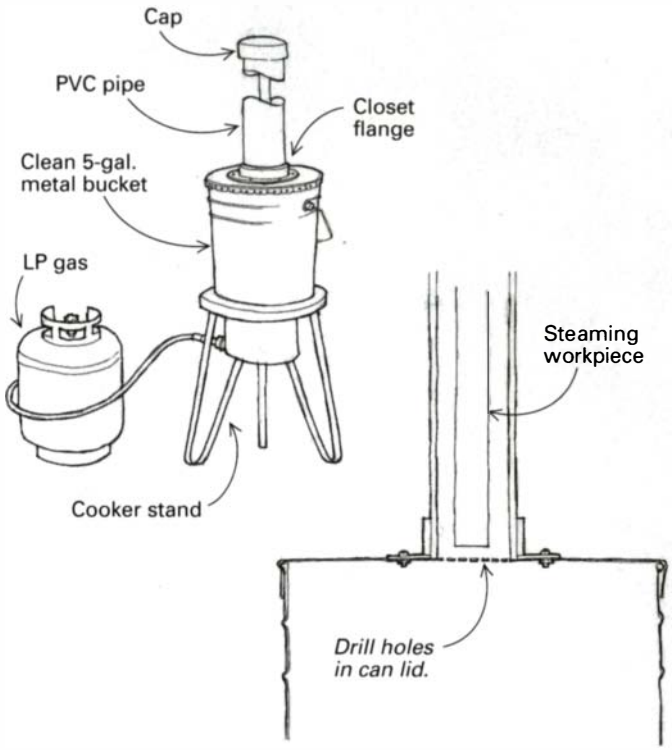
sawing. Fold a piece of paper in half. Insert a folded piece of carbon paper, inked side out. Sketch half of the design on the outside of the folded piece of paper with the fold at the centerline. When you are satisfied with your half-design, remove the carbon paper, and open the folded paper. Your full drawing will appear on the inside. *–John Saggio, Little Neck, N.Y.*

Quick tip: The quickest and easiest way to cut foam upholstery material is with an electric carving knife.

–James B. Lemyre, Saugerties, N.Y.

Making a steambox



This steambox is made with a liquid propane gas cooker, a common 5-gal. metal paint can (scrubbed clean), a closet flange (the plumbing fixture for mounting a toilet onto the floor) and a length of 4-in. PVC pipe. Bolt the metal closet flange to the lid of the can, and drill numerous holes through the lid within the circumference of the collar. Set the PVC pipe on the collar to make a chamber for the wood being steamed. Because I steam mostly chair posts and strips for Shaker boxes, I cut the PVC pipe 48 in. long. But you can vary the length of the tube to suit the workpiece. While the steambox is working, I set a PVC end cap loosely over the tube.

The vertical configuration is quite efficient because it allows the condensed steam to return to the boiler. Chair posts are steamed and ready to bend in about two hours.

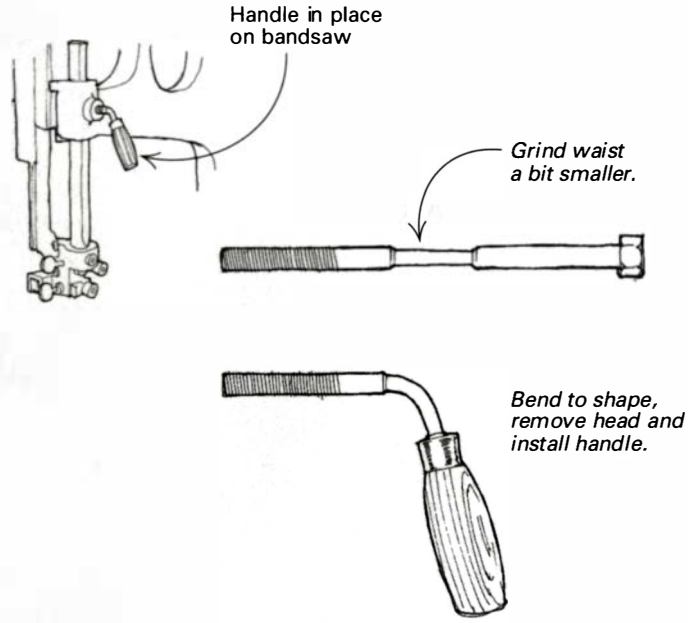
–Thomas A. Heffernan, Shaker Heights, Ohio

Threading wire through a hollow casting

Getting stiff work-light cord through the hollow top casting of older bandsaws is easy. First cover all openings with tape except for the cord input and exit holes. Next put a vacuum cleaner nozzle to one hole and then feed in some string through the other. Eventually, the vacuum will pull the string through. The cord can then be pulled through with the string. The same trick works well for getting any stiff wire through a hollow cavity.

–Robert Vaughan, Roanoke, Va.

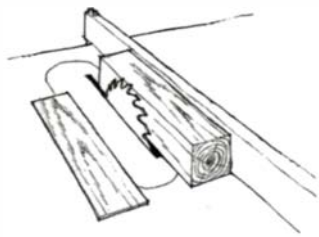
Threaded handle replaces thumbscrew



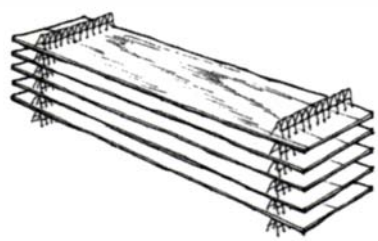
In Ronald Volbrecht's resawing article (*FWW* #122, pp. 74-79), I noticed that he had added Vise-Grip pliers to a thumbscrew to gain additional leverage. A more permanent alternative is to make a handle from a regular ⅜-in.- by 4-in.-long bolt. Grind the waist of the bolt behind the threads a little thinner, and bend the shank into a dogleg angle of 80°or so. The bending will go easier if you first heat the shank with a torch. Cut the head off the bolt, add a nice wooden handle and replace the thumbscrew with the threaded handle. Your Vise-Grips will now be available for other uses.

–Lloyd Litt, Sauble Beach, Ont., Canada

Freeze-drying veneer



Slice 3/32-in. pieces of veneer from squared-up tree branch.



Stack veneer in freezer, separated by hardware cloth stickers.

Here is a great way to make perfectly flat 1/16-in.-thick veneer from fruit tree prunings and other freshly cut local woods. I use this

method to make madrone veneer for the natural keys on harpsichords. Use only the freshest material. The best branches are 3 in. to 4 in. round by 1 ft. long. Square three sides on the jointer, sizing the parallel sides just short of the maximum cut on your tablesaw. You can go thicker if you have a bandsaw. Now cut as many 3/32-in. slices as safety will allow. Brush away the sawdust, and rush the fresh veneer to the nearest frost-free freezer.

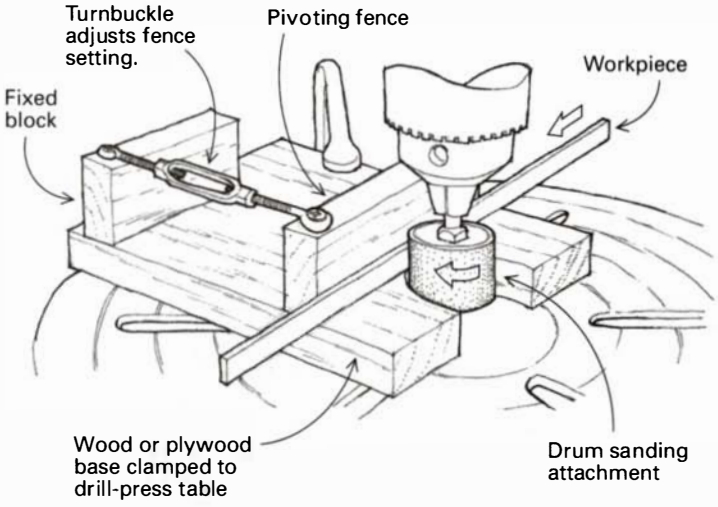
Keep the slices separated (I use stickers made from strips of 1/2-in. hardware cloth to do this), and stack the wood in the freezer. The slices will quickly freeze in the same position as they were cut. Leave the veneer slices in the freezer until they dry, which will take some time—six weeks to three months, depending on the species. To test for dryness, place one slice on the kitchen cabinet overnight. If it twists it's not dry. After you remove the dried veneer from the freezer, stack the pieces between layers of paper towels, and press flat until needed. Slices thicker than 3/32 in. won't work.

—Roger Russell, Anderson Island, Wash.

Quick tip: When spraying small items, I catch the overspray in my wheelbarrow. It keeps the wheelbarrow from rusting and is more environmentally friendly than some of the alternatives.

—Arlo Ames, Albuquerque, N.M.

Thickness sanding on the drill press

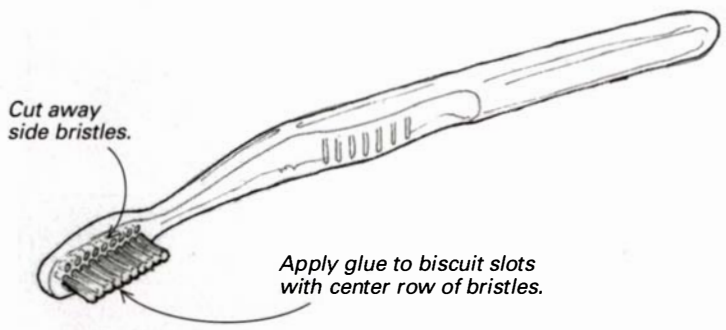


One day when my large thickness sander was down for repairs, I needed to make a length of very thin banding for an antique I was restoring. Within an hour, I had made the drill-press thickness-sanding fixture shown above from scraps around the shop. It works exceptionally well. With it, I can turn out a length of 1/32-in.-thick banding in a minute.

The fixture consists of a plywood base, cut on one edge to receive the sanding drum, and a pivoting fence that adjusts via a small turnbuckle. The other end of the turnbuckle is attached to a fixed block glued to the base. I brushed some shellac on the threads to prevent the turnbuckle from vibrating and turning during use.

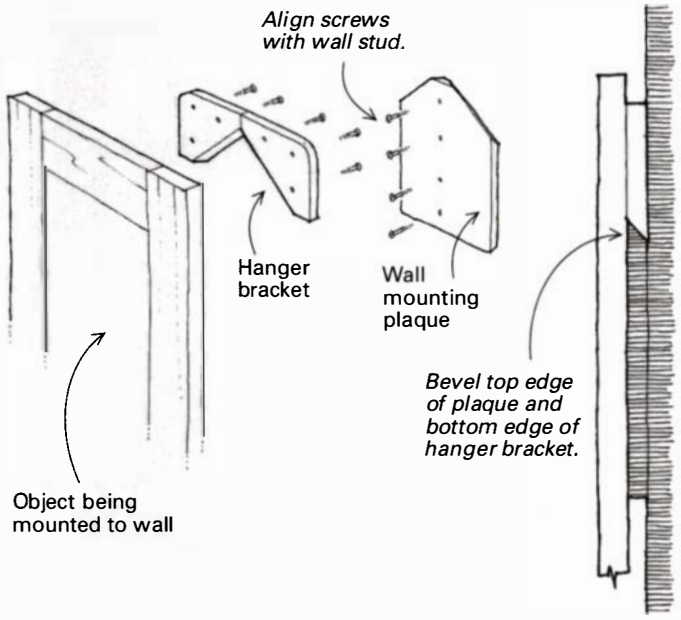
To use the fixture, I cut a rough strip on the tablesaw and feed it against the rotation of the sanding drum with one hand while pulling with the other. The trick is to keep the strip flat against the fence and feed it steadily. I give the turnbuckle a half-turn on each pass until I sand the strip to the proper thickness. The device is safe to use and will sand down a strip of wood to a thickness almost like that of paper. I now use the fixture for making guitar binding and purfling. *—E. Richard Goodall, Salmon Arm, B.C., Canada*

Glue spreader for biscuit slots



To spread glue in biscuit slots, cut off the outside rows of bristles from an old toothbrush, leaving the center bristles intact. This brush works almost as well as those special-purpose biscuit-slot glue bottles. *—Quentin E. Smith, Eugene, Ore.*

Wall-mounted hanging system

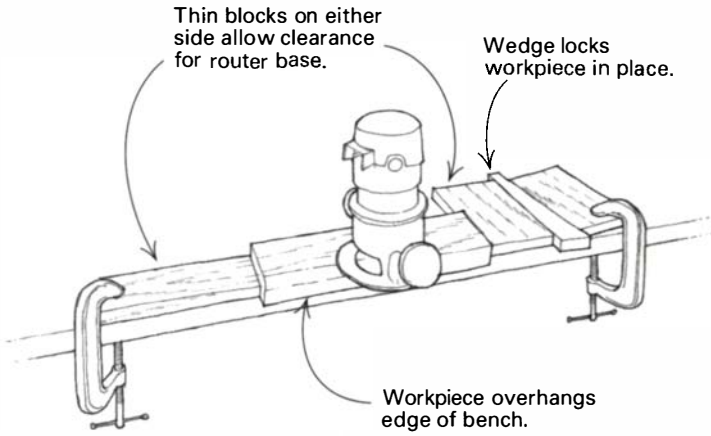


I use this system to mount small cabinets, mirrors and shelves to a wall. With this approach, you can lock the piece securely to the wall and lift it on and off easily. There are two parts, both made of 3/8-in. plywood: a mounting plaque that is screwed to the wall and a hanger bracket that is screwed to the back of the cabinet. Both parts are beveled on the edges where they meet, as shown in the sketch. This system is especially well-suited for mounting into stud walls because all the screws fall in a line along a single stud. Provided the hanger bracket is carefully squared when it is attached to

the cabinet back, plumbing the cabinet is just a matter of placing a level against the wall plaque when you attach it to the wall.

—Tom Svec, Lock Haven, Pa.

Wedge quick-clamp



On many of my projects, I round over the front edges of large numbers of identical pieces of wood, such as shelves. Often the router-bit bearing extends below the bottom edge of the workpiece.

With a simple wedge-clamp system, I can quickly secure a workpiece. The setup allows clearance for the router-bit bearing, and the thinner end blocks on each side of the workpiece allow clearance for the router base. I tap a wedge into place between the end block and an angled wedge block to hold the workpiece in place.

—Jean V. Rensel, Sanborn, N.Y.

Sanding tip for turnings

This may sound backward, but if you apply paste wax to a turning *before* sanding, you'll sand faster and cooler, reduce dust and increase the life of the sandpaper. Apply a generous layer of paste wax to a completed turning, and then start sanding immediately with a piece of 80-grit paper. Yes, the paper will fill with wax and dust, but it will continue to remove wood efficiently. Even those areas of the paper that look hopelessly loaded will continue to cut.

With this method, you get very little airborne dust and the workpiece stays considerably cooler. After sanding with 80-grit, I step through 120-, 220- and on to 400-grit. By the end of the sanding process, most of the wax has been removed and the finishes I use (Waterlox transparent finish or Behlen's Salad Bowl finish) don't seem to be affected.

—Al Vincent, Rochester, N.Y.

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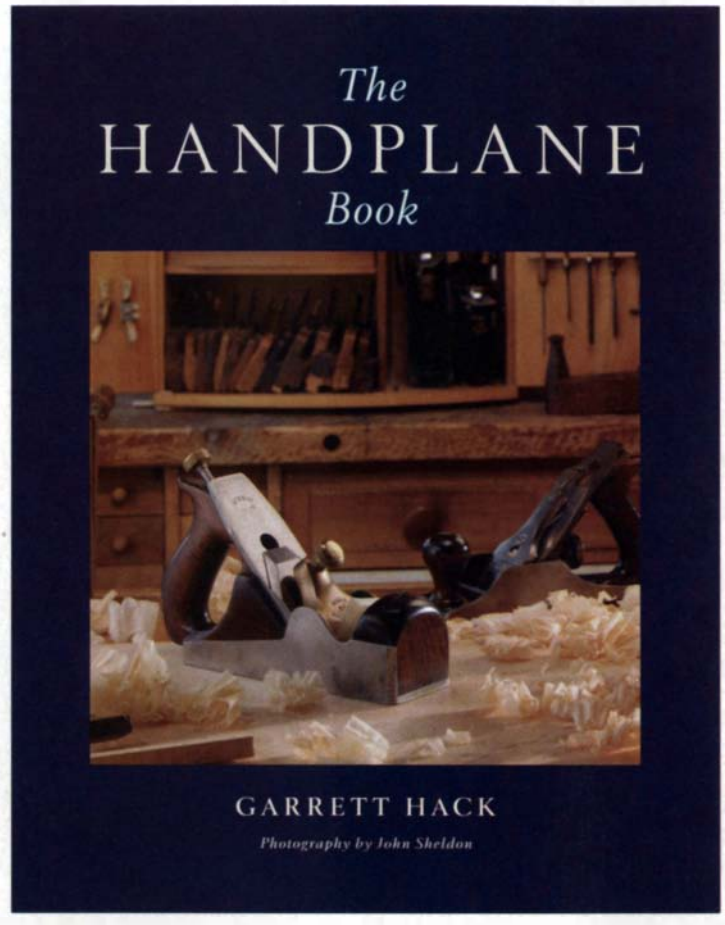

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Building an Arts-and-Crafts Sideboard

Start with a solid, carefully constructed carcase

by Gary Rogowski

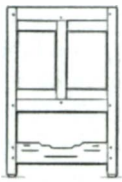
When I was asked to build a sideboard that had a Greene and Greene feel to it, I decided to use an original piece as a springboard for my own interpretation. But I wanted to do more than just copy something designed in the early 1900s by these famous brothers.

I tried to soak up as much visual information on the style as I could. I pored over designs of the Greene brothers and their contemporaries. Then I closed all the books and sat down at the drawing board. What I came up with is more contemporary and less ornate than the Greenes' work (see the photo above). This sideboard, made of Honduras mahogany, had to work as a backdrop for my inlay work as well as have the overall grace of a Greene and Greene piece. I didn't want it to dominate a room.

It's mind-boggling how many pieces, joints and cuts are in this sideboard. The key to successful completion of this project is breaking it down into manageable sections and then figuring out how to splice them together.

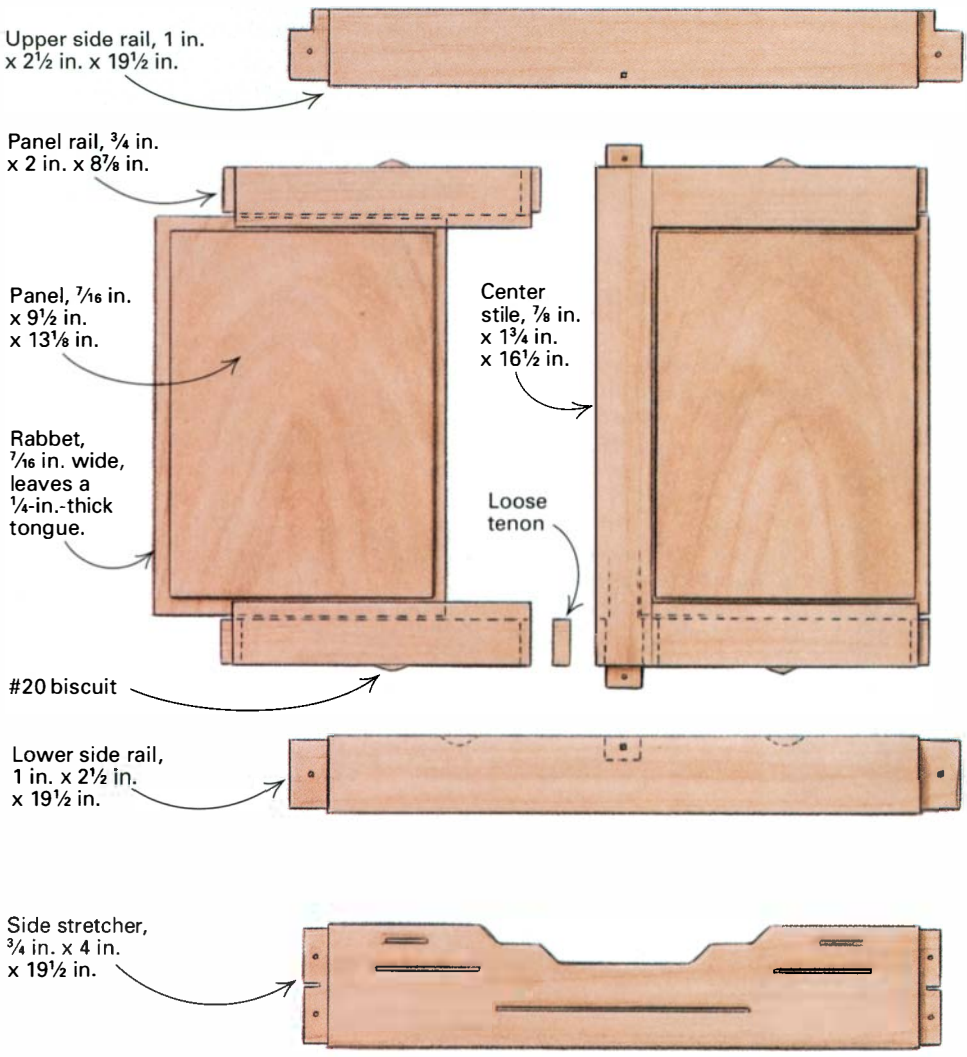
That's how I planned construction of this sideboard, and that's how the articles in this and the next two issues of *Fine Woodworking* are organized. After I worked out an overall design, I concentrated on the

Photo this page: Jim Piper

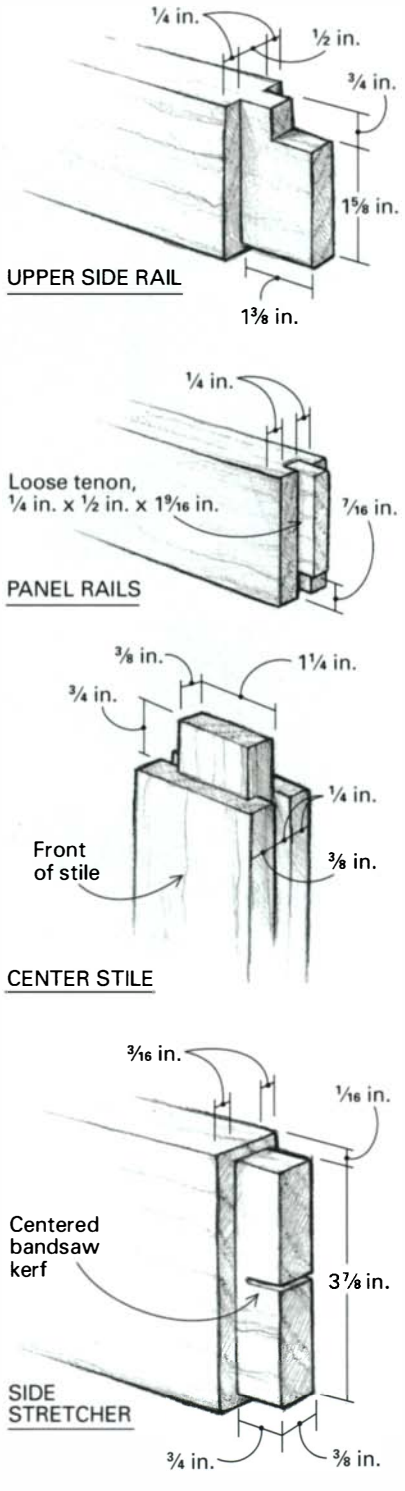


SIDEBOARD END ASSEMBLY

Construction of this sideboard begins with the two end assemblies. Lower side rail tenons are the same as the upper side rail tenons except that they're not haunched.



DETAIL: END JOINERY



structure of the carcase, which is the subject of this article. The next consideration was the interior of the piece—how the drawers would be supported and how the doors would be hung. That's covered in the second article. Finally, there are the details—knobs, pulls, carved inlay and other decoration that make a piece distinctive. You'll find all of that discussed in the third and last article of the series.

The more planning, drawings and design work you do up front, the fewer headaches you'll have later. I find it more than worthwhile to do full-scale joinery drawings; they help me avoid unpleasant surprises.

Millwork lays the foundation

A poorly laid foundation for a house causes problems from framing to finishing. Similarly, if you build a piece of furniture

Drawings: Bob La Pointe

with stock that's not straight and square, you're bound to run into trouble.

First I rough-mill the stock and let it acclimate to my shop. I cut boards to within ½ in. of finished length and joint one face and an edge. I leave stock ⅛ in. over in width and thickness. Then I sticker all the boards for a few days. If any boards cup, bow, twist or check, they're replaced. I take the boards down to their finished dimensions when I need to cut the joinery.

The millwork for the 7/16-in.-thick side panels in each end of the sideboard took some extra thought. I could have planed down 4/4 boards, but half of each board would have ended up in my dust collector. Instead, I resawed 5/4 stock. Because my bandsaw can resaw boards only up to 8 in. wide, I ripped the 10-in.-wide material in half, resawed these pieces and then glued mating pieces back together. This gave me two book-matched panels about ½ in. thick for each side with perfectly matching grain.

Begin the carcase with the ends

Each end assembly consists of a dozen pieces. I routed all the mortises and tenons, using a Multi-Router (see the photo above), although the joinery certainly could be cut in a number of other ways. First I cut and fit the center stile tenons to the mortises in the upper and lower side rails. Then, with a ¼-in. bit in my router table, I routed the grooves for the loose tenons that connect the panel rails to the center stile. Using the same router-table setup, I roughed out the panel grooves in the center stile and panel rails. I did the final routing of these grooves when the sideboard ends were dry-assembled. The stopped grooves for the loose tenons in the legs had to be marked and cut separately on the router table.

With the work on the center stiles done, I glued them between upper and lower side rails. I fitted each panel rail between leg and stile and then routed the grooves for the loose tenons that connect the panel rails to the legs. After giving all the rails a quick sanding, I glued the panel rails to the stile with loose tenons and to the upper and lower side rails with one #20 biscuit. If any of the panel-rail shoulders don't line up perfectly with the side-rail shoulders, you can trim them later with a rabbet plane.

Grooving for the side panels—The grooves for the panels have to line up all the way around the frame. Rather than routing each piece separately and hoping that the panel grooves lined up at the corners, I dry-assembled the frame to rout grooves in it with a ¼-in. slot cutter. To give the router a level platform, I put spacers on the side rails and center stile (see the top photo on the facing page). I also screwed a wooden block to the router subbase so I couldn't tip the router in the cut.

I rabbeted the panels on the router table and then handplaned the backs until they fit perfectly. I sanded and finished the panels with three coats of wiping varnish. I also finished the inside edges of the legs, panel rails and center stiles—all places that would be difficult to finish after the end assemblies were glued up.

Before leaping into a glue-up, I put a ½-in.-long 14° bevel on the foot of each leg and drilled holes for the dowel pins and the ebony plugs used to pin the mortise-and-tenon joints (see the drawing on p. 40). I also routed the dovetail slot at the top of the leg for the top front rail and laid out the dovetail in the rail from the slot.

Template-routing the stretchers—The last piece for each side assembly was a stretcher. With so many curves and routed grooves in them, templates seemed the best way to shape the stretchers. I made the templates out of ¼-in. hardboard, roughing them out on the bandsaw and trimming their long edges on the router table. I shaped the curves with a drum sander and some careful file work.

The stretchers were roughed out on the bandsaw, and the templates attached with double-faced tape. Then, with a flush-trimming bit, I cut the profiles. Using the same templates, along with a ⅜-in.-dia. template guide on my router base, I routed the ¼-in. grooves in the stretchers (see the second photo from top on the facing page). To make the routing easier and to give me clean stopping and starting points, I drilled holes at either end of each groove first.

Panels and legs complete the sideboard ends—All that remained was to slide in the panels and clamp the legs to the rails. To ensure that the spacing around each panel was the same on all four sides, I used ⅛-in.-thick hardboard spacers (see the third photo from top on the facing page). Then I clamped the assemblies together, taking care to apply pressure evenly across the two side rails and the stretcher (see the photo at right).

I checked the legs to be sure their faces remained flat during glue-up. I also kept the top rails just a tad higher than the tops

MORTISING THE LEGS

Router jig speeds and simplifies joinery. *The author used a Multi-Router to rout all the mortises and tenons on this sideboard. Grooves, dadoes and dovetail slots were done on a router table or with a hand held router. Dovetails were cut by hand.*

Photos except where noted: Vincent Laurence

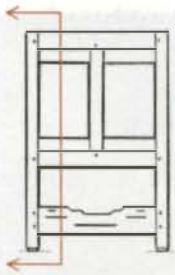
END ASSEMBLY

Rout the panel grooves. *The author uses shims and a block on the router base to keep the base flush with the legs. The frame is dry-assembled as he makes the cut.*

Grooves in the stretchers lighten them visually. *A router, template and 3/8-in.-dia. template guide make the 1/4-in.-wide grooves in all four stretchers the same. Double-faced tape holds the template in place.*

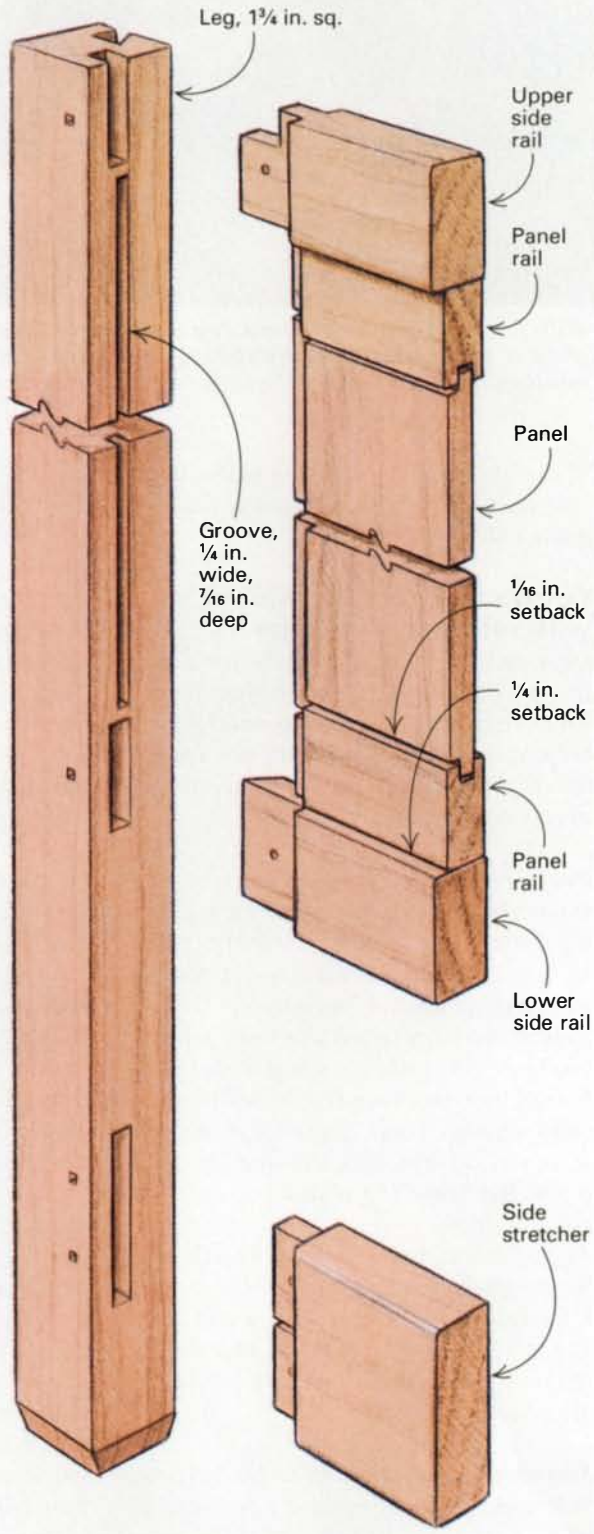
Spacers ensure an even reveal. *The author uses 1/8-in.-thick hardboard spacers to set the reveal on end panels. Short sections of 1/8-in.-dia. dowel were later used to pin the panels in place from the inside, at center, top and bottom.*

Completing the side assemblies. *The last glue-up for the sides mates the four rail tenons and two stretcher tenons with the six leg mortises. Be sure the legs remain flat under clamping pressure.*

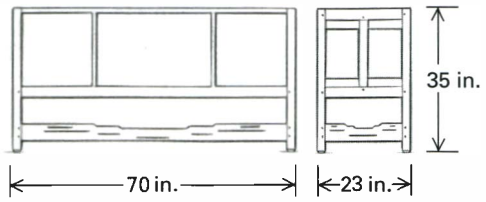


SECTION THROUGH END ASSEMBLY WITH FRONT LEG

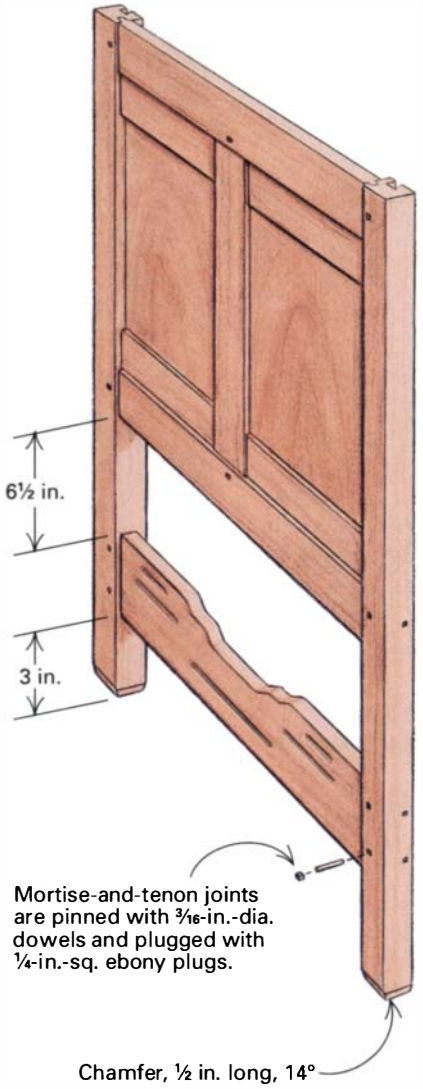
Pieces of varying thicknesses in the end assemblies create shadow lines where the parts meet, giving the ends a sense of depth. The side rails are set back from the face of the legs by 1/8 in. The center stile (not shown) sets back from upper and lower side rails another 1/8 in., and panel rails step back from the center stile another 1/8 in. The panels are 1/16 in. back from the panel rails.



With the top front rail fitted, the basic structure is complete. *The rail is not glued in place yet. Dovetailed slots still need to be cut for kickers, and knife-hinge mortises must be routed before the rail can be permanently attached.*



This drawing shows how the major parts of the carcase are joined. The kickers, the front rail and the plywood divider panels should not be glued into the case until dividers have been grooved for the drawer runners. That's covered in the next issue of *Fine Woodworking*.



of the legs. Planing the long grain of the side rails is easier than planing the end grain at the top of the leg.

Connecting end assemblies with rails and stretchers

I tenoned all but one of the rails connecting the two ends, using the same Multi-Router setup I'd used for the mortises and tenons holding the ends together; the one exception was the dovetailed top front rail (see the photo above).

Preparing for glue-up—It was tempting at this point to smear on some glue, throw on the clamps and see how the piece looked. Experience has taught me, however, that preparation is everything.

For starters, my bench was too small and too high. So I built a staging area. I connected four short sawhorses with braces and C-clamps. Then I put a sheet of particleboard on top and shimmed it until it was flat, checking with a pair of large winding sticks.

I dry-assembled the piece exactly as I would glue it up. I figured out where I needed to place all my clamps and cauls and laid them in place. Then, after checking my carcase for square across its faces, I disassembled the piece.

Marking and mortising knife hinges—Before gluing up the carcase, I cut the mortises for the knife hinges at either end of the bottom front rail. These mortises can be cut after the carcase has been glued up, but if you wait until then, I guarantee it will become work designed to test your patience and cursing vocabulary.

I also took the opportunity to mortise the hinges at either end of the top front rail at this time. It's a good idea to wait on the mortises for the inner doors (the ones on either side of the center bay) until after the divider panels are in.

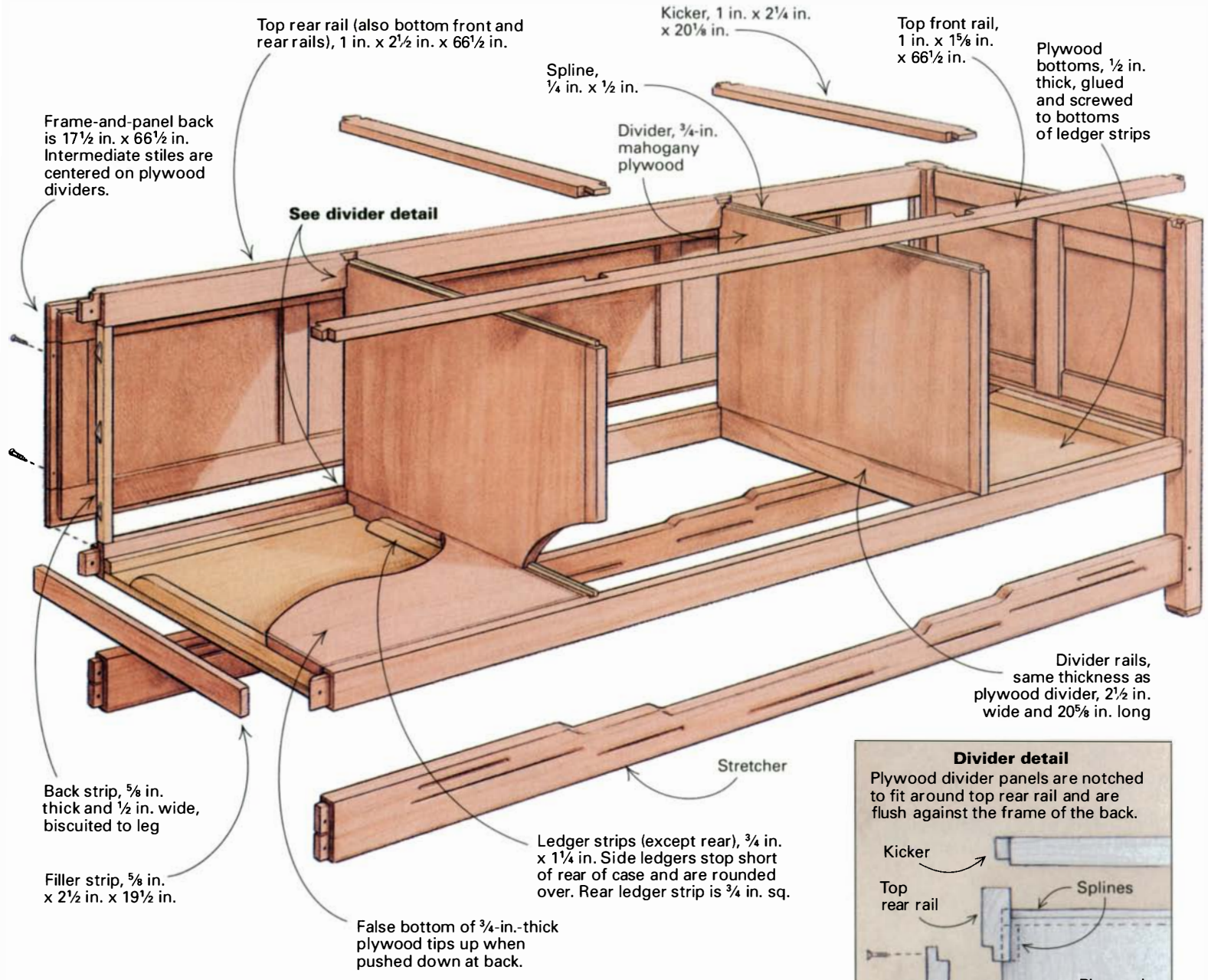
I used L-shaped Brusso knife hinges (available from many woodworking suppliers and from Larry and Faye Brusso Co.; 810-674-8458). I spaced them precisely 3/64 in. from the legs, using a piece of laminate as a shim. This created a reveal along the hinge stile for the door. I finished marking out the hinges and then disassembled the case.

I routed the hinge mortises to depth with a 3/16-in. straight bit, taking care to stay just a little back from the layout lines. I chopped out the front edge and ends of the hinge, laid the hinge in place at a slight angle and marked its back side again with a knife. I carefully pared to this line, checking the fit and paring again until the hinge fit perfectly. (For more about installing knife hinges, see *FWW* #111, pp. 48-51.)

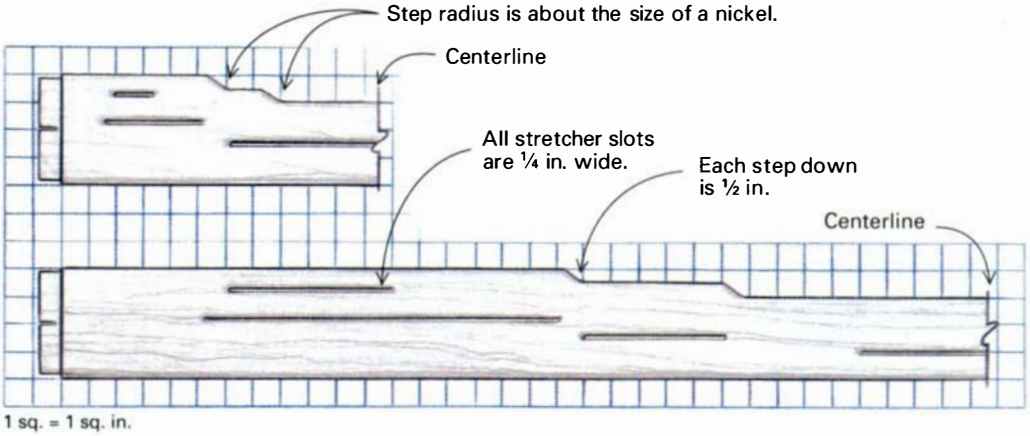
With these hinge mortises completed, I glued up the carcase. I installed the top front rail without glue, just to keep the front

CARCASE CONSTRUCTION

Dimensions do not include tenon or dovetail lengths.



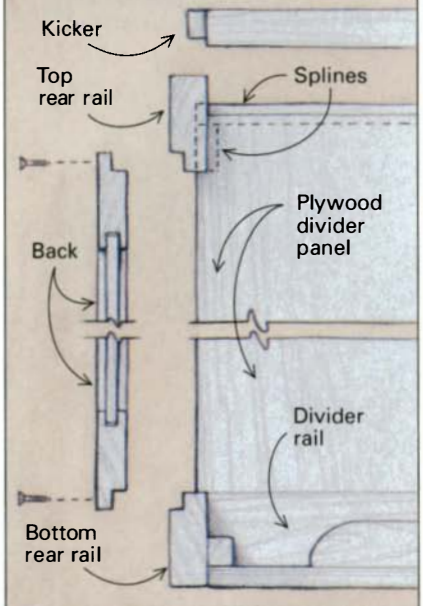
Stretcher details



1 sq. = 1 sq. in.

Divider detail

Plywood divider panels are notched to fit around top rear rail and are flush against the frame of the back.



Plywood divider panel extends onto bottom rear rail ¼ in., flush against the frame of the back.

legs parallel during glue-up. This piece had to come out as I worked on the case.

Dividing the carcase for doors and drawers

Despite all precautions and diligence, glue-ups can still be a little crazed, and the results aren't always dead-on. For that reason, I wait to do any interior work in a case piece until after it's glued together. This sideboard is divided into three sections: a center section with web frames for three drawers and two outer sections, each of which has a pair of doors. Separating these sections are two walls, each consisting of a plywood divider panel splined to a solid divider rail below it. Kickers centered on the two divider panels lock them in place.

Melamine spacer simplifies joinery— Stopped sliding dovetails connect the divider rails, which are parallel to the ends of the carcase, to the bottom rails. To index these cuts for my router, I made a spacer that butted up to the legs and was supported by the bottom rail and stretcher. As it turned out, this spacer proved useful again and again in building the carcase. To determine the width of the spacer (15 in., as it turned out), I took the intended opening for the doors and subtracted the distance between the edge of the router subbase and the center of the bit. Then, to rout the sliding dovetails, I laid the carcase on its face, clamped the spacer in place and routed away. I made two passes for each slot, one with a straight bit to eliminate most of the waste and one with the dovetail bit. Because the carcase is laid out symmetrically, I could use the spacer at both ends.

To size the divider rails, I measured between the front and rear bottom rails right up against the legs, where there was no possibility of bowing. I added ¾ in. for the two dovetails and cut the divider rails to this length. I cut the dovetails on the router table using the same ½-in. dovetail bit I had used to rout the slots. When I was sure the shoulder-to-shoulder length of the divider rail was right, I took a shaving or two off the end of each dovetail with a low-angle block plane so the joints would slide home more easily. Then I glued the divider rails in place, making sure that they were flush with or just slightly above the front and rear bottom rails.

After planing the top and bottom edges of the divider rails flush with the long rails, I concentrated on the divider panels. I made these out of ¾-in. mahogany plywood to avoid shrinkage problems, so my first task was to glue banding on the front edge of each. I made this mahogany strip just as wide as my front rail was thick.

Then the issue was how to attach these panels to the rails. I figured a spline joint was my best bet in terms of strength and ease. I used the same spacer I had used for the dovetails to put a ¼-in. groove dead center into the divider rails (see the photo below). For the corresponding groove in the edge of the plywood divider panel, I used a hand-held plunge router with a secondary fence clamped to its base to keep the cut true.

A spline cut in the top rear rail helps locate the divider panel even before the kicker is installed at the top of the case (see the divider detail on p. 41). I routed this little stopped groove in the top rear rail using the same spacer board, notched the divider panels to fit around the rear rail and routed a groove in the notched section to receive the spline.

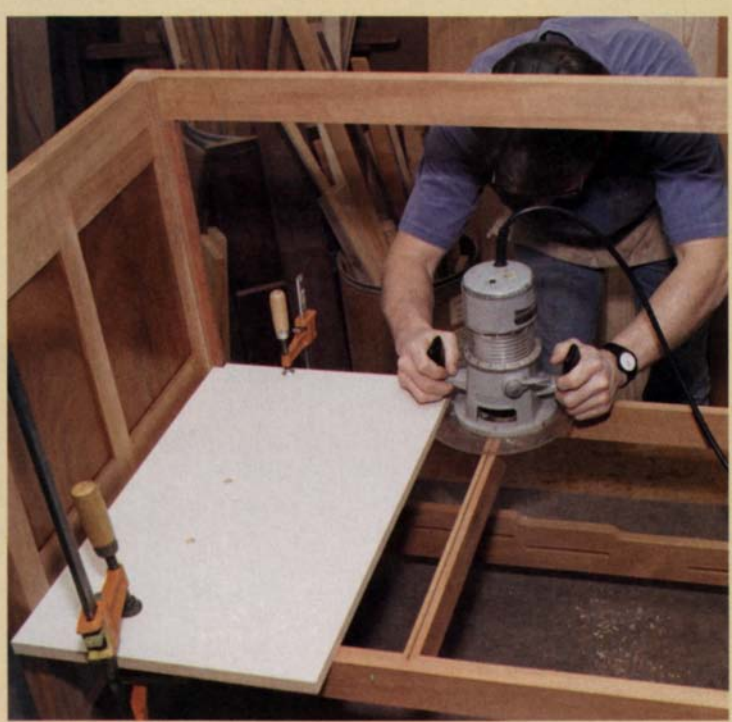
Ledger strips support bottom pieces and false bottoms—Ledger strips attached to the front, rear, side and divider rails support the ½-in.-thick-plywood bottom panels. I used biscuits to attach the strips to the rails. Then I glued and screwed the bottom panels to the ledger strips from below. The screw holes were plugged later and then sanded flush.

I included a few hidden compartments as a little surprise for the client (see the top right photo on the facing page). When you push down on the rear of the bottom panel, it pivots up and reveals the hidden compartment. I beveled the rear edge of the bottom panel just like a door so it wouldn't bind. At the same time, I kept the fit of the panel very snug so it wouldn't be obvious. Just in case it was a little too snug, I drilled a small access hole through the front ledger strip, so a short length of ⅛-in.-dia. rod could be used to push the false bottom up from below.

Kickers tie case together and prevent top drawer from dropping—The kickers had to be cut before I could cut the divider panels to their finished height. I attached the kickers to the top rails with large dovetails. I cut the slots with a router, using a pair of spacers (one for each side of the slot) similar to the one I'd used for the divider rails. Because the top front rail is flush with the back of the front leg, there's no leg edge for the spacer. To get around this, I just set a ⅝-in.-thick block against the inside of the frame instead.

I cut the kickers to length, notched their shoulder locations on the tablesaw and checked to see that the length was right. Then I transferred the dovetail layout from

A JIG FOR CENTERING GROOVES AND DOVETAILS



Divider rails are grooved for splines. *Splines connect the rails to plywood dividers. The same spacer used to rout the dovetails for the divider rails is used here.*

The case is built. *With the two end assemblies connected and the case divided into its three main sections, the carcase is ready for doors and drawers (left). The case includes two hidden compartments (below).*

the slots in the top rails, cut the dovetails by hand and fitted them to the slots.

Divider panels fit between divider rails and kickers—I measured and cut the divider panels to fit between the kickers and divider rails. The kicker and the top of the panel were grooved for the same ¼-in.-wide spline I used on the panel bottom. My first spacer centers the groove in line with the panel and divider rail. But because the router base runs into the rear top rail, I couldn't finish this cut with the kicker in the carcase. So I used the router table.

I clamped the divider panels in place vertically to the kickers and divider rails to check the drawer openings. I made sure they were parallel from front to back. Any slight adjusting can be done by cutting the grooves in the panel a bit wider so the plywood can be moved, shimming the spline to one side or the other. Once I'd positioned the dividers exactly where I wanted them, I clamped them in place and pencil-marked their positions. Then I laid out the remaining knife-hinge mortises.

Unfortunately, I had glued in the rail splines to make it easier to fit the dividers. This prevented the router base from riding the rails to rout the mortises for the knife hinges. After shrieking with disgust over my lack of foresight, I realized there was a simple way to correct this problem that was actually an improvement. I made a little platform out of some ¼-in.-thick medium-density fiberboard (MDF), clamping it in place around each mortise location. These boards were just higher than the spline and provided the router base with solid support.

Making and fitting the back

The back of this sideboard was fitted with a frame-and-panel back. The top and bottom rear rails were rabbeted to receive the panel. Rather than rabbeting the legs and weakening them, I glued strips to the rear legs to provide support for the back. If by some fluke of nature, the opening for the back is not perfectly square, cut your rails and stiles to the largest dimension and trim the frame after it's glued up.

For ease of construction, I used stub tenons for this frame. I made the mortises for these tenons slightly deeper than the panel grooves, though, so the center stiles wouldn't be hard to locate during glue-up. Be sure when gluing up that the end stiles line up flush or are just proud of the rail ends. Again, it's easier to plane long grain than end grain. The panels were sanded and finished before gluing. After the glue had cured, I pinned all the joints with ¼-in. dowels and drilled countersunk holes for the screws that hold the back in place.

Then I fit the frame to its opening and rabbeted it so it would be flush with the top and bottom rails. Once fit, the back was set aside in a safe place. □

Gary Rogowski designs and builds furniture in Portland, Ore., and is a contributing editor to Fine Woodworking. Router Joinery *(The Taunton Press), the companion book to his videotape* Router Joinery with Gary Rogowski, *will be published in August.*

Next issue: doors and drawer supports

In the October issue, Gary Rogowski builds, fits and hangs the doors. He also builds the web frames that support the drawers. In the December issue, he completes the sideboard.

How sharp are your saws? *You can learn a lot by looking down the tooth edge. Bends, kinks and other defects readily show up.*

Sharpening Handsaws

Make your saws cut straight and fast

by Fred Wilder

Someone asked, "Will a sewing needle slide down the tooth edge of a carpenter's handsaw?" It was the end of another day on Attu Island, a barren, wind-swept speck of land at the end of the Aleutian chain. We were a bunch of homesick carpenter Seabees sitting around the stove in a Quonset hut, waiting for lights out. The question hung in the air, and then there was laughter. There wasn't much to do at night, but that last question really scraped the bottom of the barrel for a conversation topic.

Still, we were curious. One of the other carpenters retrieved a crosscut saw from his tool kit. We gathered around while he placed a needle on the teeth. When he tilted the saw, the needle ran down the edge like a streak of quicksilver. The question had been answered. But I knew it didn't mean that the saw was sharp, just that the blade was straight, and the teeth had been set and filed evenly.

Only the very points of the teeth do any cutting. They could be dull as ditch water and the needle would still slide just as fast because it doesn't ride on the points of the teeth, but between them. Even so, you could say that needle sliding does show something.

Photos: Strother Purdy

Two or three gentle strokes with the jointer—*You need only joint the teeth until the file touches the tops of the shortest teeth.*

If the needle slides well, you know that you're at least halfway to making a saw ready for the work it was designed to do.

The tools you'll need for sharpening

A jointer, a file, a saw clamp, a saw set, a hammer with a convex face and an adjustable light are the main tools you'll need to sharpen your saw. You can make a perfectly good jointer by attaching an old 6-in. mill file to a block of wood. The file that I use to sharpen sawteeth is a 7-in., double extra-slim taper. It works fine for all teeth sizes. You can either buy an old saw clamp at a flea market or you can make one. You just need some way to put even clamping pressure along the blade.

A saw set bends the teeth so that they cut a kerf wider than the sawblade. My choice of saw sets is a Taintor. It has a thin washer that can be put under the set anvil to change the amount of tooth that is bent over. Saw sets with a fixed anvil height may set large teeth at the right height but will set small teeth too low. The Taintor also has a second plunger that clamps to the saw before the set plunger sets the tooth. This feature reduces the chances for error in holding the saw set on the tooth. I don't know of another saw set with both these features or one that is as comfortable to use. You'll have to keep an eye out for one at a flea market or yard sale, because they haven't been made for years.

Perhaps lighting isn't a tool, but it is important. Natural light is too unpredictable and is often hard to come by in a shop. Most of the time, I file using a shaded 100w bulb suspended on a cord, which allows for adjustment. I've found the best place for a light is in front of me, below the level of my eyes and on the far side of the saw.

Straightening, jointing and setting the saw

I begin each sharpening by checking the blade for kinks and bends, even on the saws I use regularly (see the photo on the facing page). After I get the blade perfectly straight, I joint and then set the saw. If the saw is just wood dull, it can be filed sharp a time or two without jointing or setting.

No matter how sharp, a saw will cut straight only if it's straight. Take out any bends by flexing the blade against the bend with your hands. Don't worry about overbending the blade. I have bent saws quite severely to straighten them, and I've never had one break.

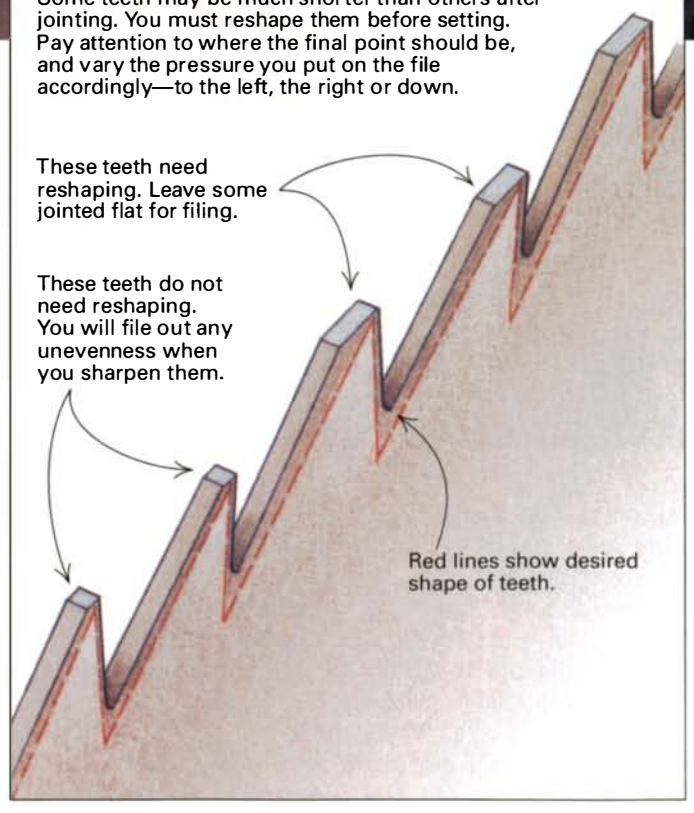
Unless a kink is severe and obvious, finding its exact location can be hard. Move the blade back and forth along its length in the light. Any kink will show up as a ripple in the reflection. Mark the whole kink with chalk, and then place the saw on a smooth hardwood board and hammer it flat. Any small hammer with a convex face, such as a ball peen, will do. Just don't use a hammer with a flat face because it will leave half-moon dents in your blade.

Before you set the teeth, make sure they are all the same height and the same shape. The jointer cuts the taller teeth even with the shorter ones. Run the jointer from the handle end to the point using light pressure (see the photo above). If a number of teeth remain untouched, make another pass with the jointer in the opposite direction, from point to handle. This will help keep the cut even.

If a saw has been run hard upon a nail or filed unevenly the last

Reshaping jointed teeth before setting

Some teeth may be much shorter than others after jointing. You must reshape them before setting. Pay attention to where the final point should be, and vary the pressure you put on the file accordingly—to the left, the right or down.



Drawings: Vince Babak

It's easier to move the saw up your lap than to move the set down the saw (above). Only the top part of the tooth should be bent (left).

time it was sharpened, you will need to joint the teeth much more. In this case, you may end up with unevenly shaped teeth, some full size, some filed very flat. Before you set them, you will need to reshape these teeth (see the drawing on p. 45).

Ideally, the tooth edge should have a slight crown from toe to heel of about ⅛ in. The crown lets the teeth cut progressively instead of all at once. This makes it easier to start a cut and easier to keep going.

Some saws were manufactured with a crowned tooth edge. To keep this crown, or make one, press down on the jointer harder near the ends of the blade, or make another short pass at each end.

I prefer to sit down and hold the saw in my lap to set it (see the photo at left). This way, the saw is at an angle, rather than my wrist. The advantage of this will be apparent if you try to set a 12 points-per-inch saw in a clamp: Your wrist won't be the same for a week. Use the teeth near the handle as a guide for how much set you should give the rest. As a general rule, bend the teeth out about half the thickness of the blade. If you cut mostly hard, dry wood, you'll need even less set. Watch the height of the anvil, and only set the top one-third to one-half of the tooth (see the inset photo at left). If it's set too low, the plunger can bend or dimple the saw plate and even break off teeth. Set a few teeth near the handle first, and observe how well they match.

Proceed from handle to point, and then on the other side of the saw, from point to handle. Actually, I can't see that it makes much difference if you start at the point. Mark my advice to habit. Set every other tooth, moving the saw set along with your left hand. Turn the saw around, and set the other half of the teeth.

When you've finished, look at the set of the teeth by holding up the saw flat to the light. All the teeth should be uniform. If not, before you set them again, determine if the problem is the set or the way you're using it.

Filing the teeth to sharp points

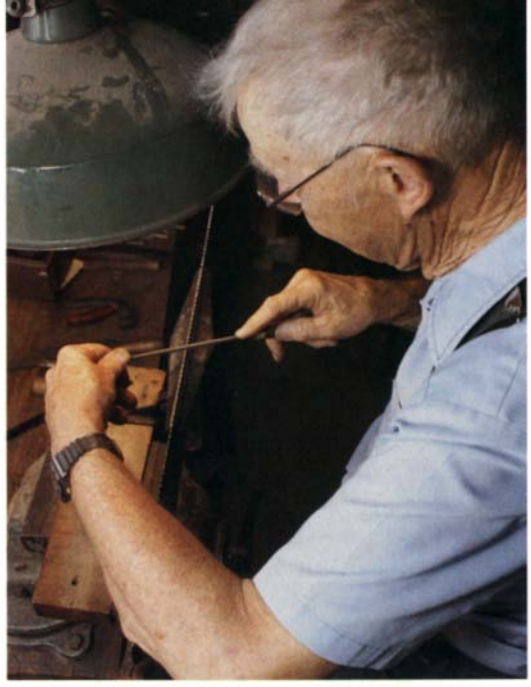
How you file the very tips of the teeth is more important than how you file the gullets and faces of the teeth. Only the very tips cut the wood. The gullets and faces just push the severed fibers out of the kerf. In filing, the key is to reduce the jointed flats to points all the same height.

How to hold the file—Put the saw in the clamp, handle to your right, with the teeth about ⅜ in. above the clamp jaws. Adjust the light so that there is a good reflection from the jointed flats of the teeth, and be sure that you can see them clearly. Position yourself so that the file is an extension of your forearm. Hold the point of the file with your other hand. Filing this way will reduce strain on your wrist and elbow.

Put the file in a tooth gullet, holding it very lightly. Let the file float for a few inches, trying to find the angles before cutting. The angles you need to keep in mind depend on the kind of saw that you're sharpening: crosscut or rip (see the drawing on the facing page). The bright area where the file has cut will tell you how good your angles are.

Reducing the flats to even points—When you're comfortable that you're getting the right cutting angles, make several passes on the back side of the teeth that are set away from you. With just enough pressure to make the file cut, take only as many passes as you need until the jointed flat at the top of the tooth is reduced by about one-half (see the photo at left on the facing page). Continue along the blade until all the teeth have been filed in this way. When I can't quite see a tooth, I have found that my thumbnail reflects light quite well when I put it behind the tooth.

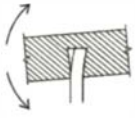
Reverse the saw in the clamp. Position yourself with the file pointing toward the handle (see the photo at right on the facing page). Repeat the operation for the other half of the teeth, again reducing the amount of flat by about a half. When finished, return the sawblade to the original position. This time, file the points until a needle point of brightness remains. Reverse the saw, and do the other teeth the same way.



Aim for only half a shine at first. *On the first pass (left), file the back of each tooth from the gullet up to the point, reducing the jointed flat by half. On the return pass (above), file the flats to sharp points. Remember that the only angle you change is the direction of the file.*

Filing angles

The drawings below show the three angles to consider when filing sawteeth. Angles don't need to be exact but should be as uniform as possible on each saw.

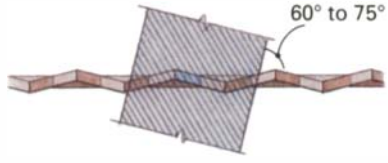


File's vertical angle affects only the ease of cut and the shape of the gullets. For all saws, hold file just under 90°.

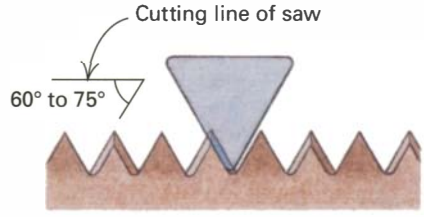
File's horizontal angle determines shape of the points of the teeth.

File's axial angle is determined by the tooth's hook. Hook is the angle between the front of the tooth and the cutting line of the saw. The greater the hook, the more aggressive the cut.

Crosscut saw

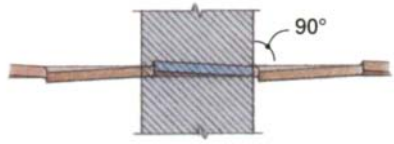


Filing at this angle will make a pointed tooth appropriate for cutting across grain.

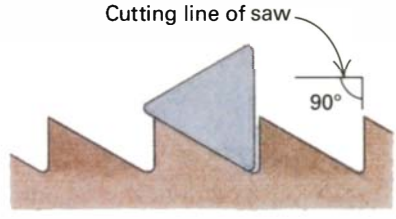


Crosscut teeth with little or no hook

Ripsaw



Filing at this angle will make a chisel-shaped tooth appropriate for ripping.



Ripsaw teeth with strong hook

Direction of cut

The reason for two or more filings on a side is to keep the teeth all the same size. Although the file should cut mostly on the left of the gullet (the back side of the tooth), it also cuts some of the front side of the adjacent tooth (see the drawing above). If the filed teeth were brought up to sharpness on the first pass, filing the return pass could excessively shorten some of the previously filed teeth.

Sometimes a thin bit of metal clings to the edge of the filed teeth. This is called a feather edge, and it reflects light, giving a false reading of the sharpness of the teeth. After you file the saw, make a cut with all the teeth to rub off the feather edge. Look at the teeth. Some will show a bit of jointed flat on the tip. File these teeth again.

Now find a sewing needle, and answer the original question for yourself. Then you'll know if you jointed and set the teeth evenly. But to see if it's sharp and will cut straight, there's no better test than that first cut. □

Fred Wilder is a forester by education and has worked as a logger and carpenter. He ran workshops for the Civil Conservation Corps from 1939 to 1942 and served as a Seabee during World War II. He is now restoring a pioneer village in St. Petersburg, Fla.

Template Routing Basics

by Pat Warner

In 24 years of self-taught woodworking, I've made a lot of mistakes. Early in my career, though, I made a fortunate one. It started a learning process with the router that I'm still working on today.

I had discovered what looked like a devilishly simple technique for cutting dadoes. I used a board clamped across the workpiece to guide the router base. The first dado looked great, but the second wandered visibly off course. That day, I learned that a router base is never concentric with the bit. Turning the router as I cut the dado put a curve in it.

I began to look for better ways to guide routers. Some of the best, I have learned, are with templates. These are simply patterns of the shapes you want to cut. The

Three bits for routing with templates

Straight bits and collar guides are the most versatile: Collars are not as accurate as bearings, but they have the decided advantage of allowing you to cut at any depth in both side and bottom cuts. Fitted to the router's base and used with straight bits, they work much like pattern bits. Collar guides also act as a shield for the bit. You'll find that you will inflict a lot less injury to the template and the work by using them.

Collar guides do have disadvantages. Because the collar must be larger in diameter than the cutter, the line of cut is displaced from the template. This offset means the finished work will never be exactly the same shape as the template. And collar guides are never exactly concentric with the bit: 1/16 in. eccentricity is typical. A way to compensate for this is to keep the same part of the collar in contact with the template throughout the cut.

Pattern bits are the most accurate: I choose pattern bits when I need the most accuracy. The bearings are typically concentric to the bit within .002 in. or better. Bearings do not leave as smooth a cut as collar guides, though the difference is generally minute. This is due to the way bearings can bounce against the template ever so slightly and very rapidly. Over time, this bouncing tends to wear the template edge unevenly.

The biggest disadvantage to bearing bits is that they're restricted to a small range of depth settings. The bearing must always engage the edge of the template. I've also found that bits of this design often have diameters slightly larger than their bearings. If you run this kind of bit with some of the cutter in contact with the template, you'll rout away some of the template. Measure your bits with calipers or test them to make sure this doesn't happen.

Flush-trimming bits are the most common: The main advantage to using flush-trimming bits for template work is that they are easier to find and slightly cheaper than pattern bits. They also come in smaller diameters than pattern bits, allowing cuts into tighter inside curves.

Otherwise, they have many disadvantages. Bottom cuts such as mortises are impossible. In other applications, the workpiece can hide the template from view, and the router must ride on the work. If it's a small or thin piece, the router will not be stable. —*P.W.*

Photos: Strother Purdy

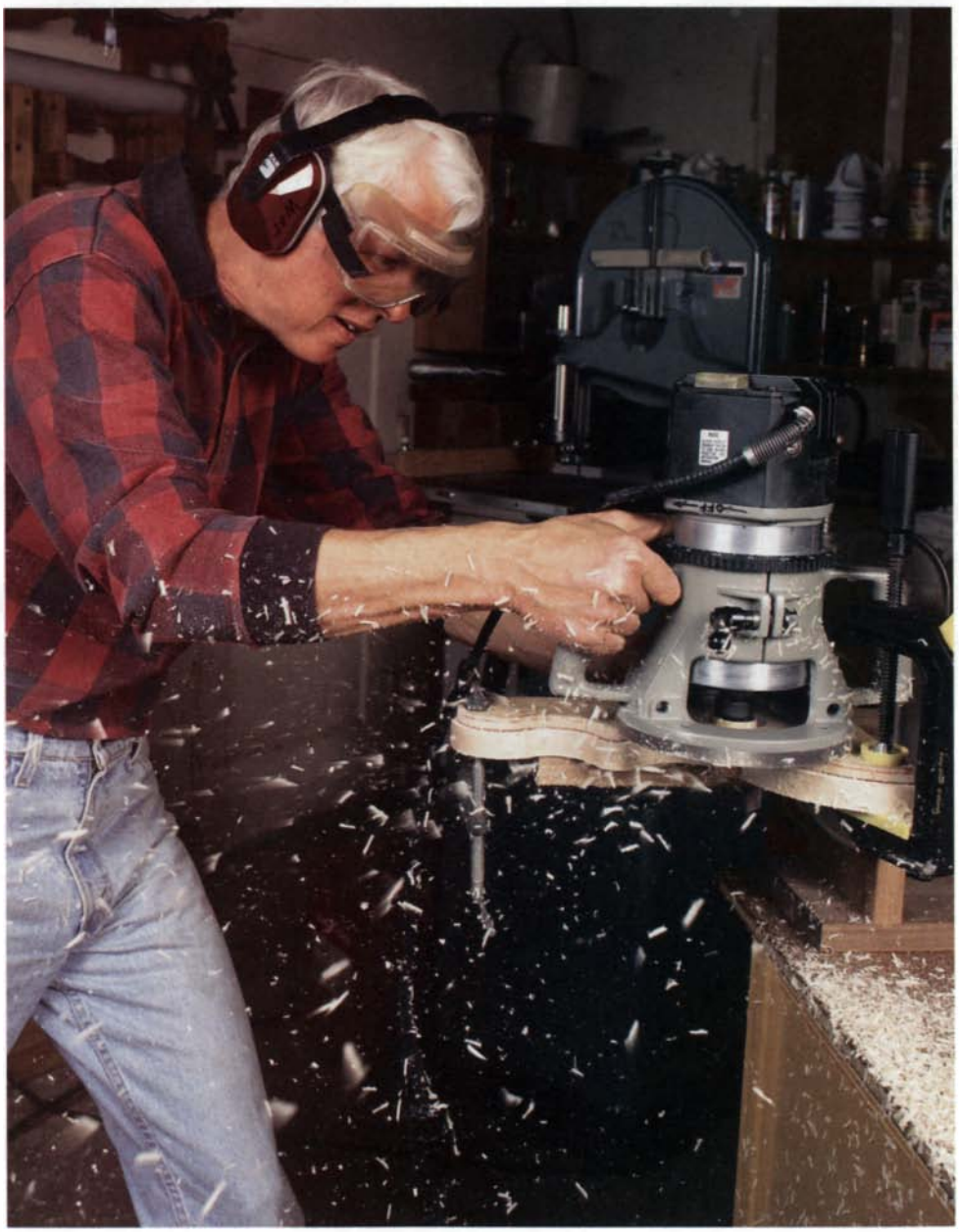
Simple guides make your router an accurate jack-of-all-trades

router registers against a template, using it as a guide through the cut. The simplicity of templates, though, gives no hint of how powerful a tool they make the router.

The router's usefulness and versatility begin with the tremendous variety of bits that are available. With only a ball bearing on the end of the bit as a guide, you are really limited to detailing edges. When you use a template, however, you free the router from following the edge of the workpiece. The router becomes capable of two more fundamental woodworking tasks: milling repeatable patterns and all kinds of joinery.

You can easily make your own inexpensive, simple and accurate templates for a wide variety of joints and patterns. The initial investment of time to make a template for a precise task is well worth it. Your router will perform that task far faster and far more reliably than other tools can. And it's much harder to make mistakes when you are using templates.

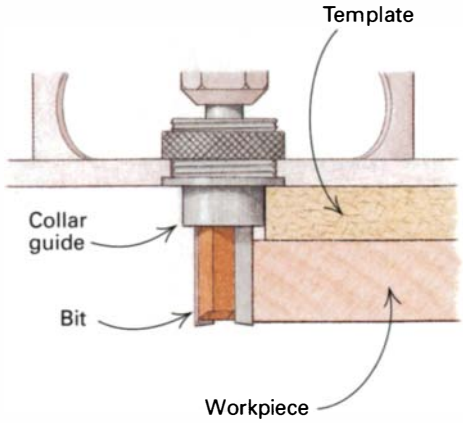
Templates will allow you to repeat cuts and shapes perfectly, but only if you remember to use the same bit with the same



Cutting multiples

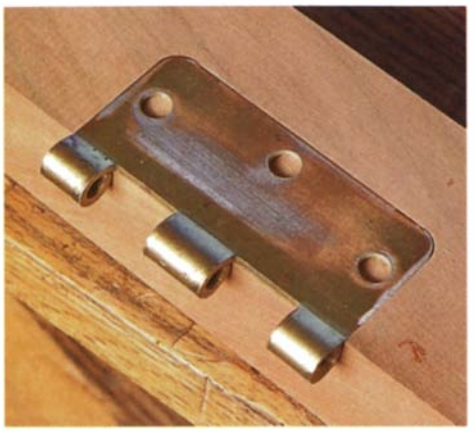
A straight bit and collar guide make a good combination for cutting a stack of profiled pieces, like decorative shelf supports. The bits can cut stock of any thickness and will produce a smoother edge than a bearing-guided bit. One thing to keep in mind: The template and the finished piece will not be identical because the collar guide keeps the bit away from the edge of the template.

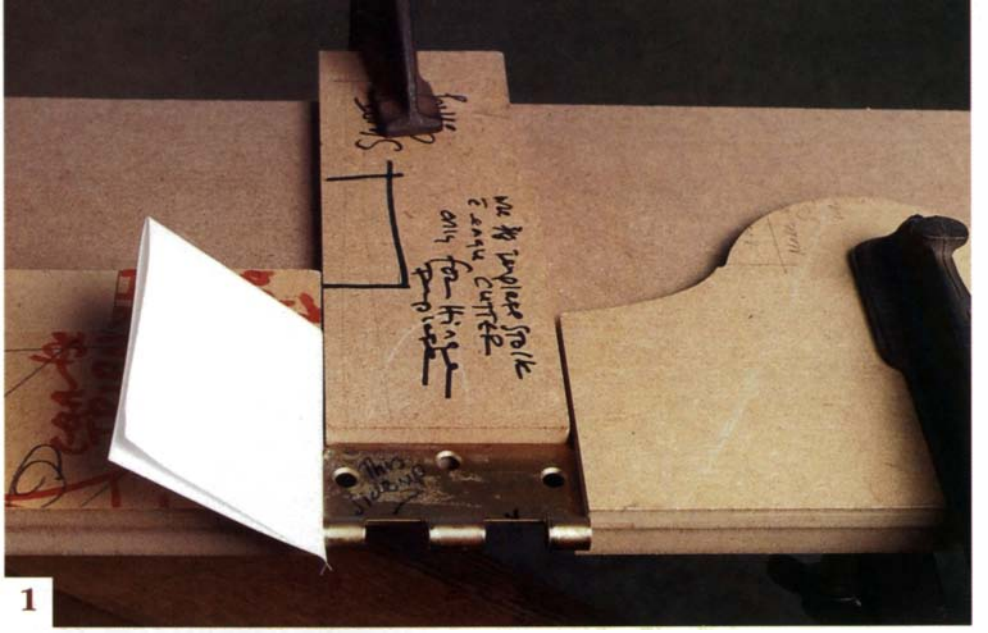
Straight bit and collar guide with template over work



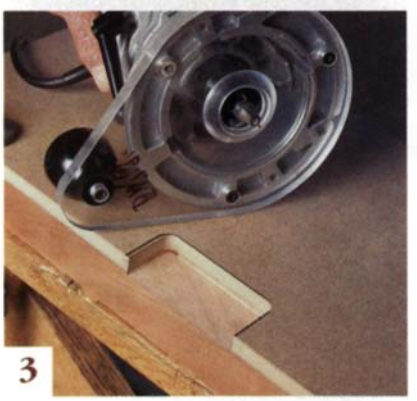
Drawings: Vince Babak

A template for butt hinge mortises

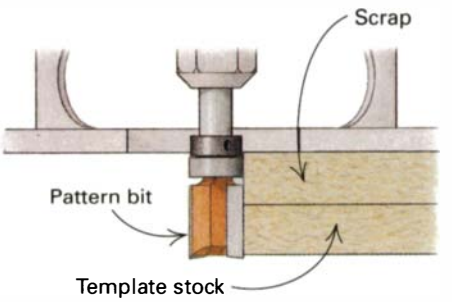




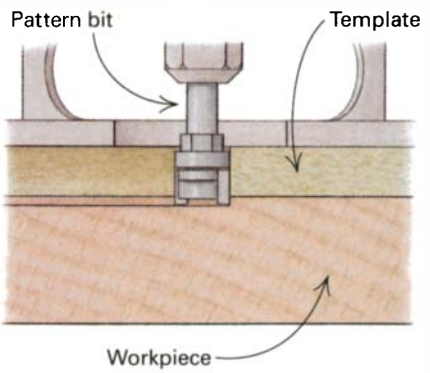
A pattern bit is a good choice for cutting shallow mortises precisely and quickly. To make the template, align the hinge on a piece of template stock, and then mark the outline with a pencil. Bandsaw out most of the waste, and reposition the hinge on the template stock. Clamp straight-edged scrap around the hinge to define the edges of the mortise **(1)**. A paper shim will prevent the mortise from being too tight. Then remove the hinge, and rout to the line with the scrap as a guide **(2)**. Remove the scrap, and you have a finished template that cuts an accurate mortise **(3)**.



Making the template



Cutting the mortise



collar at the same depth. The best place to record this information is directly on the template itself.

Make precise templates

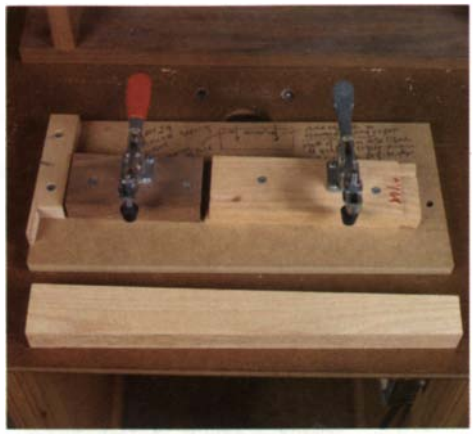
The best way to learn the basics of template routing is to make and use some simple templates. But before looking at the practical applications for templates illustrated on these pages, it's a good idea to start with some general advice about how to make them, what materials to use and the best ways to use them.

The most difficult part of template routing is making the template itself. All the important information about the final shape you want to rout is encoded in the design of the template. The more accurately you make your templates, the more time you'll save in the long run. You'll do less sanding, fitting and fudging afterward.

Sawing, rasping and filing are time-consuming and tedious ways to make templates. It's also very hard to make a perfect curve with hand tools. I never make a template by hand unless there is no other way. I've found that accurate templates are most easily made with sanders and, yes, routers, templates and other guides.

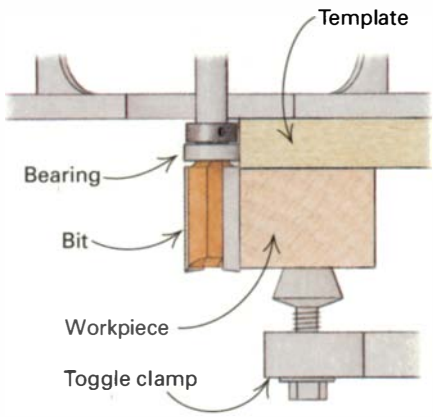
Templates should be dimensionally stable, durable and capable of taking fine details. Solid wood is a poor choice because it's not dimensionally stable. Steel is stable and durable, but to a fault. If you accidentally touch a spinning bit to one, you'll probably wreck both the bit and the template. Acrylic and Lexan are transparent and allow you to see the work beneath. They also won't kill bits. But be aware that a slow bearing will generate enough heat from friction to melt them. Medium-density fiberboard (MDF) is the best all around

Template for routing small pieces



Templates can be made so they hold small pieces as well as guide the router. Coupled with a pattern bit, the template above makes short work of cutting tapered coffee table legs. The workpiece is held on the template with toggle clamps. To keep toggle clamps out of the way while routing, the author flips the template upside down on the workbench (left). Blocks between template and bench provide room for the toggle clamps.

Use a pattern bit for tapered legs



choice. Mind you, it isn't perfect. It's toxic and unpleasant to work with.

Four everyday templates

You can use any one of the three kinds of router bits designed for template work. Each has its own strengths and weaknesses (for more, see the story on p. 48). Some bits are especially well-suited to certain kinds of templates, but all of them can bring speed and reliability to repetitive work.

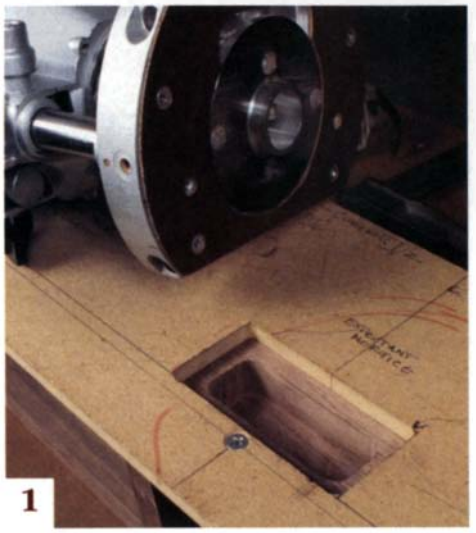
Template for repeatable shapes—Using a scroll saw and an oscillating sander to make a single curved shape, like a decorative shelf support, might be just as fast as template routing it. But only the first time. If you make any more, template routing will be faster and easier. A router bit leaves a much smoother edge than a scroll saw, and the edge will need far less sanding. Make the template much the way you would make the support if you had no templates. Smooth, gradual curves on MDF are best obtained by sanding to layout lines on a stationary belt sander.

For this kind of work, it's easiest to use a straight bit with a collar guide because you can adjust the cutting depth to match the thickness of the shelf-support stock (see the photos and drawing on p. 49). Collar guides, however, will displace the cut from the exact edge of the template. With straight lines, this merely entails positioning the template the offset distance from the layout line. The lines will be just as straight.

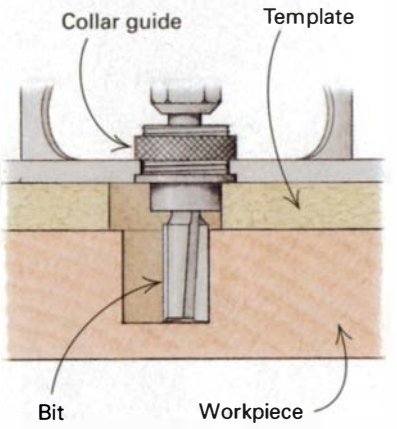
It's a different story with curves. A collar will make the bit cut slightly larger radii on outside curves and smaller radii on inside curves. The result will be a finished piece slightly different from the template. In com-

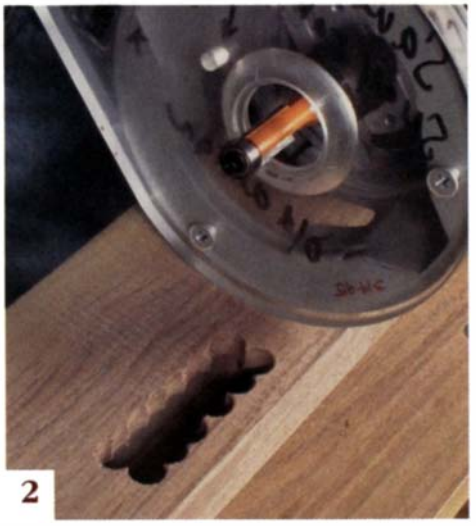
Routing a through mortise

Deep mortises can be cut accurately by starting with a template and straight bit with a collar and finishing up with a flush-trimming bit. First rout the mortise as deeply as you can with the template as a guide (1). Then drill through to the other side. Remove as much waste as you can, and then flip the workpiece over (2). A flush-trimming bit that follows the upper part of the previously cut mortise will finish the job.

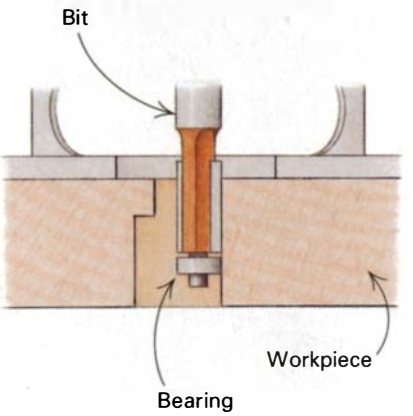


First pass with pattern bit





Finish with flush-trimming bit



plementary template work, this is a crucial consideration. But with something like the profile of a shelf support, the difference is not consequential. To tell where the bit will actually cut, run a pen in a loose bearing with the same offset as the collar along the template to draw the layout line.

Cutting shallow mortises—Cutting shallow mortises that are clean and evenly deep—like those that you would want for butt hinges—is a difficult task with traditional tools. Except for the very smallest hinges, a router guided by a template will give you more accurate cuts faster and with less variation between them. The photos and drawings on p. 50 show you how to make one.

Once you've made this template well, it's hard to go wrong using it as long as you are careful. Router stability on the template is essential to an accurate and safe cut. A 6-in. round base router with a ½-in.-dia. bit will have no more than 45% of its footprint on the template in an edge cut. If you make a turn around a 90° corner, that percentage is reduced to less than 20%. A router that wobbles with a lot of cutter engaged can break the cutter, tear the stock and template, or even cause a kickback that sends the router to the floor. The machine has to stay flat and stable at all times.

This butt hinge has rounded corners the same diameter as the bit. If it had square corners, you'd have to do some handwork to make the hinge fit. A bit with a larger diameter than the corners would also require handwork. Just never use a bit with a smaller diameter, or you'll have gaps to patch.

Cutting tapers on small pieces—Some workpieces are far too small to rout safely if they are sandwiched between a workbench and a template. To taper legs for a coffee table, for instance, I built a template (or a jig, if you like) that holds the workpiece firmly in place with toggle clamps, as shown in the photos and drawing on p. 51. Guide blocks position the side and end of the leg but leave enough room behind them to clamp the template upside down to a workbench edge. In use, neither the toggle clamps nor the clamps holding the template to the bench get in the way.

To get a good, smooth taper, you need only secure the guide blocks at the desired angle in relation to the edge of the template. As the router follows the edge, it cuts the taper angle of the blocks in the leg. Compared with tablesaw techniques that require more complex jigs, put fingers at risk and leave a coarse cut, this one is far superior.

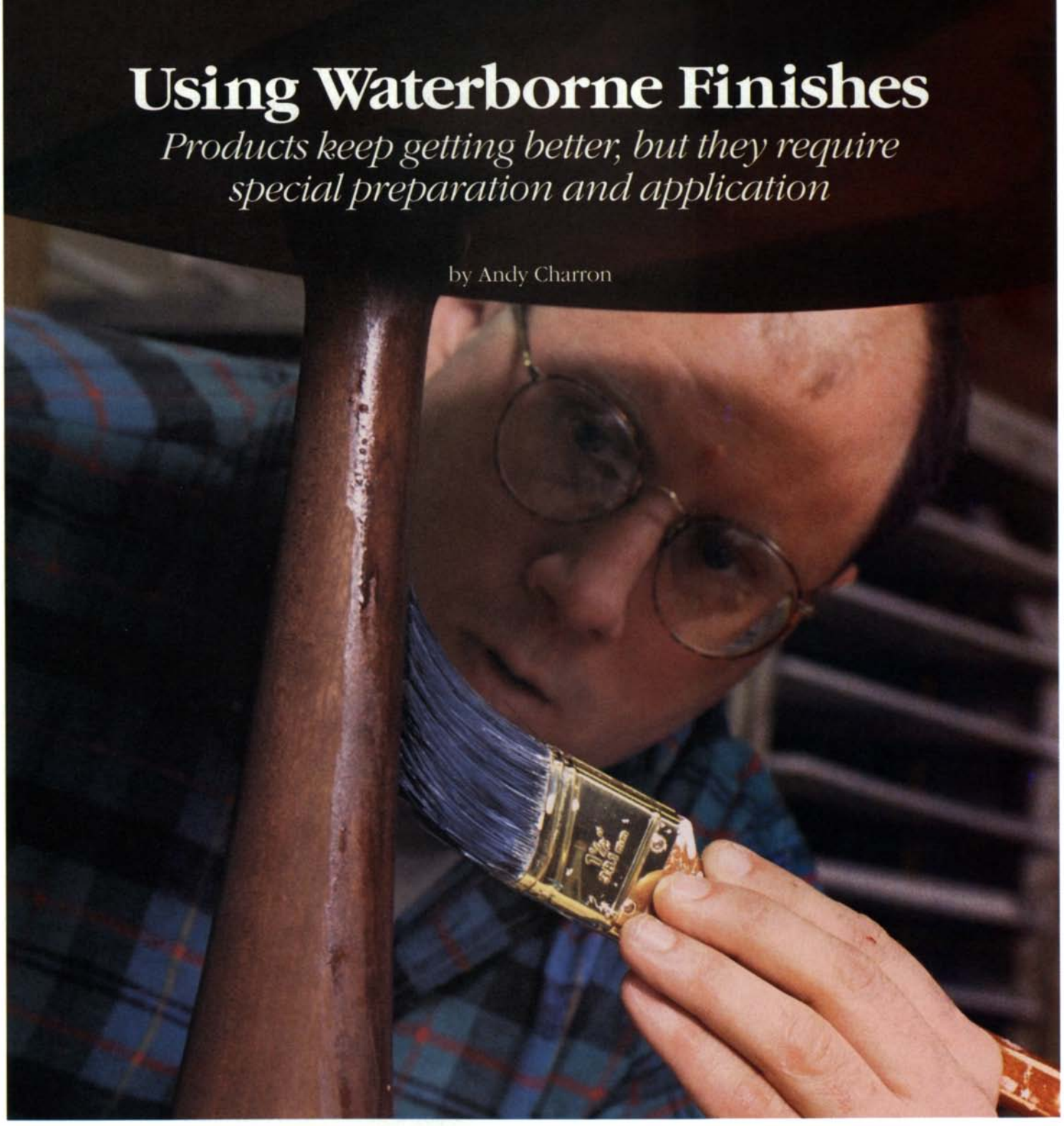
Template for through mortises—The plunge router is the best tool for inside template cuts, such as mortises, but it needs a lot of support to make it safe and accurate. Plunge routers are top heavy and have comparatively small bases. This make them excellent candidates for router teeter-totter problems. A template for mortising must be large enough so that the plunge router's base is completely supported by the template at all times during the cut. The photos and drawings at left show a very simple technique to make a through mortise deeper than any bit you own. □

Pat Warner is something of a jack-of-all-trades. A woodworker, college instructor and tool-industry consultant, he also manufactures the Warner Offset Routerbase. His book Getting the Very Best from Your Router *was released last fall by Betterway Books. He lives in Escondido, Calif.*

Using Waterborne Finishes

Products keep getting better, but they require special preparation and application

by Andy Charron



Before I owned any spray equipment, I used brushes or rags to apply solvent-based finishes. When I finally purchased a spray gun, I had a limited amount of money and very little shop space, so I could not set up a proper spray booth. I sought out finishes that were nonflammable and relatively safe to use. Waterborne lacquers were the obvious choice. All I needed was a fan for air circulation and a clean place to spray.

It took trial and error, but now I get consistently even coats of finish that are smooth and free of defects. I've also discovered that I don't have to use spray equipment to get good results. A number of waterborne finishes can be successfully applied with brushes or pads. Even though I now have the shop equipment to spray solvent-based lacquers and varnishes, I use waterborne finishes 90% of the time.

Many states now regulate the amount of solvent or volatile organic compounds (VOCs) that may be released into the air by professional shops. This has led to the development of more user-friendly and less-toxic waterborne finishes. However, waterborne products are still very different from their solvent-based counterparts. If they are not applied properly, they can be frustrating to work with and can yield disappointing

Photos: Anatole Burkin

Waterborne dyes are rubbed on with a rag. *Flood the workpiece when applying stains and dyes. Work quickly, and wipe off any excess to avoid lap marks.*

Waterborne finishes will raise the grain. *Apply a sanding sealer over a stain or dye before any topcoats. Sanding sealers contain lubricants, which make them easy to sand.*

Don't use tack rags to wipe off dust. *They can leave chemical residues that will show up as blemishes under a waterborne finish. Use a rag dampened with water.*

results. Knowing what problems to expect and understanding how to overcome them will help make waterborne finishes easier to apply. (For help in choosing the proper waterborne finish, see *FWW* #115, pp. 48-53.)

Success depends on several factors: surface preparation, compatibility of sealers, stains and topcoats, material preparation, application methods and even the weather. My methods are applicable to waterborne urethanes, lacquers, enamels, dyes, sealers and primers.

Prepare the surface by raising the grain

If you have ever spilled water on a freshly sanded piece of wood, you may have noticed how the grain stands up, creating a rough surface. All waterborne finishes have this effect on wood. Earlier versions contained more water than the newer formulations, so grain-raising isn't as bad as it used to be. The resins used today are lighter, more viscous and require less water in their formulations. But no matter how much you sand bare wood, all waterborne finishes will raise the grain at least enough to require some additional sanding (see the top right photo).

The simplest way to deal with raised grain is to surrender to it. First, finish-sand workpieces as you normally would with a sandpaper in the 180-grit to 220-grit range and then intentionally raise the grain. You can use water, sanding sealer or dewaxed shellac. If you use water, lightly dampen a sponge or a rag, and wipe the workpiece. Or you can dampen the wood with a plant mister. Let the workpiece dry to the touch, and then sand with 220-grit to 400-grit paper. A waterborne finish, when applied over this surface, will not raise the grain very much. A light sanding after the first coat is required, but you would be performing this step when using a solvent-based finish, too.

I usually raise the grain with a coat of sanding sealer instead of

water. Most manufacturers offer sealers that are designed for their products. Sealers are usually formulated with stearates, which act as lubricants and make sanding easier. If you can't find a sealer, shellac works very well.

If the wood needs to be colored, I use one coat of water-soluble dye to raise the grain and then follow with a coat of sealer or shellac. When that dries, sand it. The sealer or shellac stiffens the fibers raised by the dye, making them much easier to sand. The sealer also gives you a buffer that keeps you from sanding through the dye to bare wood so quickly.

The amount of grain raised will vary with the type of wood. Open-grained woods, such as oak, will require more sanding than closed-grain woods, such as maple. I use wet-or-dry sandpaper in the 220-grit to 400-grit range, depending on how fine a surface I'm after. I don't use sandpapers that contain stearates. Small stearate particles that aren't cleaned off the workpiece surface will cause surface defects called fisheyes when waterborne finishes are applied over them. After sanding, use a slightly damp, lint-free cloth to wipe off the dust (see the bottom right photo on the facing page). By the time you get out your brushes or set up your spray equipment, the workpiece will be dry enough for a finish. Do not use tack rags because the resins in them can react with the finish and leave blemishes.

Make sure all finishing products are compatible

Waterborne topcoats must be compatible with any other fillers, stains or dyes that are applied. Most waterborne materials have improved and many are now compatible with solvent-based products. That does not mean that all materials will be compatible in all cases.

If, for example, you plan to apply waterborne lacquer over pigmented oil stain, give the oil-based product enough time to cure fully. Before applying the waterborne product, rough up the surface with a very fine-grit sandpaper so the first coat has a better chance to bite into the stain. Sometimes, two products demonstrate their incompatibility immediately and the topcoat will bead up or not flow out. Problems such as blistering can manifest themselves several days later. If you're unsure about compatibility, experiment on a piece of scrap.

The best way to eliminate any doubt about the compatibility of two products is to apply a barrier coat of sealer between them. The best sealer I have found is dewaxed shellac. Although you can buy shellac that has the wax already removed, often referred to as blond shellac, it can be hard to find and usually comes in large quantities. I buy clear, pre-mixed shellac in a 3-lb. cut and keep it undisturbed for a day or two until the wax settles to the bottom of the can. Then I pour off the clear, top fluid. I thin it down to 2:1 with denatured alcohol. Then I apply a fairly heavy, even coat of this, let it dry for about a half hour and lightly sand with 220-grit (or finer). The shellac not only seals in the first coat but helps the two potentially incompatible materials bond. It's never failed for me.

Thoroughly mix and strain finishing materials

Most waterborne finishes are designed to be used straight from the can and do not require thinning. The only thing you need to do before applying them is to stir up the solids that settle to the bottom of the can. These solids have a tendency to separate or settle out over time and may require a lot of stirring to get back into solution. The older the material, the more likely it contains

BRUSHING THE FINISH

Let the excess finish drip off the brush. *Rubbing the brush against the edge of the container may cause the finish to foam.*

Other causes of foaming— *If you shake a can of waterborne finish instead of stirring it, you'll have a problem with bubbles.*

Once you've started, work from a wet surface to a dry section. *Brush quickly and with the grain; let the bristles skate off the workpiece surface to lessen brush marks.*

Get the lumps out. *Waterborne finishes have a high solids content, so it's important to strain the material before spraying.*

lumps. As a final precaution, I always strain it through a plastic, paper or nylon-mesh filter (see the photo above).

Occasionally, you may need to thin a finish such as a thick, pigmented primer because it doesn't flow or spray well. Unlike traditional nitrocellulose lacquers, which can be thinned almost indefinitely, waterborne finishes are extremely sensitive and don't respond well to thinning. Waterborne materials contain carefully measured amounts of various chemicals including solvents, water, defoaming agents and resins. Adding another material to the mix can upset this balance. When that happens, the finish may be prone to runs and drips because it takes too long to dry.

If the finish isn't flowing out properly after brushing, check with the manufacturer to see if a flow-additive is available. As a last resort, try adding small amounts (3% to 5% by volume) of clean water. Ideally, you should use distilled water, but I have used plain tap water without any noticeable ill effects. If the finish seems to go on too dry when spraying in hot, dry conditions, you might want to add a retarder (the surface will look and feel fuzzy).

Choosing an application method

There are differences between waterborne topcoats made for spraying and those meant for brushing or padding. A spray finish is just that. If you try brushing it, the material may foam or dry too quickly. But I've found that any finish made for brushing can be sprayed with good results.

Most waterborne stains and dyes don't require any special application equipment and can be wiped or sprayed just like solvent-based stains. However, because waterborne products dry so quickly (in particular, water-soluble dyes), you will have to move rapidly when wiping them on. Be sure to flood the surface with a full, wet coat to avoid lap marks.

I usually get a good finish with two applications of topcoat. For added durability, such as you might need on a tabletop, I'd recommend three or more coats. Although waterborne finishes don't release the kind of noxious fumes some solvent-based finishes do, they still give off some vapors. So I take precautions. If I'm brushing finishes, I make do with some cross ventilation. When I'm spraying, I wear a respirator with organic vapor filters and ventilate the work area.

Select a synthetic bristle brush for finishing—Natural bristles will absorb the water in waterborne products and begin to splay and lose their shape. Synthetic bristles won't. When applying a finish, keep the brush wet, and don't scrape the bristles against the edge of the can (see the top left photo on p. 55). Let the excess material drip back into the container. This takes a little longer, but it will help prevent foaming. Then apply the material on the workpiece in a thin coat. Put it on too thick and you will get runs and sags. Always work quickly and from a wet edge to avoid lap marks (see the bottom photo on p. 55).

The more you brush the finish, the greater the likelihood it will begin to foam and bubble. If you experience foaming, add a flow additive for the finish, if one is available. If not, as a last resort, try adding a few drops of lacquer thinner, mineral spirits or milk to the finish. These additives can reduce the surface tension of the finish and improve flow. Disposable foam or sponge brushes and paint pads also work with waterborne materials. Apply the finish over the surface using quick, light passes.

Spraying gives the best results—A spray gun allows you to apply a full, even coat over an entire piece in a manner of minutes. The finish dries so quickly that, in most cases, you will be able to apply several coats in one day.

Because waterborne finishes contain a higher percentage of solids than most other finishes, they have a tendency to run or sag if applied too heavily. When spraying, lay on just enough material to leave a shiny, wet sheen on the surface of the wood, but not so wet that it begins to run.

If you catch a run or drip while it is still wet, wipe it off with a clean, lint-free cloth, and recoat the area immediately. Otherwise, use a razor blade to cut off any dried or skinned-over trouble spots, sand and recoat (for more on correcting spray finishing problems, see *FWW* #117, pp. 74-75).

Spray equipment that's made of plastic or stainless steel is best for use with waterborne products because those materials won't rust. But if your gun is made of metals that can corrode, you can ward off rust by drying it thoroughly after use by blowing compressed air through it. You can also remove any residual water by running a few ounces of denatured alcohol through the gun.

Weather conditions affect finishes

The cooperation of Mother Nature can certainly make a difference when applying finishes. When waterborne materials are applied on dry, warm days, they flow out smoothly, level quickly and dry to the touch in less than an hour, sometimes in a matter of minutes when spraying. Under ideal conditions (around 70°F with 35% to 50% relative humidity), you can apply several coats in one day. However, if your finishing room is cold or the humidity is high, waterborne products can become downright ornery.

When waterborne products are cold, they don't atomize

SPRAYING THE FINISH

Begin spraying before you reach the workpiece. *Hold the gun 4 in. to 6 in. away from the workpiece, and spray at a speed that makes the surface wet and shiny but not runny.*

Don't stop before the edge. *Keep spraying until the pattern falls off the edge of the workpiece. On the next pass, overlap the previous section.*

Many waterborne finishes look milky white when first applied. *The section closest to the author already shows signs of clearing up as he works toward the center of the table (right).*

properly, don't flow out well and take longer than normal to dry. Ideally, you should heat your finishing room. But there's another way. I've found that if I heat the finish to about 75° right before using it, I can apply topcoats in a room as cold as 45°F. All I do is place the can of finish in a sink or bucket full of hot water for a few minutes. (Never use a stove or open flame to heat any kind of finish material.) Warm finish is easy to spray, flows out well and dries quickly.

Lowering the humidity can be more difficult. In a small room, a dehumidifier can reduce the moisture content. But I have a large shop near the ocean and no equipment to reduce humidity. I have found that a fan blowing warm air over the piece being finished can offset the negative effects of high humidity.

Waterborne finishes, like other topcoats, can be rubbed out to increase or decrease their sheen (for more on rubbing out finishes, see *FWW* #119, pp. 46-49). Just remember to avoid steel wool, which can cause black spots if pieces of it lodge in the finish and rust. □

Andy Charron runs a production woodworking shop in Long Branch, N.J., and is the author of Spray Finishing *(The Taunton Press, 1996).*

Building a Basic Stool

Working with green wood can be fun as well as simple

by Harriet Hodges

A Windsor stool makes an ideal first project for beginners or a quick exercise for woodworkers who have been at it for a while. A stool comes in handy in most households, and it can make a welcome gift. Tool and wood needs are simple. Hardwood for the undercarriage must be clear and straight-grained, but you can use wood of dubious quality for the seat. The process of building a stool allows for mistakes: I once made a tenon ½ in. too long on one leg of a stool, and it still went together just fine.

Decide on a design

To get started with a stool project, you need to decide the number of legs, style of turning, how tall, seat shape and whether to upholster. You can choose the finish later.

Three legs or four? Even if you live in a house with a pitted earth floor, a stool with three legs will never teeter. Do decide the height now. Legs can be cut down later, but tapers look clumsy when they are sawed off too close to the end, and stretchers look silly too close to the ground.

Turned bamboo patterns are handsome and easy to make. I would advise against plain legs—they bespeak factory work. Add some coves and tapers or some beaded balls. Why not make your stool interesting or even playful? Make some cardboard templates, paint them black and live with them a little. Leg diameters in the drawing on the facing page are minimums for strength.

A bead or two on the perimeter of a seat makes a nice touch. If you dish the seat, don't overdo it. The dish doesn't add much to comfort. With a leather top—a luxurious touch—a groove accepts the leather and a rattan spline. Or, if you're using a soft wood, brass tacks secure the leather to the seat and add a decorative touch.

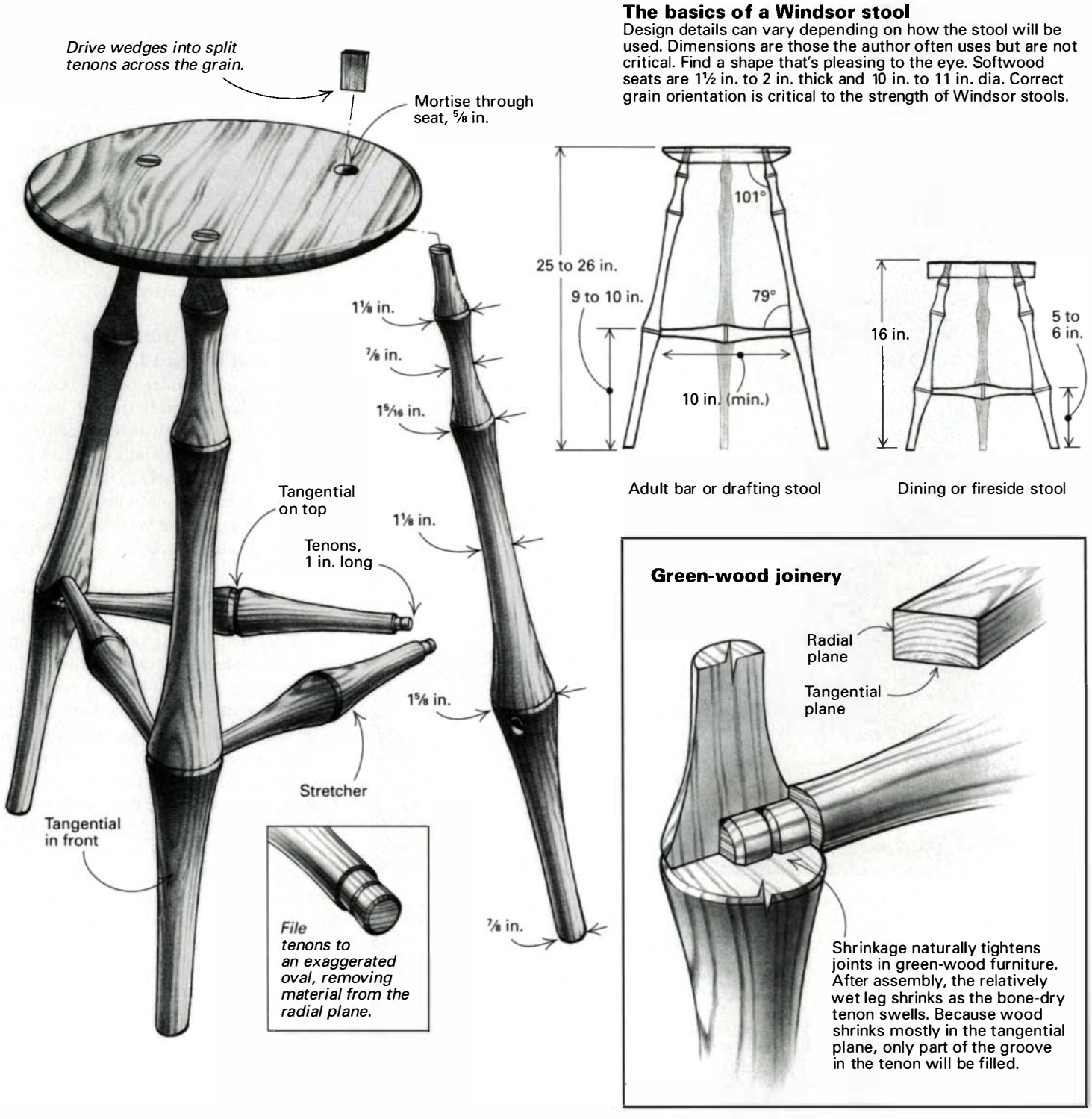
A seat diameter of 10 in. to 11 in. is approximate. Larger or smaller works. Allow enough space above the stretchers for two big feet. (I didn't do that on my delicate first stool and quickly renamed it a child's stool.) I like to limit the splay of the legs, but the more stability you want, the more splay you must have.

You'll need a brace and a sharp ⅝-in. bit, a bevel gauge, a protractor, a lathe and some turning tools, a thin-bladed saw, a chisel or two, and some splitting implements. Find a reamer (available from Garrett Wade; 800-221-2942) for shaping tapered holes in the underside of the seat and a tap wrench to hold it. Turn a test taper of very dry wood for the tops of the legs. Match the shape to your reamer to use as a master when turning the legs.

For the joinery to hold, the legs must be green hardwood; walnut, maple, cherry or beech all work well. But the seat, particularly for a first stool, should be a soft wood such as basswood, horse chestnut, pine or poplar. The wood will more easily compress around the tenons of the legs and make better-looking joints that go together smoothly. For the legs, secure a bolt of hardwood about 12 in. dia. and as straight-grained as possible. The bolt should be recently felled and, exclusive of the pith and the sapwood, should allow 2½-in.-sq. pieces to be split from it. Minor defects are acceptable. The leg should be long enough to remove any checking.

Split the bolt with an ax or a froe as close to 2½ in. as you dare. Square up the shapes with a bandsaw if you have one, taking

Photos: William Duckworth



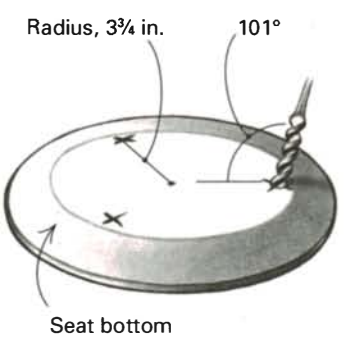
special care to make cuts parallel to an annual ring in the radial plane. You want to follow the grain of the wood to build in maximum strength. Cutting across the grain allows fibers to lift and form a split. For the seat, almost any piece of 1½-in.- to 2-in.-thick wood is fine as long as it has been dried for at least six months and has been stored outside to around 30% moisture content. Have on hand some dry, straight-grained hardwood for wedges.

Turn the seat and legs on a lathe

I like to use an English prick plate and double-faced tape to hold the seat blank in the lathe. A prick plate is a round blank screwed to a faceplate, through which sharp nail points protrude by about 3⁄16 in. It will, with the tailstock tight against the workpiece, hold a flat blank nicely in the lathe. You can also drive screws through your faceplate into what will be the bottom of your seat. (Call it vanity, but I don't like screw holes, filled or not.) With either method, turn the underside and the side edges first.

Once you've roughed out your leg stock, cut it to length. Make a story stick of your design, with marks to indicate diameters. Round stock to its largest diameter; turn the middle before heading for the ends. The tenon is the only part of the leg needing precision. It must match your test taper but be a hair oversized to allow for shrink-

Drawings: Michael Gellatly



Boring holes in seat—*The author sights angles from two directions using a sliding bevel gauge and a mirror to align bit to bevel (photo and drawing above). The reamer (right) cuts a taper in the hole to match that on the tops of the legs.*

age in a makeshift kiln you'll use later.

If you are fairly new to turning, I recommend removing your first leg from the lathe and setting it upright to look at it. What looks good horizontally is often clumsy in the vertical plane—a trick the eye plays. Once you are pleased with the design and proportion of your first leg, turn the rest. Mark the line where the stretchers go with a skew tip. Sand the legs through 220-grit for a paint finish and 400-grit for a natural finish. Moisten them, let dry and lightly sand off the raised grain.

Bore and ream the holes in the seat by hand

You want the leg holes on the bottom of the seat to line up properly with the grain pattern in the seat. With three-legged stools, put one leg on the centerline. Mark sight lines from each leg hole to the seat center. Prick the hole centers with an awl, and clamp the seat to the workbench so that the area you bore through will overhang the bench.

Set your bevel gauge to 101°, or another desired angle, and center it on the sight line. Bore with a ⅝-in. bit in a brace until you can just feel the point poke through. Check angles as you drill with a mirror and by eye (see the top photo at left). Flip the seat, and bore through the other side to prevent tearout on the top of the seat.

Ream the holes from the bottom of the seat (see the bottom photo at left) until the test taper fits a hair proud all around the top of the seat. As you ream, test the angle with a bevel gauge set parallel to the sight line and a try square set perpendicular to it. If this is your first stool, it is likely your tapered holes will vary, so aim to match each leg to a hole. I use colored stick-on tabs to match them up (see the bottom photo on the facing page). Fit a leg to a hole until the leg is slightly proud on the topside. Mark around the leg. You want all legs proud by about the same amount, roughly ¼ in. or so. Mark the ends of the legs for wedges, and saw thin kerfs.

Once your legs are fitted, align them in the holes so that the grain orientation is correct; the grain pattern will be in the tangential plane facing out at the points where the stretchers go (see the drawing on p. 59). Pound them lightly into place. Sight through one leg to find the center of its opposite. Mark this spot with an awl. Turn the stool. Sight again and mark the other leg. Do the same to mark all the holes for the stretchers. Measure and record the dis-

tances between the awl marks on matched pairs, and add for tenons. Don't be alarmed if stretcher lengths are not equal. It doesn't matter. Cut stretchers to size, turn them on the lathe and sand them.

Fit the stretchers to the legs

Just as you fit leg tenons to the seat, stretcher tenons must be matched to leg mortises. Wrap legs and stretchers in aluminum foil, except the tenon ends, and put them in a kiln, such as a gas oven with the pilot on. The tenons should come to near zero moisture content, and the rest of the leg should retain enough moisture to shrink around the tenons. The pieces should feel faintly damp when you unwrap them.

File a small amount of material from a tenon on one of the stretchers in the radial planes. This intentional slop is where swelling will take place once the pieces are joined. Chamfer the end slightly. Try the fit in a scrap that can be split off the tenon if it gets stuck. If the tenon slips in easily, it's too small. If the tenon won't penetrate with moderate hammer blows, it's obviously too big. Judicious filing works. Or put the piece back on the lathe. When the tenon fits tightly, record its diameter with vernier calipers and prepare the others.

For boring holes in the legs, a reliable holding system is a must, no easy matter with tapered stock (see the top right photo). Drill all the holes in the legs using a bevel gauge and a mirror. As for jigs, you don't need them: Your hands and eyes are capable of more than enough accuracy.

Assemble stool, and level legs

Once you're sure all the joints will align and fit right, glue the stretcher assembly first. Pound parts together with a mallet. Be quick; the tenon is swelling.

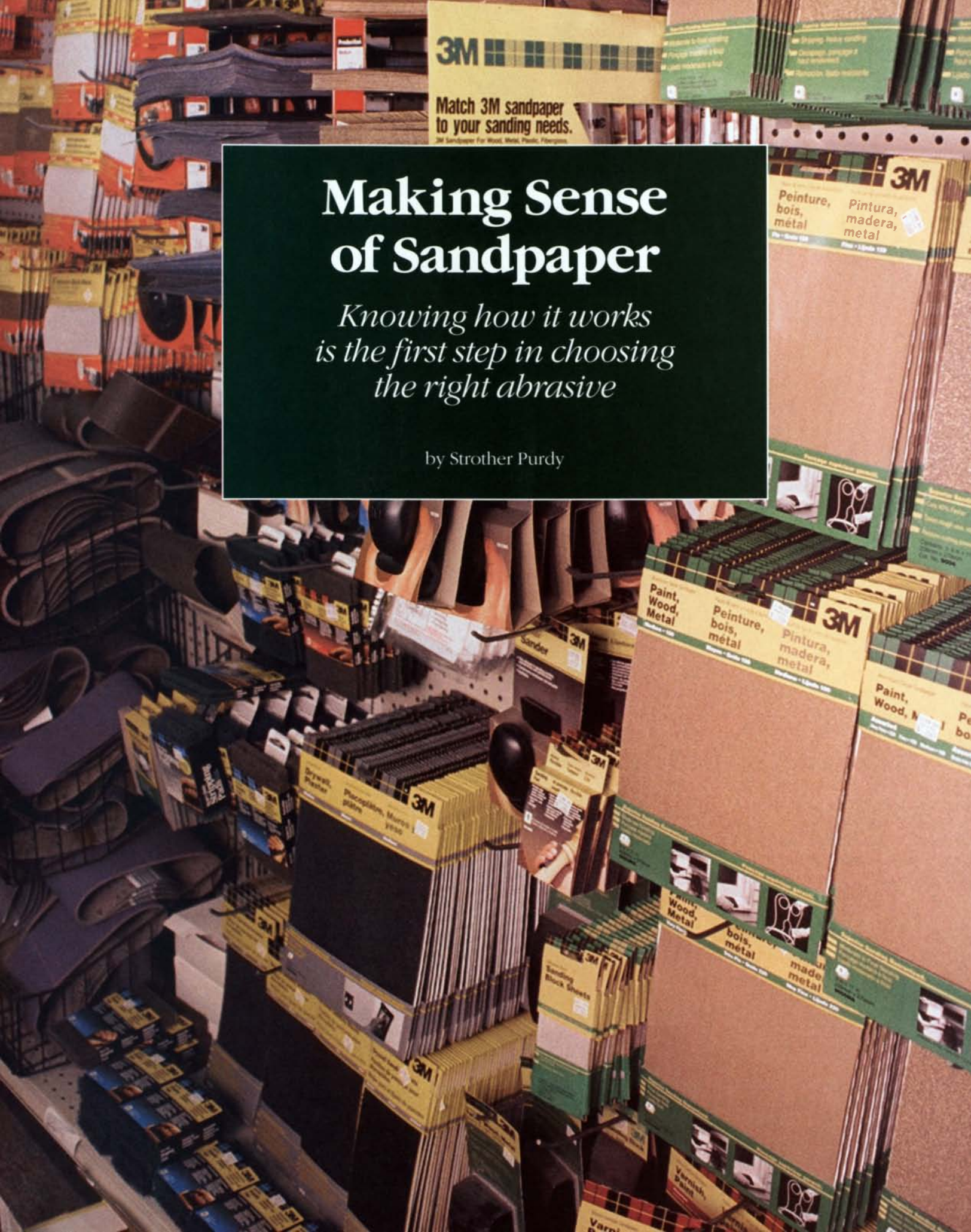
After legs and stretchers are together, place the seat upside down on blocks on the bench, and swab the mortises lightly with glue. Work glue into the tenon kerfs, and wrestle the assembly into place. Pound legs alternately, stopping when the sound changes. Turn the stool over. Hammer in glue-smeared wedges. Cut small wedges to fill in any smaller gaps. Let the glue dry before trimming tenons. Scrape and sand the seat smooth. Set the stool on plate glass. Make sure it's level and steady, blocking it up if not. Mark all around, saw off the legs on the marks and chamfer the edges. □

At her farm in New Castle, Va., Harriet Hodges makes Windsor chairs and stools.

Dry-fit the legs to measure the stretchers. *Stretchers are cut to fit; it doesn't matter whether all the stretchers are the same size.*

Wedges and dogs hold the legs in place *when boring holes for the stretchers. Three dogs hold the workpiece firmly at a comfortable height off the floor.*

Colored tabs make a quick visual index *of one part of the stool to another. The author supports the seat on scrap blocks when pounding legs in place.*



Making Sense of Sandpaper

Knowing how it works is the first step in choosing the right abrasive

by Strother Purdy

Years ago at a garage sale, I bought a pile of no-name sandpaper for just pennies a sheet. I got it home. I sanded with it, but nothing came off the wood. Sanding harder, the grit came off the paper. It didn't even burn very well in my wood stove.

Sanding is necessary drudge work, improved only by spending less time doing it. As I learned, you can't go right buying cheap stuff, but it's still easy to go wrong with the best sandpaper that's available. Not long ago, for example, I tried to take the finish off some maple flooring. Even though I was armed with premium-grade, 50-grit aluminum-oxide belts, the work took far too long. It wasn't that the belts were bad. I was simply using the wrong abrasive for the job. A 36-grit ceramic belt would have cut my sanding time substantially.

The key to choosing the right sandpaper is knowing how the many different kinds of sandpaper work. Each component, not just the grit, contributes to the sandpaper's performance, determining how quickly it works, how long it lasts and how smooth the results will be. If you know how the components work together, you'll be able to choose your sandpaper wisely, and use it efficiently. Then you won't waste time sanding or end up burning the stuff in your wood stove.

Sandpaper is a cutting tool

What sandpaper does to wood is really no different from what a saw, a plane or a chisel does. They all have sharp points or edges that cut wood fibers. Sandpaper's cutting is simply on a much smaller scale. The only substantial difference between sandpaper and other cutting tools is that sandpaper can't be sharpened.

Look at sandpaper up close, and you'll see that the sharp tips of the abrasive grains look like small, irregularly shaped sawteeth (see the drawing on p. 67). The grains are supported by a cloth or paper backing and two adhesive bonds, much the way that sawteeth are supported by the sawblade. As sandpaper is pushed across wood, the abrasive grains dig into the surface and cut out minute shavings, which are called swarf in industry jargon. To the naked eye, these shavings look like fine dust. Magnified, they look like the shavings produced by saws or other cutting tools (see the inset photo at right).

Even the spaces between the abrasive grains serve an important role. They work the way gullets on sawblades do, giving the shavings a place to go. This is why sandpaper designed for wood has what's called an open coat, where only 40% to 70% of the backing is covered with abrasive. The spaces in an open coat are hard to see in fine grits but are very obvious in coarse grades.

Closed-coat sandpaper, where the backing is entirely covered with abrasive, is not appropriate for sanding wood because the swarf has no place to go and quickly clogs the paper. Closed-coat sandpaper is more appropriate on other materials such as steel and glass because the particles of swarf are much smaller.

Some sandpaper is advertised as non-loading, or stearated. These papers are covered with a substance called zinc stearate—soap, really—which helps keep the sandpaper from clogging with swarf. Stearated papers are only useful for sanding finishes and resinous woods. Wood resin and most finishes will become molten from the heat generated by sanding, even hand-sanding. In this state, these substances are very sticky, and given the chance, they will firmly glue themselves to the sandpaper. Stearates work by attaching to the molten swarf, making it slippery, not sticky, and preventing it from bonding to the sandpaper.

What goes on between belt sander and board? *Sandpaper is a kind of cutting tool, like a saw or a plane. Magnified at left, swarf from sanding with the grain looks like shavings from a ripsaw.*

Methods for sanding efficiently

Sanding a rough surface smooth in preparation for a finish seems a pretty straightforward proposition. For a board fresh out of the planer, woodworkers know to start with a coarse paper, perhaps 80-grit or 100-grit, and progress incrementally without skipping a grade up to the finer grits. At each step, you simply erase the scratches you made previously with finer and smaller scratches

Photos: Strother Purdy

Aluminum oxide

Trade names
Adalox
Aloxite
Imperial
Metalite
Production
Three-M-ite

Aluminum oxide is a sharp and blocky mineral. It is the most common, all-purpose woodworking abrasive, and for good reason. It is the only abrasive mineral that fragments under the heat and pressure generated by sanding wood. This characteristic is called friability and is highly desirable. As you sand, aluminum oxide renews its cutting edges constantly, staying sharp and cutting much longer than other minerals.

Aluminum oxide is also a relatively tough abrasive, which means that its edges won't dull much before they fragment. Its friability and toughness make aluminum oxide the longest lasting and the most economical mineral.

All aluminum oxides are not created equal. 3M alone manufactures 26 different kinds, ranging greatly in toughness and friability. The toughest grades are nearly white in their raw form and are used on premium-grade sandpapers. The softest grades are dark brown and more appropriate for sandblasting than sanding. Some cheap sandpapers have blast-grade aluminum oxide on them. No manufacturer is going to tell you which kind is on which sandpaper, however, and it's impossible to judge by the color of the sandpaper because a size coat covers and colors the mineral. If one brand's aluminum-oxide paper doesn't work well, don't judge all aluminum oxides by it. Simply try another.

Silicon carbide

Trade names
Durite
Tri-M-ite
Fastcut
Powerkut
Wet-or-dry

Silicon carbide is black and iridescent, and the grains are shard-shaped (see the photo below). Unlike aluminum oxide, there is only one kind of silicon carbide. It is harder and sharper than most aluminum oxides, making it the better choice for cutting hard materials, such as finishes, paint, plastic and metal. Consequently, you'll probably find the widest range of silicon carbide sandpapers in a good auto-body supply store.

Silicon carbide sandpapers for woodworking are almost always on waterproof paper and intended for sanding finishes. Though silicon carbide is a friable mineral, it is so hard that sanding wood will not cause it to fragment and renew its cutting edges. Though it will sand faster at first, it will dull more quickly than aluminum oxide. It is also generally more expensive than aluminum oxide.

Abrasive grains are little sawteeth. *This is 24-grit silicon carbide sandpaper before a size coat has been applied. It is easy to see how sharp the particles are.*

until, at 180-grit or 220-grit, the scratches are too small to see or feel. But there are a fair number of opinions on how to do this most efficiently.

Don't skip grits, usually—Skipping a grit to save time and sandpaper is a common temptation, but not a good idea when working with hardwoods. You can remove the scratches left by 120-grit sandpaper with 180-grit, but it will take you far more work than if you use 150-grit first. You will also wear out more 180-grit sandpaper, so you don't really save any materials. When sanding maple, for instance, skipping two grits between 80 and 180 will probably double the total sanding time. This, however, is not as true with woods such as pine. Soft woods take much less work overall to sand smooth. Skipping a grit will increase the work negligibly and may save you some materials.

Sand bare wood to 180- or 220-grit—For sanding bare wood, 180-grit will generally give you a surface that looks and feels perfectly smooth and is ready for a finish of some kind. Sanding the surface with a finer grit is only necessary if you're going to use a water-based finish. These finishes will pick up and telegraph the smallest scratches. Sanding the wood to 220-grit or finer will pre-

Ceramics

Trade names
Norzon
Dynakut
Regalite

Ceramics come in a wide variety of shapes, from blocks and heavy wedges to flake-like shards. They're all more costly and less common than other abrasive minerals. All of them are very tough and very aggressive.

Like silicon carbide, ceramics are not friable, and do not renew their cutting edges when sanding wood. But they don't dull as quickly because of their extreme toughness. This makes them the best choice for hogging off stock, roughing out shapes, removing finish and leveling uneven boards. For this reason, they are generally available only in coarse-grit cloth belts for stationary and portable sanders.

Ceramic mineral names and the trade names they're sold under are not easy to sort out. Though Cubitron sounds like a trade name, it's a ceramic mineral. One of its trade names is Cubicut. When mixed with aluminum oxide, it's sold as Regalite. Alumina zirconia is the name of a ceramic mineral. Sometimes it's marketed as aluminum zirconia, as if it were another type of mineral. It's also sold under the trade names Norzon and AZ as a ceramic mineral.

Abrasive manufacturers make these names intentionally confusing to avoid losing their copyrights. If a trade name becomes synonymous with the product in the public's mind (think of a thermos), then any company can use it.

Garnet

Trade names
None

Garnet is the only natural abrasive mineral still widely used for woodworking. Like aluminum oxide, it is blocky in shape. Unlike aluminum oxide, it is non-friable, not very tough and dulls very quickly. This is not necessarily a defect. The softer cut of a garnet paper, though slow, will produce the smoothest finish of all the abrasives within a given grit size. Because it is so soft, garnet will not leave pigtail-like scratches the way an aluminum oxide will when used on a random-orbit sander. This makes it well-suited for final sanding of wood surfaces.

Garnet is an excellent choice for final sanding end grain and blotch-prone wood. Garnet's peculiar tendency to burnish wood—close off pores—makes a stain penetrate far more evenly though less deeply (see the photo at left).

Pigmented stain prefers a garnet-sanded surface. *Both sides of this test board were sanded to 150-grit, the left with an aluminum-oxide paper and the right with a garnet paper.*

pare the surface better. However, it's not always wise to sand to a finer grit. You will waste your time if you can't tell the difference, and you may create problems in finishing. Maple sanded to 400-grit will not take a pigmented stain, for example. Pigments work by lodging themselves into nooks and crannies on the surface; without them, they will have no place to stick.

Sand faster across the grain—How many times have you been told never to sand across the grain? True enough. The scratches are much more obvious, look terrible and are hard to remove with the next finer grit. But what holds true for planing wood is also true for sanding. You will plane and sand faster and more easily when the direction of your cuts is between 45° and 60° to the grain, because the wood-fiber bundles offer the least resistance to the cutting edges. Cross-grain scratches are harder to remove simply because they are deeper.

Use a combination of cross-grain and with-grain sanding to get the smoothest surface in the fastest manner. First make passes at 45° to 60° to both the left and the right, making an X-pattern on the workpiece. Then, with the same grit, sand with the grain to remove the cross-grain scratches. Do this with each grit when belt-sanding and hand-sanding. The non-linear sanding action of random-orbit

Abrasive grading systems

The most common grading systems used in North America are CAMI, FEPA and micron grading. CAMI and FEPA are similar in grades up to about 220. Beyond that, they diverge greatly.

	CAMI (U.S. Std.)	FEPA (P-scale)	Micron (μ)
finishing	1,200		5
	1,000		9
	800		
	600	1,200	15
	500	1,000	
	400	800	20
	360	600	
	320	500 400	30
	280	360	40
	240	280 240	45 50
	220	220	60
	180	180	
smoothing	150		80
	120	150	100
	100	120	
	80	100	150 180
	60	80 60	
	50	50	
	40	40	
shaping	36	36	
	30	30	
	24		
	20	24	
	16	20	

The three systems grade particle size to different tolerances but by the same methods. From the coarsest grits up to about 220, particles are graded through a series of wire mesh screens. The smaller grit sizes are graded through an air- or water-flotation process that separates particles by weight.

CAMI-graded abrasives tolerate the widest range of particle sizes but are perfectly good for sanding wood.

P-graded abrasives are to tighter tolerances than the CAMI grades.

Micron-graded abrasives are most uniform in size and best for sanding finishes.

and orbital sanders can't take advantage of the wood's grain properties. When I use my orbital, I just sand with the grain.

Choosing from the four abrasive minerals

Four common abrasive minerals are aluminum oxide, silicon carbide, ceramics and garnet. Except for garnet, they are all manufactured, designed if you will, for different cutting properties. Harder and sharper minerals cut deeper scratches and, consequently, sand the wood faster. But these deep scratches leave a coarse finish, whether you sand with or across the grain.

Softer minerals within the same grit size will cut far more slowly but leave a smoother finish. For example, if you sand a board on one side with a 120-grit ceramic, the hardest abrasive mineral, and the other side with 120-grit garnet, the softest, you will be able to feel a distinct difference between the surfaces. It will seem as if you sanded the two sides with different grit sizes.

It's easy to rate each mineral's hardness and sharpness, but it's not as simple to prescribe specific uses beyond generalizations. There are many other factors that influence the appropriateness of a sandpaper for a job (see the boxes on pp. 64-65).

Some fine points about grading scales

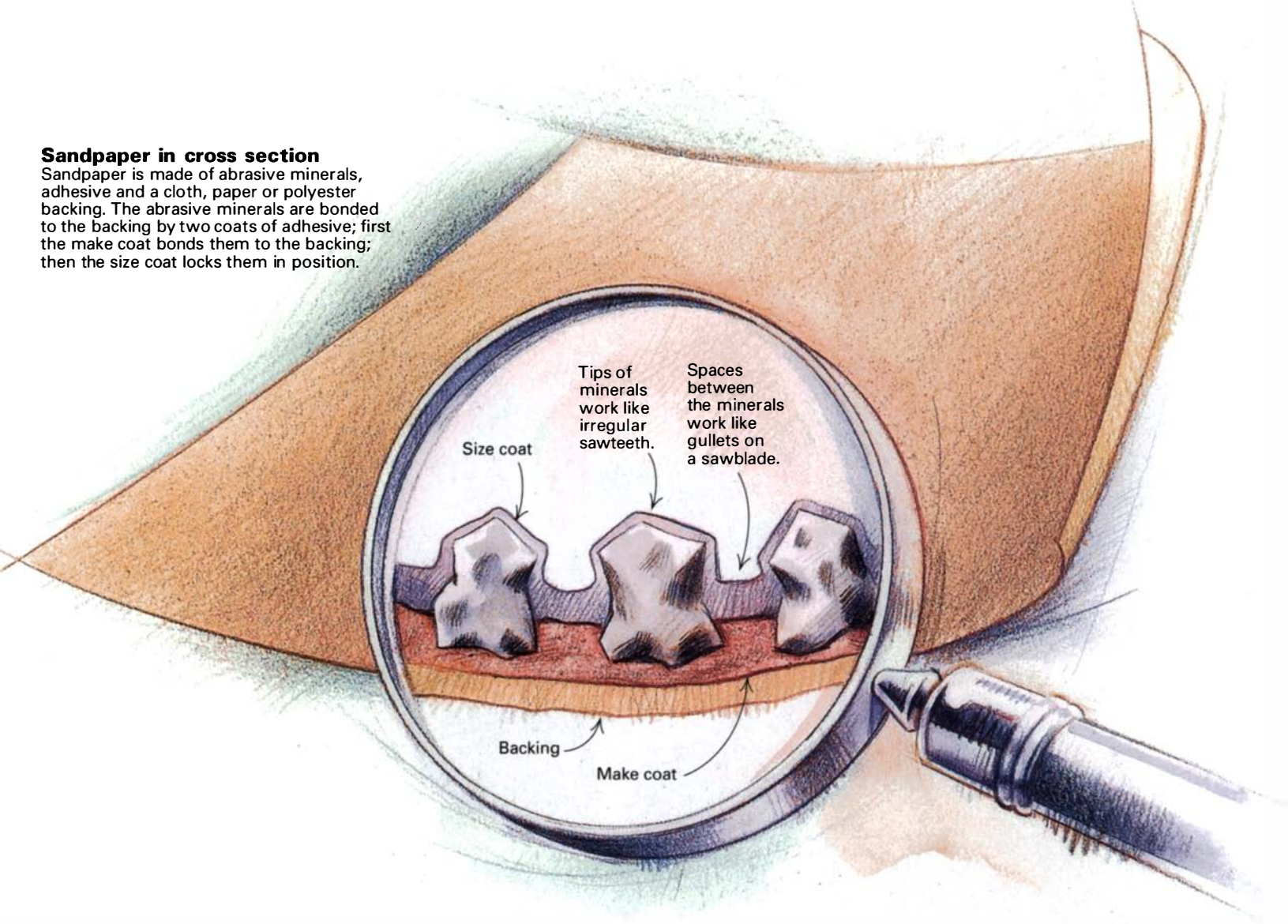
If you don't mind that we have two measurement systems, the U.S. Customary (foot, gallon) and the International (meter, liter), then you won't mind that we have three major abrasive grit-grading systems. In North America, the Coated Abrasives Manufacturers Institute (CAMI) regulates the U.S. Standard Scale. CAMI-graded sandpapers simply have numbers, such as 320, printed on them. The Europeans have the P-scale, regulated by the Federation of European Producers Association (FEPA). These abrasives are identifiable by the letter P in front of the grit size, such as P320. Finally, to make sure everyone is really confused, there is a totally different micron grading system. This system is identified by the Greek letter mu, as in 30μ.

The chart at left is helpful in comparing grits of the three grading systems, but it doesn't tell the whole story. Abrasives on the P-scale are graded to tighter tolerances than CAMI-graded abrasives. This means that the CAMI-scale tolerates a wider range of grain sizes within the definition of 180-grit than the P-scale. Tolerances are even tighter for micron grading. P-graded and micron-graded abrasives give more consistent cuts with fewer stray scratches from outsized minerals.

Micron-graded abrasives on polyester films are about three times as expensive as paper products and probably not worth it for sanding wood. I have a hard time telling the difference between wood sanded with a 100μ finishing film abrasive and standard 120-grit sandpaper. But for polishing a high-gloss finish, I find micron-graded abrasives make a substantial difference.

Discs don't flex, they break. *The adhesive and backing on a random-orbit sanding pad can crack if the disc is folded like ordinary sandpaper.*

Sandpaper in cross section
Sandpaper is made of abrasive minerals, adhesive and a cloth, paper or polyester backing. The abrasive minerals are bonded to the backing by two coats of adhesive; first the make coat bonds them to the backing; then the size coat locks them in position.



The supporting role of backings and bonds

The backing's stiffness and flatness influence the quality and speed of the sandpaper's cut. For the most part, manufacturers choose adhesives and backings to augment the characteristics of a particular abrasive grit. You will have a hard time finding an aggressive abrasive mineral, for example, on a backing suited to a smooth cut.

The stiffer the paper, the less the abrasive minerals will deflect while cutting. They will cut deeper and, consequently, faster. Soft backings and bonds will allow the abrasives to deflect more, giving light scratches and a smooth finish. You must even consider what's behind the backing. Wrapping the sandpaper around a block of wood will allow a faster cut than sanding with the paper against the palm of your hand. For instance, an easy way to speed up your orbital sander is by exchanging the soft pad for a stiff one (see the photo at left). The other consideration is the flatness of the backing, which has nothing to do with its stiffness. Flat backings position the minerals on a more even level so they cut at a more consistent depth, resulting in fewer stray scratches and a smoother surface.

Soft pads let the sandpaper deflect. *Soft backings on sanding tools won't support the sandpaper and make it cut more slowly.*

Cloth is the stiffest but least-flat backing. It will produce the coarsest and fastest cut. Cloth comes in two grades, a heavy X and a light J. Paper is not as stiff as cloth but it's flatter. It comes in grades A, C, D, E and F (lightest to heaviest). A-weight paper that has been waterproofed is approximately equivalent to a B-weight paper, if one existed. Polyester films, including Mylar, look and feel like plastic. They are extremely flat and pretty stiff. They will give the most consistently even cut and at a faster rate than paper.

The backings for hand sheets and belts are designed to flex around curves without breaking. This is not true for sanding discs for random-orbit sanders. They are designed to remain perfectly flat, and if used like a hand sheet, the adhesive will crack off in large sections (see the bottom photo on the facing page). This is called knife-edging because the mineral and adhesive, separated from the backing, form knife-like edges that dig into and mark the work.

Adhesive bonds on modern sandpaper are almost exclusively urea- or phenolic-formaldehyde resins. Both are heat-resistant, waterproof and stiff. Hide glue is sometimes used in conjunction with a resin on paper sheets. It is not waterproof or heat-resistant, but hide glue is cheap and very flexible. □

Strother Purdy is an assistant editor of Fine Woodworking.

Drawing: Tim Langenderfer

First-Aid for Failing Joints

How to tackle common furniture repairs

by Jeff Jewitt

Well-executed joinery will last a long time, but even the best joints may not hold up to the abuses of feisty 2-year-olds and careless moving companies. After the ravages of time and use, most furniture will need some sort of repair.

Recutting original joinery or replacing an entire part may not be the right course if the furniture is a valuable antique. But if your furniture is not destined to become part of a museum collection, repairing a broken joint involves dismantling it and replacing worn or damaged pieces with wood from the same species (see the photos on pp. 70-71).

No joint repair can begin until the piece of furniture has been taken apart, and well-meaning novices and poorly trained professionals who worked on the piece earlier can make your life difficult. Nails, screws and metal brackets are often installed on loose joints in an effort to repair them. Glue is dribbled into partially opened joints, and hot-melt glue is used too often. Many production furniture pieces were pinned with small finishing nails to hold glued joints together until they set, eliminating the need for clamps, but making disassembly a chore.

Remove fasteners, and soften glue joints

Fasteners need to be removed so the joint comes apart easily. To pry out small nails, regrind the outer jaws of pincers to grab nails set flush with the surface (see the photo at left on the facing page). I find that it's best to leave nails set below the surface rather than push them through. This will split the mating piece when the joint is pried apart, but that's easier to repair than the damage done to the visible surface of the wood.

With old flat-head screws,

make sure the tip of the screwdriver fits snugly in the slot to avoid stripping the head. I keep an old driver on hand that I regrind for a custom fit. For frozen screws, hold a screwdriver in the slot, and heat the shank of the screwdriver with a propane torch to transfer the heat to the screw (see the far right photo). After the screw cools, it should come out easily. A screw extractor is the last resort.

Prior to the mid-1940s, hot animal hide glue was the standard for furniture assembly. After that, polyvinyl acetate (PVA) glues took over. A simple test will tell you which glue was used. Place a drop of hot water on the glue, and wait several minutes. Hide glue will become sticky, and PVA glues will turn a milky white (see the bottom left photo).

One attractive characteristic of hide glue is that it is reversible. It can be softened with water and heat or crystallized with denatured alcohol for really stubborn joints (see the bottom right photo). And new hide glue will bond to old glue. This means that joints originally glued with hide glue do not have to be scraped to bare wood to get the new glue to stick.

PVA glues are very difficult to remove, but wetting a joint with hot vinegar often loosens it enough to wiggle it apart. PVA glue does not re-bond to itself, so you must scrape it off to the bare wood. Follow the hot vinegar with a brass bristle brush to clean off residue.

Because of previous attempts at repair, you may encounter other glues: epoxy, urea-resin or cyanoacrylate. None of them can be softened to aid in disassembly, but most will break at the glueline with a soft but sharp hammer blow delivered with a rubber mallet.

Besides diagnosing the kind of glue that was used, you need to know the type of joint that needs repair. With few exceptions, it's probably one of the three most common joints used in furniture construction: mortise and tenon, dowel or dovetail.

***Pincers ground flat,** like those on the left, will grab nails set almost flush to the surface.*

***Heat a frozen screw** by torching the shank of a screwdriver held in the slot of the head. Once the screw is cool, it's easy to remove.*

Mortise and tenon

Because a mortise and tenon joins wood with grain at right angles, expansion and shrinkage eventually cause the glue to fail, loosening the joint. Cabinetmakers have known this for centuries, so variations of the standard joint have been devised. When a standard mortise-and-tenon joint fails, it is easy to disassemble by deactivating the glue and pulling the joint apart. When the joint is pegged or wedged, it will be loose, but it will still hold together. To disassemble these joints, the pins or wedges must be removed.

Through, blind and offset pegs—Pegs that go completely through the joint and come out the other side can be tapped out. On old furniture, these pegs were usually tapered and driven into place from the show side, so tap from the back side. If the pegs can't be tapped out easily, then drill them out.

Pegs that don't go through to the other side must be drilled out if they can't be pulled out with pliers. Later, when replacing them, use pegs of the same species and hand-whittle them to duplicate

***A simple test identifies glue.** Water turns PVA glue white and makes hide glue sticky. Knowing which type was used makes taking furniture apart much easier.*

***Alcohol crystallizes hide glue.** The author wicks denatured alcohol into a dovetail joint, weakening the bond.*

Photos: William Duckworth

***A broken tenon can be rebuilt** by drilling out what's left and gluing in a new piece. Veneer can be used to build up the tenon to the correct thickness.*

original construction. It's worth repeating that on valuable pieces, this should only be done if the primary consideration is restoring structural integrity.

Pegs that are driven in offset holes in the tenon are impossible to distinguish from blind or through pegs unless the joint is taken apart. You will rarely have to repair this joint because it won't loosen enough to be a structural problem—unless the surrounding wood becomes weakened through rot or wood worm.

***Adding a new tail**—To replace a broken tail, define the angle of the saw cut into the piece by following that of the original joint. The long V-shaped cut allows plenty of glue surface for a good grab.*

***Wedged through tenons and blind tenons**—*If a through tenon does not pull apart easily when the glue is deactivated, the tenon may be wedged. In most cases, wedges will be of a contrasting or slightly dissimilar wood and should be easy to see. You can pull them out after drilling small holes into the wedges. In some cases, the wedges are made from the same wood and are difficult to spot. In this case, you'll need to drill two sets of holes with a 3⁄32-in. drill bit at the top and bottom of each tenon. That should be enough to collapse the tenon as you pull it out of the mortise.

Rebuilding mortises and tenons

If you scraped away a lot of wood to remove the glue, you may need to build up the cheeks of the tenon to get a good fit. Simply glue two pieces of veneer cut slightly oversized to the tenon cheeks, orienting the grain in the same way and using wood of a similar species. Don't add veneer to one side only: It will offset the tenon.

When a tenon is broken off, it must be rebuilt (see the photos above). Cut away the broken parts flush to the shoulder, and drill a series of holes 1 in. to 1½ in. deep, using a drill bit of the same diameter as the width of the original tenon. Chop out the waste, and cut a new piece of wood to splice into the old one, using the original mortise to size the thickness.

Round tenons, often found on chairs, are another matter. Rarely does the design provide enough meat to accept a dowel of the same diameter as the tenon. To repair these joints, cut off the tenon, and glue on a new piece of oversized wood with a scarf joint. The new piece is then planed and spokeshaved to the original profile (see the photos at right).

Dowels often need to be replaced

Since the mid-1850s, dowels have been used as replacements for mortise-and-tenon and dovetail joints. Though despised by purists, properly installed dowels create strong and durable joints. But contrary wood movement will sometimes loosen dowels until they need to be reglued or replaced. Some dowels will simply loosen because the grain of the dowel is at a right angle to the grain of the furniture component. If the joint is already loose, it can usually be tapped apart with a soft-faced mallet and then reglued.

If a dowel breaks, it must be drilled out and replaced. The new dowel must seat exactly like the old one to avoid misalignment of the joint. Here's how I do it: Cut the old dowel flush to the surface of the workpiece (held in a padded vise). Using a brad-point or Forstner bit slightly smaller than the diameter of the dowel, drill out the center. When the bit reaches the bottom of the dowel hole, you'll feel the bit slip a little,

and you can stop. Using a gouge with a sweep that matches the dowel's circumference, pare the excess dowel away from the sides of the hole. To remove the waste, run a drill bit of the same diameter as the new dowel backward into the hole. That keeps the bit from catching and ripping the hole apart.

To check the fit, don't use new dowels; they can seize in the joint and become difficult to remove. Use dowels that have been pared or sanded, so

they're easier to remove after a test-fit. Replace those with full-sized dowels for final glue-up.

Dovetails: through, half-blind and sliding

These classic joints form a mechanical lock in addition to the glue bond. Like the mortise and tenon, dovetails come in several variations. The most common versions found on furniture are through, half-blind and sliding. Through dovetails are found on carcases and drawers. Half-blind dovetails are the traditional favorite for drawer fronts; sliding dovetails are used for table legs and on chair crests.

The biggest problem with these joints is often a broken pin or tail. After disassembling the joint, a new piece is spliced in and then pared down until it fits with the mating joint (see the bottom left photo). With sliding dovetails, like those where legs join the column of a candle stand, the biggest problem occurs when a leg is racked until the glueline cracks. Because there's rarely any structural damage to the wood, repairing the joint is easy, but getting it apart is not. Drilling small holes down the outermost points of the male portion of the joint and injecting alcohol or hot water into the holes will usually coax the joint apart. □

Jeff Jewitt restores and refinishes furniture in North Royalton, Ohio. He is the author of Hand-Applied Finishes *(The Taunton Press).*

LEG REPAIR

Repairs to a broken tenon on a rocker chair leg start with a no-going-back slice that removes the bottom of the leg (1). The cut is made at 30° or less. On a piece of wood of the same species, the author sketches out a replacement part (2), cuts it out and glues it to the end of the leg with a scarf joint. To shape the new tenon at the end of the leg, the author starts with a plug cutter (3). With the size of the tenon established, a fine-tooth saw (4) is used to make a light cut around the leg and define the tenon shoulder. A chisel pares the tenon down to its finished size (5). Careful staining and finishing will blend the new leg (6) with the rest of the rocker, making the repair virtually invisible.

Fitting a Drawer

A traditional British approach to the classic piston fit

by Alan Peters

My wife, Laura, doesn't understand why I make such a fuss about drawer fitting. The drawers in our kitchen cabinets slide on plastic runners, and she says they work better than the drawers in any of my furniture. I can't argue with that—those nylon rollers do their job well. But plastic slides don't belong on dovetailed drawers. Fine furniture requires another solution, an approach that substitutes craftsmanship for the manufactured precision of drawer slides.

The technique we use in my workshop involves three successive levels of fitting. The first is of the individual drawer parts, then the assembled drawer without its bottom and, finally, the drawer with its bottom installed. The result is a drawer that fits so well that it's slowed by a cushion of air as you push it in. And when you pull out the drawer, any other drawers in the case are gently pulled back into the nearly airtight case. It takes time to achieve this piston fit, but the results speak for themselves. Other furnituremakers may pride themselves on their dovetails or some other joinery, but for me, a finely fitted drawer is the benchmark of a craftsman's skill.

Well-built drawers start with stable wood

Drawer sides should only be made of top-quality, mild-grained and, preferably, quartersawn stock. What you are looking for is wood that will remain straight, move very little with shifts in humidity and plane easily and cleanly. At the top of my list is Honduras mahogany. Most of my drawer sides are made of material salvaged from old, fac-

Photos: Vincent Laurence

FITTING DRAWER PARTS

1

2

SIDES FIRST

1. Mark the drawer sides. *Because each drawer is fit precisely to a particular opening, the location and orientation of each part is marked.*

2. Shoot the edge. *A sharp jointer plane and a shooting board will give you a straight edge that's 90° to the face of the drawer side. A little wax on the sole and side of the plane will help it glide better.*

3. Snug but not binding—*When the sides will just slide in and out without binding in the case, they're fit. If they do bind, look for shiny spots on the top edge, which indicate high spots.*

3

tory-made mahogany furniture. Because of its age, the wood is about as stable as it's ever going to be. After mahogany, quartersawn oak is my choice for drawer sides.

I make my choice depending on the wood used for the drawer fronts, always aiming for a contrast in color. I like mahogany with lighter colored drawer fronts, such as ash or sycamore, and oak sides when the drawer fronts are made of darker woods, such as walnut or rosewood. From time to time, I use other woods, such as teak, because it wears so well, and rippled (curly) sycamore on special cabinets or desks, where the visual quality of the drawer sides is very important.

Fit the drawer pieces individually and precisely

Regardless of how much care you put into making and fitting the drawer, it will not fit well if the opening in the case is not consistent front to back and top to bottom. Check the openings, and true them with a shoulder plane if necessary. Make sure, above all, that the case doesn't taper in from front to back. Once the case is trued up, sand the inside, and polish it with a good-quality paste wax.

I don't make or fit drawers on damp or particularly humid days. Instead, I'll wait for a dry spell so that the drawer parts aren't swollen with moisture. Also, whenever possible, I bring the drawer stock into the shop to acclimate for a few weeks before dimensioning it.

Fit the sides first, top to bottom—The first step in fitting the drawer pieces is to

The sides have been fitted. *The drawer backs are next. Colored dots at the corners of the case piece identify mating edges and indicate the front of the case.*

cut them to rough size, say, within ⅛ in. of finished length and width. All pieces can be thicknessed to final dimension, as long as you bear in mind that you'll be planing and sanding them slightly to fit. Before I do any planing, I use a pair of winding sticks to be sure that all pieces are flat.

I work with the sides first, testing both faces of each side to see which planes better. I choose this side for the face because it will have to be planed to fit and mark it accordingly (see the top right photo on p. 73). If there's more than one drawer, I also indicate which drawer the part belongs to. The end of the drawer where I start my plane stroke becomes the front end so that all fitting is from front to back. If one edge of a drawer side is more difficult to plane, I try to make it the bottom edge because the top edge is where all the planing to fit takes place. Then I plane the inside of the drawer and sand it with 400-grit paper. After this, I shouldn't have to do anything more other than apply a coat of paste wax.

I cut the sides to length on the tablesaw and then plane the bottom edges on a shooting board. I saw the other edges to within 1/16 in. of the finished width (or less) and then plane them, too, on the shooting board (see the bottom right photo on p. 73). After nearly every pass with the plane, I check the fit in the case. If it binds, I check the top edge to see where it's bur-

DRAWER BACKS ARE NEXT

Fit the backs from side to side. *Check the fit often because only one stroke of the plane separates a drawer that fits from one that's sloppy. These drawer backs have been cut to width to fit over drawer bottoms.*

nished, indicating rubbing between the drawer side and the case, and remove a shaving there. When the side goes all the way home without binding, but still requires a fair amount of force, it's ready (see the photo on p. 72). There should be no play at all. Further fitting, which will make the drawer side move more freely, will take place after the drawer has been assembled. Repeat the process for all drawer sides in the case.

Fit the back perfectly—A perfect fit for the back is absolutely essential because it is used as the pattern for the front. With large drawers, I fit each back precisely to its opening, so it just snugs into the case opening on all four sides. This is important, because the opening often will not be perfectly square. Fitting the back (and then front) of the drawer to the opening helps to ensure a perfect fit.

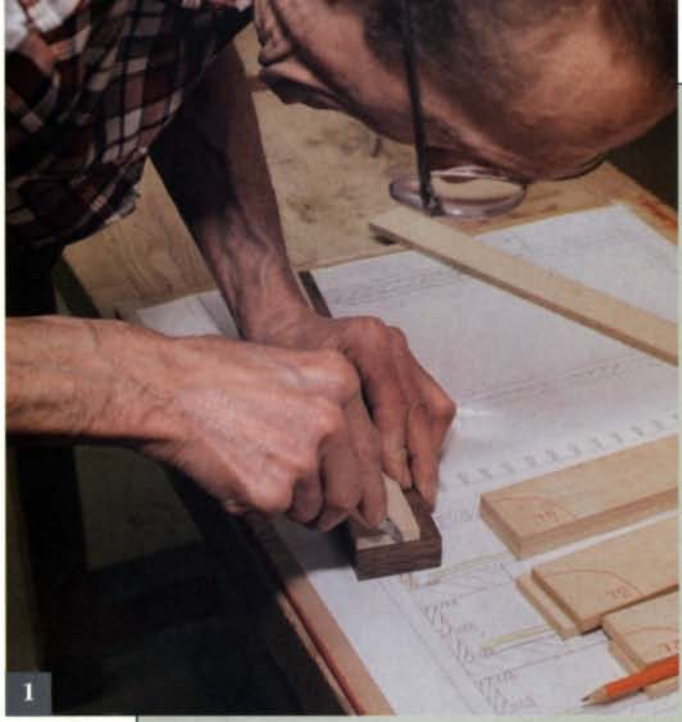
On small drawers, however, like the ones in this desktop unit, it's less important to fit the drawer backs from top to bottom. Because the drawers are so narrow, only the lengths of the backs need to be fit to the case openings. Openings this small can't be out of square by very much.

I mark the backs by indicating which drawer each one belongs to and writing this number on a little round paper dot that I can peel off later (see the bottom right photo on the facing page). I stick the dot on the inside of the drawer—facing the front of the cabinet, at the top—so I know how the back is supposed to be oriented throughout the fitting process.

To prepare the back, I shoot the bottom edge and then saw and plane the top edge to width to fit snugly in the drawer opening. Then I'll transfer the outline of the drawer back to the front before cutting the back to width to fit over the drawer bottom, which slides beneath it. In the case of a small drawer, though, I just cut and plane the back to width right away. I get this measurement—from the top of the drawer bottom groove to the top of the opening—from my full-scale drawing.

Next I shoot one end of the back square, set it in place in the opening and then position the other end as closely as possible to where it belongs. I make a pencil mark at this end, cut the back just a hair long and then plane it to fit, checking it in the case after each stroke (see the bottom right photo on the facing page).

To prevent end-grain tearout at the edge of the board (what we call spelching here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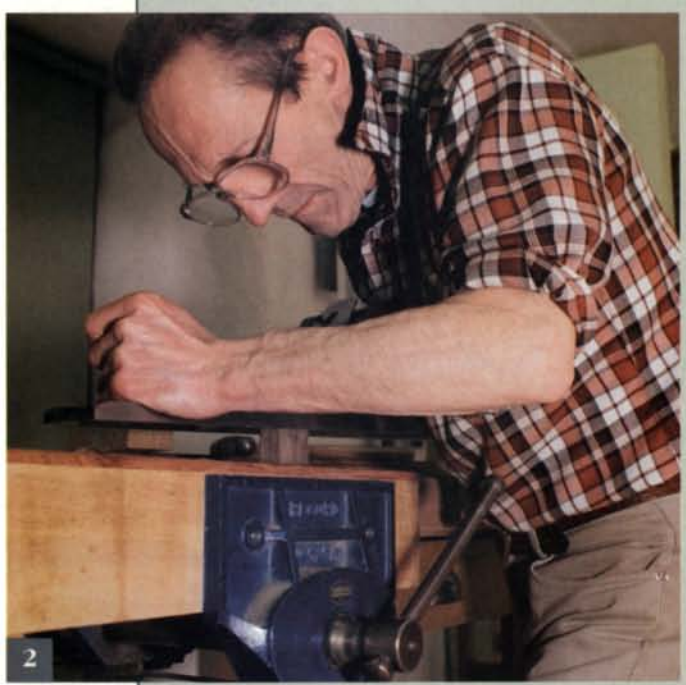
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3

DRAWER FRONTS ARE LAST

1. Mark the fronts from the backs. *Because the backs fit snugly from end to end (and on large drawers, from top to bottom), they can be used to lay out the fronts. Marking with a knife gives the author a precise line that he extends across the face of the drawer front with a small square.*

2. Plane a slight bevel on the ends. *This inward taper helps with the fitting of the drawer front.*

3. Fitting the fronts—With the fronts snugged into place, no light or gaps should be visible at the top, bottom or sides.

Fronts are fitted. *With all drawer parts fit to their openings, the drawers can now be dovetailed together.*

in England), I pivot the plane nearly 90° to the direction of cut as I complete the stroke. This way, the blade cuts across the fibers at the edge of the board rather than catching them and breaking them off. There should be no gap at all at the ends of the backs when they're in place in the case.

The front should fit like a plug—I mark out the length of the front by placing the corresponding back on it, with the bottom edges flush, and knifing marks at either end of the back (see the top photo on p. 75). After shooting the bottom edge of the front, I saw and then plane the top edge to fit, beveling it ever so slightly front to back. I check the fit after each stroke, holding the piece in its opening at an angle (because it hasn't been cut to length yet), being extremely careful not to take off too much with any one pass.

I fit the front from end to end in the same way that I do the back, except that I bevel the ends slightly, just like the top (see the center photo on p. 75). The front should fit its opening exactly, with no gaps around it at all (see the bottom photo on p. 75).

Fitting the drawer box

Drawer joinery is another subject entirely—far too big to include in this article. Suffice it to say that any drawer worth fitting this well has been properly dovetailed. And be sure to mark out the dovetails so the tails stand slightly proud of the pins. The front and back of each drawer have

FITTING DRAWERS TO THE CASE

MAKE IT SQUARE

Make sure the drawer glues up square. *As soon as the joints are together, compare diagonals and adjust the drawer box if necessary.*

TRIM TO FIT

1. Pare away the top back corner. *This will prevent the drawer from binding as you try to fit it into its opening.*

2. Clean up the sides. *A few strokes with a plane will bring the sides flush with the end grain of the front and back, which have been fit precisely and should not be planed further.*

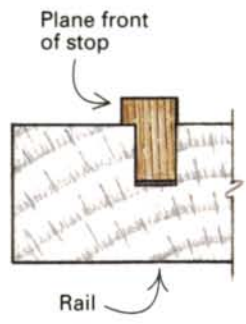
3. Plane stops to position drawer front. *If you have more than one drawer stop per drawer, remove material evenly from each.*

been fitted precisely to the opening, so you'll want to remove material from the drawer sides, not from the ends of the front or back, which are your reference lengths.

When I glue up a dovetailed drawer, I don't use any clamps, relying instead on the accuracy of the joints to hold the drawer together. I use glue very sparingly and just tap the dovetails home with a hammer. I use a block of wood to prevent the surface of the drawer sides from being marred. The same goes for mortises and tenons, which I sometimes use to attach the back to the sides as I did on this drawer. Extending the sides past the back allows the drawer to open fully without dropping out of its opening. Whatever the construction, if a drawer is going to fit its opening well, it's important to compare measurements from corner to corner when gluing up and to make adjustments to get the drawer square (see the bottom photo on the facing page).

A drawer board supports the drawer as you plane—Once the glue has cured (I wait several hours at least, but overnight is better), I take a chisel and pare away the top back corner of both sides (see the top left photo above). If the back corner was dovetailed, often it will have swollen up because of the moisture introduced by the glue. Even if that's not the case, taking down this corner will prevent the drawer from binding as it enters the case. I also ease all the arrises (the sharp corners where edge meets side) with a block plane

Section through drawer stop



Wood grain for stop is oriented vertically for strength.

Drawing: Vince Babak

followed by some fine sandpaper, and I soften the top edge of the drawer back.

I leave the bottom out at this stage so I can position the drawer over a drawer board to plane the sides (see the top right photo on p. 77). The drawer board fully supports the drawer but doesn't get in the way of the plane. The drawer board should fit quite accurately between the inside faces of the drawer front and back.

I take a few passes with a plane to bring the sides flush with the end grain of the drawer front and back and then check the fit of the drawer in its opening. I leave just a little sanding or planing to do after the drawer bottom is installed. I slide the drawer in and out of its opening rapidly a few times. This burnishes the sides and top edges of the drawer sides wherever they're rubbing against the case. I plane away these burnished (shiny) spots and check the fit again.

This process is repeated until the drawer will move in and out with relative ease, but no slop. The closer I get to a fit, the more often I check.

As you're planing the drawer sides, be careful not to remove too much material from the edge of the drawer front, where it would be visible from the front of the case. After cleaning up the dovetails, I often won't touch this area with a plane again. I just sand it lightly until the fit is right.

Final fit is with the drawer bottom in place—Once the drawer is sliding nicely in its opening, it's time to put the drawer bottom in. I almost always use solid cedar of Lebanon. It smells nice, my clients like it and it keeps moths and worms away. Because it's solid wood, I orient the grain from side to side so that any expansion is front to back. I spot-glue the bottom at the front so that no gap opens up there, and I screw the bottom to the back using slotted screw holes so the bottom can move.

To make sure that the bottom is seated in its groove all the way along its length, I set the drawer on the bench on one side and then tap on the other with a hammer. A piece of scrap protects the side that's being hammered. I repeat the process on the other side.

Next I check the fit of the drawer in its opening. Often it will need no further fitting. If it's a little snug, removing a shaving or two is the most that will be necessary. A light sanding with 400-grit usually will do.

With the drawer fit, I make sure all outer faces and edges are sanded to 400-grit (the insides have already been done). Then I apply a coat of paste wax to all surfaces except the face of the drawer front. It will be finished with the case later.

The result is a drawer that fits so well it's slowed by a cushion of air as you push it in. And when you pull out the drawer, any other drawers in the case are gently pulled back into the nearly airtight case.

Drawer stop determines the position of the front

All that remains is to get the plane of the drawer front where you want it—either flush with the sides of the case or back a bit if you prefer. Many furnituremakers simply glue a small block of wood to the drawer divider for a drawer stop, perhaps affixing a piece of leather or felt to cushion the impact. Unfortunately, this type of drawer stop will almost always get knocked out over time.

In my shop, we prevent this problem by mortising L-shaped drawer stops into the drawer dividers (mortises are cut before the case is assembled). The grain of the drawer stop is oriented vertically, perpendicular to the dividers. No amount of force will break off a stop like this, and the leg of the L-shape gives me material to plane away to get the drawer to stop where I want it (see the bottom photo and drawing on p. 77).

I check the drawer in its opening once more, this time to see how much material I must remove from the front of the stop. A few passes with a bullnose plane and the job is done. If you have more than one stop (I usually use two, one near either case side), try to remove material evenly from both stops. To see if you've succeeded, place a little pressure against the drawer front right in front of one of the stops. If the drawer front gives at all, the stop behind it has had more material removed from it. The other one will need a shaving or two removed to even things up. As always, the closer I get to where I want to be, the more cautiously I proceed. □

Alan Peters first began woodworking as an apprentice in Edward Barnsley's workshop in 1949. He has been designing and building furniture ever since. In 1990, he received the OBE (Order of the British Empire) from the queen of England in recognition of his contributions as a designer and craftsman. He lives and works in Kentisbeare, Devon, England, where he manages a team of four other craftsmen.

Shopmade Trimmer

Simple carriage steadies trim router to flush-cut plywood edge-bands

by Jim Siulinski

Every time I use sheet goods to make cabinets, I'm faced with the job of banding the exposed edges. I'm turned off by glued veneer tape because I worry that it will eventually peel away or chip off. It also has that department-store furniture look. I prefer a solid wood edge-band, which is more durable and more attractive.

Applying and trimming solid-wood edge-banding, though, can be difficult and time-consuming. After applying an oversized strip to the edge, you have to trim it flush with the face of the panel. I find it difficult to balance a router or laminate trimmer on a panel edge, and I immensely dislike sanding out the inevitable snipe and chatter marks from router wobble and bearing hops. I looked for a way to improve the process.

The solution is a stable carriage for the trim router

My solution was to make a carriage for a trim router with an extended base and fence and handles like those on a handplane

A simple tool for cleaning up banded plywood edges—*The author devised a carriage that improves stability for his trim router and makes flush cuts a breeze.*

(see the drawing). The trim router is mounted in the fence and attached to the base at 90°. The base rides on the face of the panel, and the fence rides along the edge. The 15-in. by 5-in. base significantly increases the surface area of the tool. It's stable and wobble-free. An adjusting knob (see the center photo on the facing page) set into the top of the plane body allows precise alignment of the trimming bit with the bottom of the base for a perfectly flush cut.

I scrounged most of the materials from a junk pile at my workplace and from a friend's woodshop. I used melamine with a medium-density fiberboard (MDF) core for the base and fence because it's stable, durable and slides well over the work. The wood in the plane body is jarrah, though any stable hardwood will do. The only uncommon part is a scrap of anodized-aluminum angle bar I used for a bracket to house the adjusting knob. If I hadn't found the angle bar, I probably would have made some kind of bracket out of wood. Like many shopmade jigs, this one is fast, easy and inexpensive to build. The whole jig took about four to five hours, start to finish.

It works much like a handplane

With the edge-banded plywood lying flat on a workbench, I use the carriage much like a handplane. To avoid tearout, the trimmer should be used with the bit turning into the cut, in the same direction as the trimmer's movement (see the drawing). This means that the carriage must be used in a left-handed fashion. (Lefties should appreciate this.) Facing the work on a bench, start at the left, and move to the right. The mass of the carriage and the sure grip of the plane-like handles make it easy to keep the bit from self-feeding and clogging or skating down the workpiece. Be sure to clamp your work to the bench. A few test-cuts should ensure proper bit alignment with the base. I like leaving the band ever so slightly proud—just in case—and afterward, lightly sanding it flush.

Few or no obstacles to a clean cut

One of the trimmer's major advantages is its ability to trim directly over dadoes. I think it is easier to cut a dado prior to edge-banding, thus avoiding a more complex stopped dado cut. Using a trim router with just a bearing for a guide would ruin the edge as the bit turned into the dado.

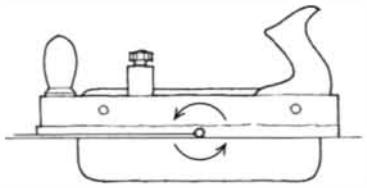
Another advantage is that the trimmer is not thrown off by dried glue. A 9/16-in. gap between the edge of the base and the fence makes it unlikely that any dried glue squeeze-out will interfere with the carriage base. A bearing-guided bit would create bumps in the edge-band as the bearing rolled over drips. It should be noted that a warp in the sheet will alter the trimmer's cutting depth, so clamp your work flat to the work surface.

The trimmer carriage works best when edge-banding sheet material at least as large as the carriage. I typically use it when making bookcases and shelves. Because the essential use of the fence is to make a stable cut, the carriage may be adapted to many other applications. I sometimes use it to trim the edge of a face frame on a finished case. By adjusting the bit, you can use it to cut rabbets. By changing bits, you can apply different molding profiles—and not just to edge-bands. □

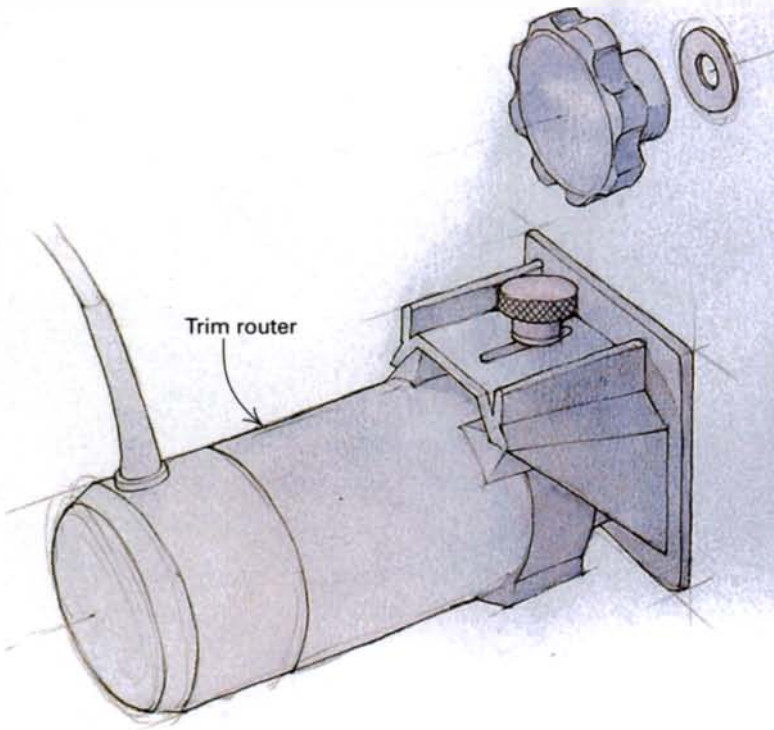
Jim Siulinski is an applications engineer at National Semiconductor and runs a small woodshop business on the side in Westbrook, Maine.

Carriage for trimming solid wood edge-bands

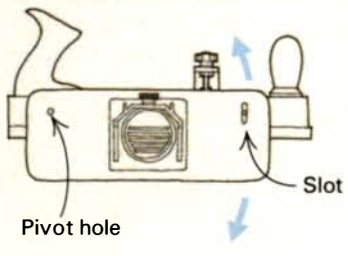
This carriage was designed to improve the stability of a trim router while cutting solid wood edge-bands flush with panels. The base rides on the face of the panel. The plane body and handles make a sure and comfortable grip. The fence guides the trimmer along the edge of the panel. An adjusting knob and bracket allow fine adjustments to the depth of the cut.



Cutting direction
Use the trimmer with the bit turning into the cut to avoid tearout. Go slowly and steadily because the bit can self-feed.

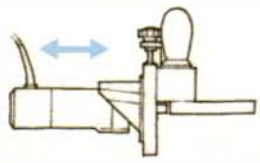


Adjusting the depth of cut
The trimmer's performance depends on how evenly the bit cuts with the bottom of the base. It must be finely adjustable.

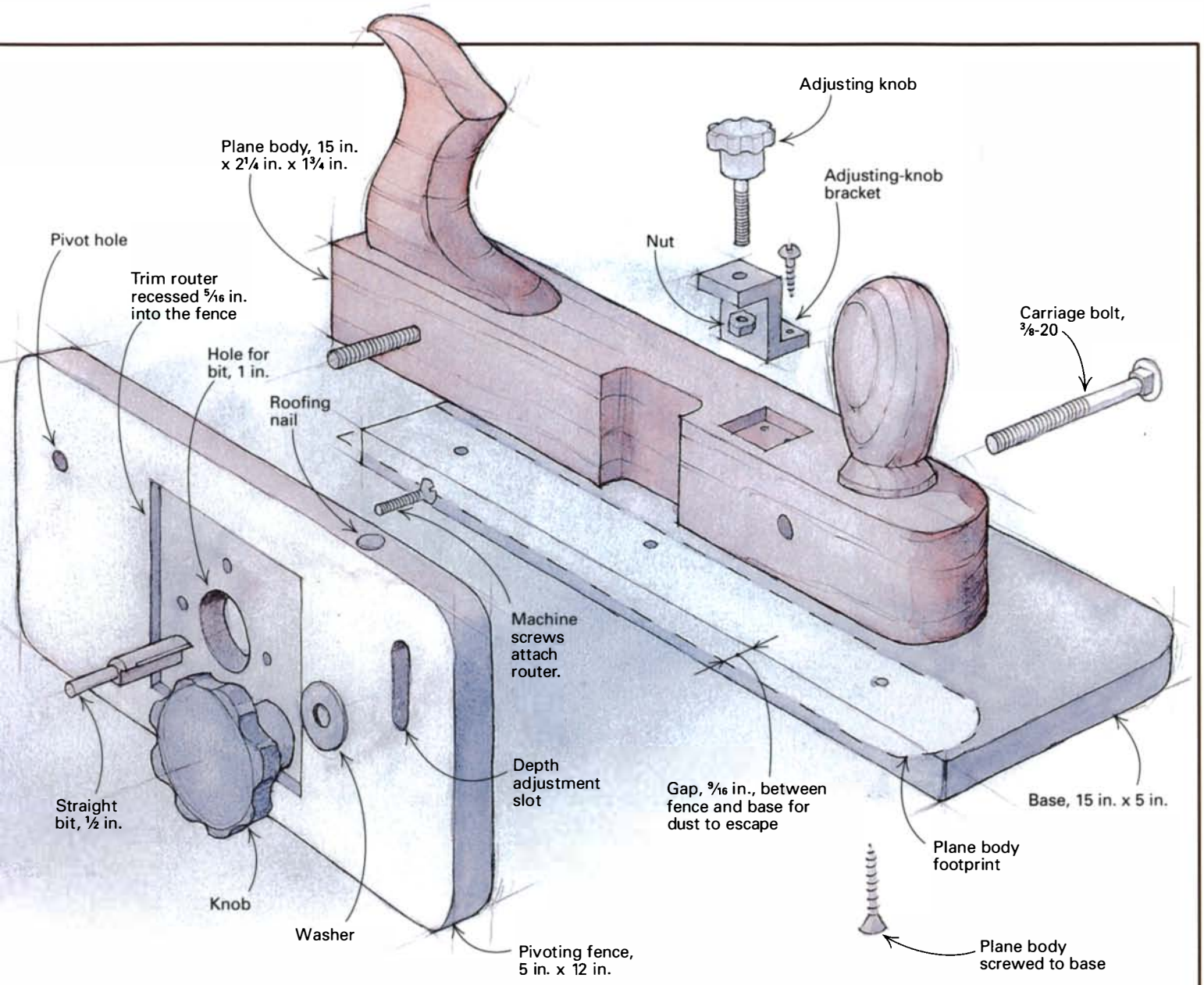


Slot in fence allows the base to travel up and down, pivoting on the opposite carriage bolt.

Laminate trimmer's depth adjustment works to set trimmer's width of cut.



Drawings: Jim Richey



***Easy design and assembly** from odd materials. Trimmer is mounted in a fence and attached to a base at 90°.*

***Adjusting knob sets cutting height.** A roofing nail makes a resilient contact point, reducing wear on the fence.*

***Gap between base and fence avoids obstacles.** Trimmer won't hang up on glue squeeze-out or oversized edge trim.*

Photos: Strother Purdy

Old Growth Redux

Lumber dealers scour unlikely places for virgin timber felled a century ago

by Scott Gibson

The tree emerging from the silty water of a river in southwestern Georgia sure didn't look like much. Slippery, barkless and gray-green, the 40-ft. log would've settled back to the bottom if Fred Tatman hadn't chained it to his pontoon barge. The last time this stick of first-growth longleaf pine had seen the light of day was close to a century ago when it sank on its trip from woodland to sawmill. Soon it would be a stack of unusually valuable lumber earmarked for flooring, cabinets, even a piece of furniture.

It's been a long time since first-growth longleaf pine (*Pinus palustris*) was cut commercially in the South. These tall, slender trees once covered as much as 70 million acres of lowland coastal plains from Norfolk to New Orleans. Today, first-growth standing longleaf amounts to 1,000 acres or less. Most of the country's first-growth species, hardwoods and softwoods alike, were cut down long ago, but lots of it sank on the way to the mill. Saw logs of cypress, longleaf pine, oak, elm, maple, redwood and other species have been abandoned ever since on lake and river bottoms.

Because of relatively low temperatures and oxygen levels, the timber is still sound. It is being snapped up by sawyers like George and Carol Goodwin of Goodwin Heart Pine Co., to whom Tatman sells much of what he retrieves, and the Superior Water-Logged Lumber Co., which pulls up logs from the icy depths of Lake Superior (see the photo above). These and other lumber companies are offering woodworkers raw materials that have not been available for generations. The only obstacle to working with wood this rare, should you be interested, is the cost.

Photo above: Rick Wood/*Milwaukee Journal Sentinel*

***Up from the deep**—A diver scouts logs that will be hauled from the bottom of Lake Superior and milled into pricey lumber (left). Lake-salvaged timber includes bird's-eye maple, birch and red oak (above), all perfectly preserved by cold temperatures and low oxygen levels at the lake bottom.*

From antiques to lumber mill and furniture

George Goodwin was happily plying his trade as an antique dealer in Micanopy, Fla., when Tatman got him interested in old logs that littered a Georgia river bottom. The logs were longleaf pine, tight-grained and heavy with a resinous heartwood that turns a beautiful brown-red over time. Before long, George had invested $5,500—every nickel he had—in an old sawmill. He added equipment slowly and, eight years ago, made his first big sale—a load of flooring for a house on Cape Cod.

These days, the Goodwin Heart Pine Co. cuts several hundred thousand board feet of pine and cypress a year. Prices range from about $5 to $13 per board foot for 1-in. kiln-dried lumber, depending on width. River-recovered heart pine and cypress logs (see the bottom photo on p. 84) are trucked in from diving operations in Georgia, Alabama and South Carolina. The Goodwins also sell southern yellow pine timbers salvaged from old buildings.

Though most of the mill's output is currently turned into flooring, the Goodwins see potential in selling the lumber to furnituremakers and in selling their own line of finished furniture. They supply several Florida furnituremakers with lumber. They've also formed a loose partnership with Mark Webb, a furnituremaker from nearby Florahome, to produce a line of tables and cabinets made of cherry and river-salvaged heart pine. A few days a week, Webb drives to Micanopy and works in one of the Goodwins' big open-air sheds.

Go easy on the sandpaper

Webb likes this old pine for several reasons: its tight and sometimes curly grain (see the bottom photo on p. 85), its finished look, its suitability for a style of Southern furniture he favors and its rarity. He uses it for legs, drawer parts, inlay and mortise pegs in a side table he makes and in similar ways in hunt boards and small chests (see the center photo on p. 85). About the only fault he finds with the wood is that it's hard to sand, a result of its resinous content.

Stephen Hunter, a Brooker, Fla., furnituremaker who has made a number of commissioned pieces in heart pine, also likes the wood. But he agrees that sanding can be problematic. The first time he used heart pine was to build a 100-sq.-ft. display booth for the Goodwins. He went through $100 in abrasives in the process.

Hunter has learned to stop his sander every few seconds and use a wire brush to knock off accumulated resin. If he sands for even 60 seconds at a time, the resin in the wood melts into the belt and ruins it. He uses a cabinet scraper as much as possible, and he makes sure all of his tools are very sharp. Heart pine's high resin

Photos except where noted: Scott Gibson

It's a keeper. *Diver David Edison winches up a century-old longleaf pine log on a river somewhere in southwestern Georgia. River salvagers insisted the exact location remain a secret.*

The lumber will be pristine. *Despite appearances, these longleaf, or heart, pine and cypress logs stockpiled at the Goodwin Heart Pine Co. will shortly become prized lumber. Trees cut before 1880 were felled by ax and have V-shaped ends.*

content has not affected gluing (Hunter uses Titebond yellow glue), but he is careful in the finishing process not to load the wood with too much oil. It won't dry readily. Sprayed nitrocellulose lacquer works well as a finish or a sealer coat, he says. Hunter doesn't think that heart pine is any more unstable than other woods, maybe less.

In the Great Lakes, it's mostly hardwood

There's plenty of room at the Chequamegon Hotel in Ashland, Wis., in January. Just down the hill, the marina is iced over and a wind off Lake Superior is driving the snow sideways. The diving season is long over for the Superior Water-Logged Lumber Co., but a mile east along Highway 2, the company's 19 employees are still working on a stockpile of logs accumulated during the last season: red oak, maple, elm, birch and hemlock. Superior Water-Logged is expanding into a 125,000-sq.-ft. mill. The company is now working with a single portable bandsaw mill and a small kiln but making plans for a much more extensive operation.

Led by a Milwaukee-raised treasure diver named Scott Mitchen, the company is banking its long-term hopes on a formidable stockpile of first-growth hardwood logs on the bottom of Lake Superior. The logs are all that's left of vast forests felled a century or so ago and used to build cities of the Midwest. On its way to the region's sawmills, like those in the Ashland area, some of the logs sank. Mitchen kept bumping into them on diving forays. He raised the first one with an inner tube after an old-timer suggested the logs might be worth something. When the wood is hauled up and

milled, the lumber shows no signs of decay (see the photo at right on p. 83). Chuck Ouimette, the company's general manager, believes there are enough logs on the lake floor to support the company for decades. This year, they hope to raise 20,000 of them, a 20-fold increase over 1996. Permits require the company to turn over 30% of the proceeds to the state.

Lumber that's pricey as well as rare

Chris Hinton was a dulcimer maker and log cabin builder in a small town a few hours away from Ashland when he read about Mitchen's company. Hinton drove up to see what was going on and ended up working for the company. He's still agog at working with what he calls "the Jurassic Park of lumber." Unlike trees taken from today's forests, says Hinton, these old trees grew slowly under the great softwood canopies of virgin forests. As a result, the wood may have 30 or more growth rings per inch. Hinton believes that characteristic, plus the long submersion in the lake, gives the wood unique qualities.

Consumers, whether they are furnituremakers or furniture-buyers, clearly are attracted by the mystique of this material. And they pay dearly for it. Rather than use standard grading rules, the company divides the lumber into only two categories: select and character. In widths below 8 in., select runs $12 a board foot for 4/4 kiln-dried material ($8 for character, a grade that permits knots and other defects). Prices go up quickly from there. In widths of 8 in. to 16 in., select lumber runs $30 per board foot. Prices for figured woods like bird's-eye maple or flame birch are much higher. The best grade of figured lumber more than 8 in. wide costs $112.50 per board foot.

Even at those prices, the company says it sells everything it cuts. Some of the material goes to instrumentmakers. A violin set, which is just over 1 bd. ft., or enough to make a single instrument, can cost $1,200. The lumber also is used for cigar humidors, pool cues and corporate board rooms. Nothing is thrown out. The company is exploring turning scraps into $200-a-set chopsticks, knife handles or pens. Employees bag up sawdust in hopes it will be turned into a special paper. The governor is said to be interested in the idea.

This wood is not for ordinary furniture

Dave Johnson, who lives just outside of Ashland, was working last winter with his first bit of lake-recovered hardwood: bird's-eye maple that he was turning into a tabletop (see the top photo). The wood was a new experience and Johnson was finding subtle differences between this maple and lumber of the same species cut today. It seemed harder, possibly because of its very tight growth-ring pattern. Johnson thought the wood held crisp machined edges better than ordinary bird's-eye and took a little more effort and time to sand. His early experiments showed that the lake-recovered lumber did not absorb oil-based stains readily and may be more suited to water-based aniline dyes. When he sanded the wood, he said he noticed a distinctive, musty smell.

The woman who commissioned that table knows all about the wood's rarity. That's the point. The figure in those boards was not very different from figure in ordinary bird's-eye maple. But she will be able to look at that tabletop and ruminate on the notion that the tree which produced the boards was a seedling at roughly the same time that Columbus reached land and was cut down by a long-dead logger who earned $1 a day for his labor. □

Scott Gibson is editor of Fine Woodworking.

***A tabletop in first-growth maple**—Dave Johnson, an Ashland, Wis., furnituremaker, sands a tabletop made of bird's-eye maple recovered from the bottom of Lake Superior.*

***Finished chest combines old and new wood.** Corner posts, drawer parts and inlay are heart pine in this chest by Mark Webb; the rest is made of Florida cherry.*

***Curly pine is rare.** Quartersawn heart pine shows tightly spaced annual rings, characteristic of old-growth timber. Much rarer is the curly heart pine behind it.*

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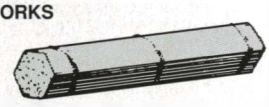

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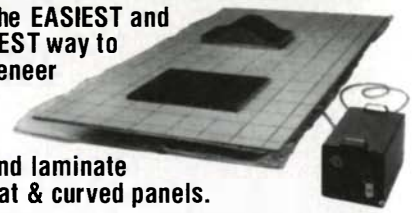

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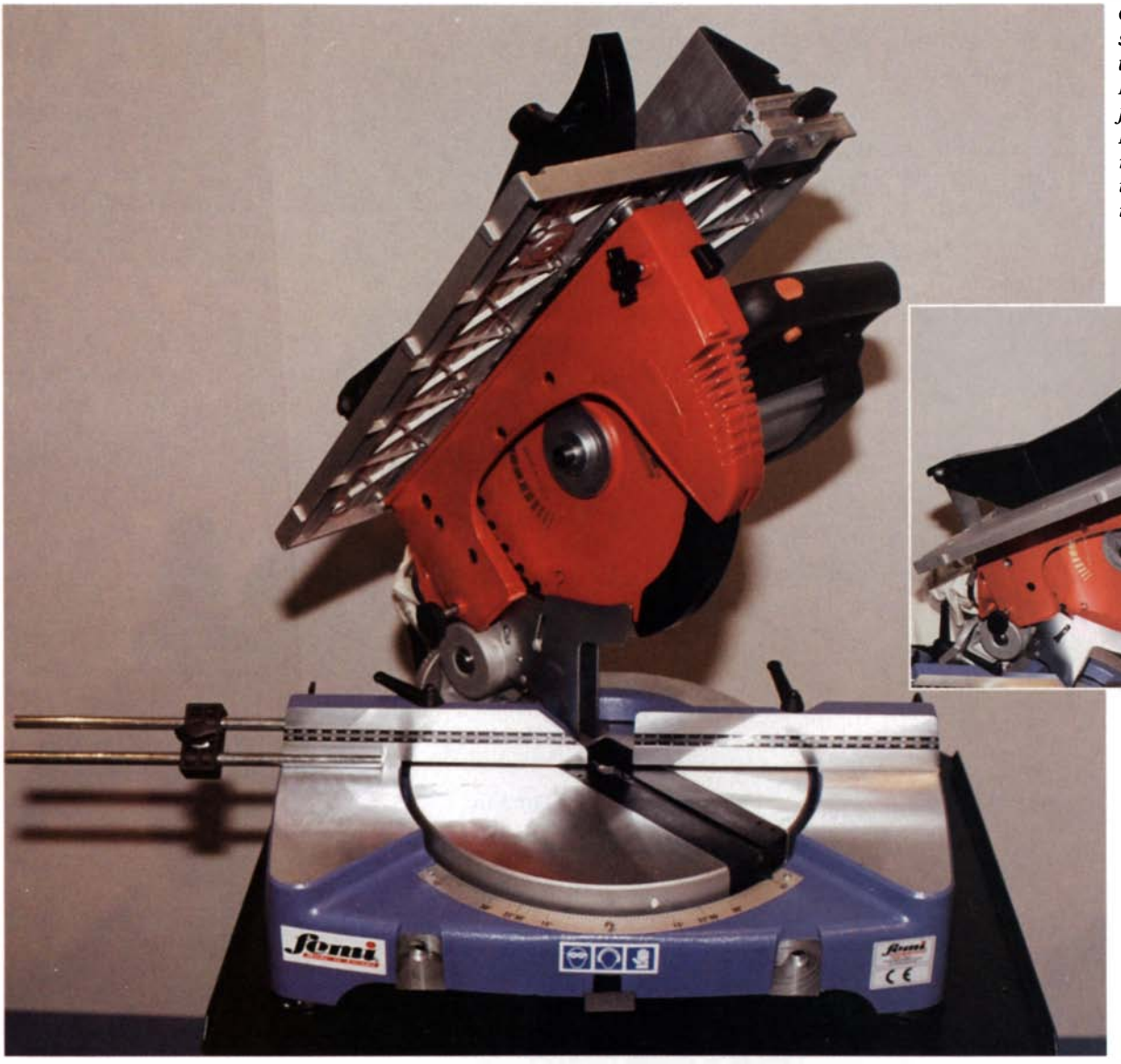
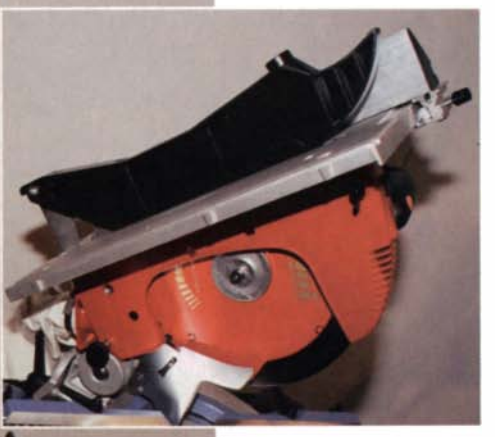




Combination chop saw and mini-tablesaw—*Many European tool manufacturers, such as F.E.M.I., make tabletop miter saws, a tool unfamiliar to buyers in the United States.*

I had only hiked for half an hour through one of the cavernous halls at the International Hardware Fair in Cologne, Germany, but I felt like I had already seen it all. Wending my way through the scores of Taiwanese and Chinese display booths, I began experiencing a strong case of déjà vu. I was surrounded by power tools in very familiar colors: DeWalt yellow, Bosch blue, Hitachi green. As I inspected a DeWalt cordless drill clone from Taiwan, a salesman appeared and asked for my business card. With a few thousand dollars and a few hundred self-stick labels, I could have started my own import business.

Although selling and making money is really what the show is all about, it's also a good opportunity to see what's new, even if you can't give a tool a full tryout. The bigger companies create huge displays to attract attention. To draw crowds, the marketing minds at Bosch constructed a slot-car racetrack and dressed up workers in hats and jackets emblazoned with the words "racing team." Custom toy cars that looked like Bosch jigsaws with wheels zipped along on the track.

Receiving just as much attention was Bosch's new compact belt sander. This is a very aggressive detail sander with a narrow profile that can squeeze into tight quarters. Plans are for it to be released in the United States later this year.

Bosch and Black & Decker had an undeclared battle raging for whose new jigsaw blades were the real meat eaters. Bosch had men cutting nail- and pipe-studded lumber with their new Progressor blades, which did indeed seem to cut through anything and keep on going like the Energizer bunny on testosterone. The folks at Black & Decker were showing how their Piranha blades handled boards filled with nails. The blades seemed as ferocious as their name implied.

Metabo, a company that makes some fine tools but whose presence is low-key in the United States, introduced a new paint-removing tool that showed engineering ingenuity. The machine is shaped something like a disc grinder with a flat,

Photos this page: Anatole Burkin

aluminum base that houses a spinning disc loaded with a pair of replaceable cutting knives. The machine works fast but leaves a fairly rough surface. It may be available in the United States by the end of the year.

Large combination machines are very popular in Europe. Many manufacturers offer tablesaw/jointer/shaper machines, and by and large, these appear to be well-made. At the small end of the spectrum is the ubiquitous tabletop miter saw, which is just that—a chop saw with a small table attached to the upper half of the machine. Many companies, such as the Italian manufacturer F.E.M.I., make such machines (see the photos on p. 92), but I have never seen one sold in the United States.

Also prevalent are lightweight contractor's tablesaws. These often come with stands that have wheels and built-in handles. Typical of these saws is the Norsaw, made by Ernex AS (Norway), as shown in the photo below. The blade/motor housing tilts 45° and rotates 90°. The blade height can be set and locked as it is on a typical tablesaw or raised and lowered with a handle—effectively making it an upside down chop saw.

A spokesman for the company said he tried to drum up interest in the U.S. market, but he hadn't made any headway.

Jacobs Chuck Manufacturing Co. showed off an impressive new product—a wrenchless router collet. Consumers will first see the Hand-Tite RouterChuck come as standard equipment on a line of ¼-in. routers.

The router chuck has an outer sleeve, which acts as a release/lock mechanism. Bearings inside the chuck channel centrifugal force into clamping action. Jacobs is also developing a ½-in. chuck.

—Anatole Burkin

Unusual portable tablesaw from Norway—The Norsaw, which is not available in the United States, has a blade/motor housing that tilts and rotates.

New plunge router from DeWalt

DeWalt 621 variable-speed plunge router—This 2-hp router comes equipped with a built-in dust port. Most of the tool's controls are built into the handles.

It's just possible that you'll find the DeWalt 621 plunge router a little hard to get used to. I know I did. The round handles (see the photo above) house two of the three most-used controls: the on/off switch and the plunge lock. So in some ways, using this tool can feel a little like learning how to use a router all over again.

This design approach is a mixed blessing. Sometimes I need to grab a router with one hand. Maybe I shouldn't do that for safety reasons, but the truth is I do. That's why I prefer oblong-shaped router handles, which I think give me a more positive grip.

The plunge lock is controlled by turning one of the router's base handles. My greatest fear was that I would inadvertently loosen the plunge lock by twisting the handle as I picked up the tool. My fear was unfounded, and in fact, the lock is very positive and holds well. Even so, I think that DeWalt's designers attached too many functions to this component.

The switch must have been designed by a veteran thumb wrestler. It is a two-part design: push down and pull in. To lock it takes two more moves. Once you get used to it, however, it is very quick to use.

It's hard to find fault with the other features of this 2-hp workhorse. The plunge

Photo at left: Anatole Burkin; photo at right: Gary Rogowski

mechanism works smoothly without slop. The depth-setting adjustments are very sweet. They're easy to read, use and adjust. DeWalt knows how to make fine depth adjusters. The electronic, variable-speed (8,000 to 24,000 rpm), soft-start motor will keep a constant speed, even under load. But the router's footprint is a little small for my taste, and I suggest adding a larger subbase for better stability. The machine comes with ¼-in. and ½-in. collets.

An innovative feature of the 621 is an effective dust-collecting chute that runs through one of the plunge columns. Part of the dust-collection system includes plastic cover plates that surround the bit. If your plunge lock loosens while you're running a very wide bit, it'll chew up that top cover plate in a hurry. These well-intentioned plates also distort your sight of the bit. I took mine off and found the dust-collection system still worked.

Is the tool worth its $220 price tag? I'd have to give it a qualified yes. For someone looking for one router to do a variety of jobs, the 621 would be a good choice as an entry-level tool. *—Gary Rogowski*

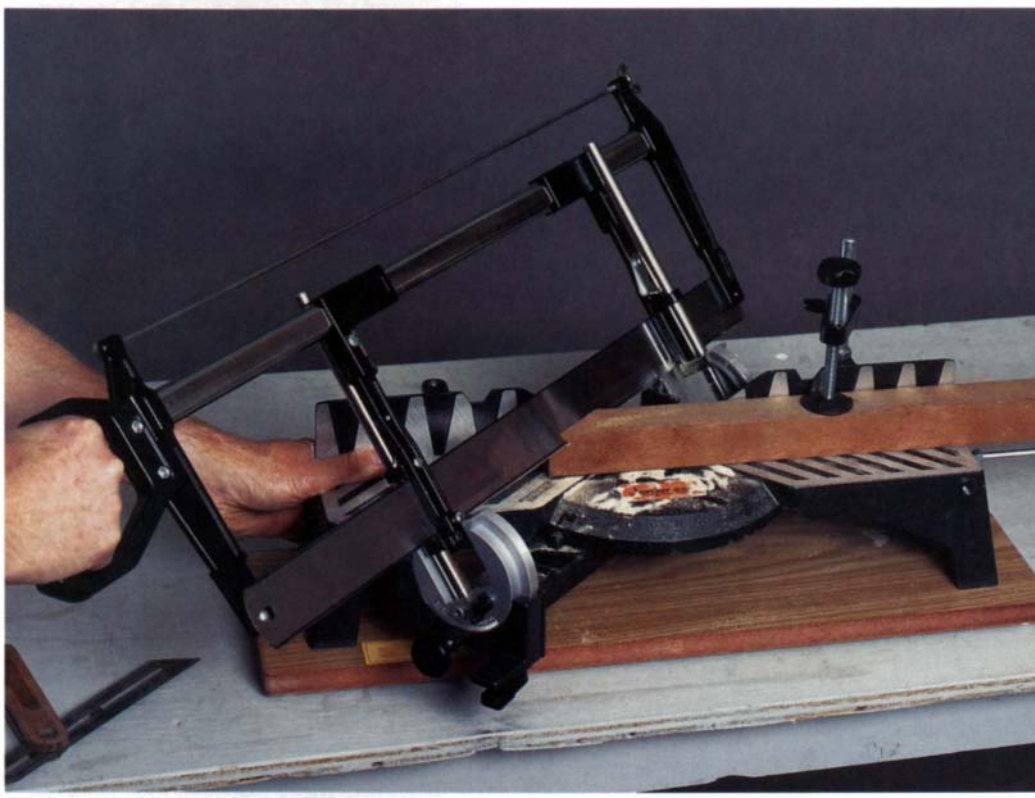
Hand-powered compound miter saw

What saw, sliding back and forth, can cleanly and precisely cut pieces of trim to compound angles? If you pictured a powered sliding compound miter saw, take another look. The Adjustable Clamp Co. recently introduced the Jorgensen hand-powered miter saw that cuts not only horizontal angles but also features a quadrant assembly on the saw carriage to allow the blade to tilt 45° to either side of perpendicular (see the photo at right).

I found the tool to work and cut with exceptional smoothness. The fine (18 tpi) bow-saw type blade makes perfectly flat and accurate cuts even at the maximum compound angle of 45° by 45°. There is, however, a downside to this precision: lack of speed. It took 35 strokes to crosscut a 1½-in. by 1½-in. fir board at 90°. In contrast, the saw in my trusty, 70-year-old Millers Falls miter box can make the same cut in 13 strokes, although it leaves a much rougher surface.

I reset the Jorgensen to a 45° by 45° compound angle and grabbed another piece of fir. It took about 200 strokes to saw through it. This isn't as bad as it sounds, however, because the short, quick strokes take just under two minutes to execute. I would gladly sacrifice a little smoothness for a significant jump in speed by replacing the factory equipped 18-tpi blade with a 12-tpi version. Though blade replacements are not available through the distributor, you can get them through some mail-order tool sources.

This saw boasts one innovation I would love to add to my venerable Millers Falls: a stock support that can be attached to either side of the saw. Two would be even better, but the support is not available as an accessory. Angle settings are adjusted by turning tiny thumbscrew locks. Large thumbscrews would make this task easier.



Jorgensen hand-powered compound miter saw—*The fine-tooth blade on this saw cuts slowly but leaves a smooth surface. It comes with one hold-down.*

The saw comes with a nicely machined, straight and perpendicular fence and table. But the surfaces are too slippery to hold a workpiece securely, especially when cutting at acute angles. Saw-drag friction easily overpowers the built-in clamp, reducing the accuracy and flatness of the cut. My solution is to attach fine sandpaper to the surfaces with double-faced tape and to use additional clamps.

Who would want a hand-powered miter saw? I essentially stopped using my old Millers Falls in 1970 soon after Delta came out with its electric 9-in. miter saw. Cutting trim by hand is just too darn slow for production work. But for running occasional trim in the house or putting together a picture frame, a quiet, lightweight and accurate hand-powered miter saw might make sense. And, of course, a hand miter saw is nowhere near as expensive as a powered saw. This saw is available discounted for about $110. *—Jim Tolpin*

Anatole Burkin is an associate editor of **Fine Woodworking.** ***Gary Rogowski is a custom woodworker in Portland, Ore., and a contributing editor to*** **Fine Woodworking.** ***Jim Tolpin is a woodworker and writer in Port Townsend, Wash.***

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9"X40T	$146	$109	$ 98	$ 87
30T	$125	$ 99	$ 89	$ 79
*8-1/4"X40TX 3/32"	$136	$ 99	$ 89	$ 79
8"X40T 3/32"	$136	$ 99	$ 89	$ 79
30T	$115	$ 89	$ 80	$ 71
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Fine Woodworking Magazine test Oct 96, page 43

After installing your blade and 5 in. stiffener the vibration in my saw went down another 20%. I ran several pieces of hardwood through the saw, both crosscut and ripping, and was amazed at the smoothness. It was like cutting butter, maybe smoother. I have never had a saw blade that cut this smooth.

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352VS 3x21 VS Belt Sander
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7810 tool triggered vacuum 269
556 plate jointer w/cs & fnc 139
360 3x24 sander with bag 214
362 4x24 sander with bag 219
360VS 3x24 vs belt sander 219
362VS 4x24 vs belt sander 229
9862 12v 3/8" dr kit w/2 bat 174
9872 14.4v drill kit w/2 bat. 199
743K 7-1/4"15 amp saw w/cs 129
347K RH 7-1/4 saw w/case 129
843 LH 7-1/4" saw w/brk 144
447 7-1/4" 15 amp saw w/brk 144

90690 1-1/2 HP Router w/Case
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7539 3-1/4hp 5 spd plng rtr 274
691 1-1/2 hp D handle router 164
697 router table w/router 234
75183-1/4 hp 5 speed router 284
7538 3-1/4 hp plunge router 259
7403 paint remover 179

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1584VSKbarrel jigsaw w/case 159
1634VSK vs recip saw kit 179
3107DVSK 5" rndm sndr kit 114
3107DVS dstls rdm orb sndr kt 99
3310K 12v T-handle w/2 bat 174
3610K 14.4v 3/8" vsr 2/bat 194

11224VSR 7/8" Bulldog SDS Rotary Hammer
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11304 Brute breaker hammr 1249
1194VSRK1/2" hmr drill w/cs 159
1276DVS4x24 vs belt sander 219
1275DVS 3x24vs sndr w/bg 214
1274DVS 3x21 vs sndr w/bag 169
1615EVS 3-1/4hp vs plng rtr 289
1604 1-3/4 hp router 144

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TR215 8-1/2" slide saw 349

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5397-6 3/8" hammer drill kit 144
0408-612 v crdls kit w/xtra bt 174
0234-61/2"vsr 0-850 magnm 134
0236-6 1/2" drill w/case 149

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0380-13/8" keyless angle drill 179
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6767-1 5amp hd scrwshotr kt 139
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DN10DYK vs 9.6v R.A. drill 159
M12V 3-1/4 hp vs pl. router 229
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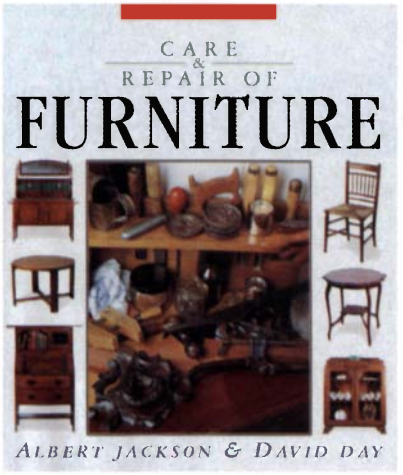
Care & Repair of Furniture by Albert Jackson and David Day. *HarperCollins Publishers. Published in the United States by The Taunton Press, Newtown, Conn. (800-888-8286); 1994. $27.95, hardback; 160 pp.*



Veteran furniture repairers may feel a sense of misgiving about this lavishly illustrated and detailed book. After 25 years in the field, I found myself harrumphing as Jackson and Day revealed various repair secrets, such as how to clamp together the curved legs of a tripod table or how to get a dowel into a shattered spindle. I spent years figuring out my trade by trial and error. This book lays out most of it in front of the reader.

Jackson and Day present a whole range of furniture repair work in a straightforward and confidence-building way. This book is almost encyclopedic. In addition to the expected instruction on wood joinery, glues and finishes, you will find insights into marble, glass, leather and cast iron. And I haven't read a woodworking book that illustrates upholstery repair so well.

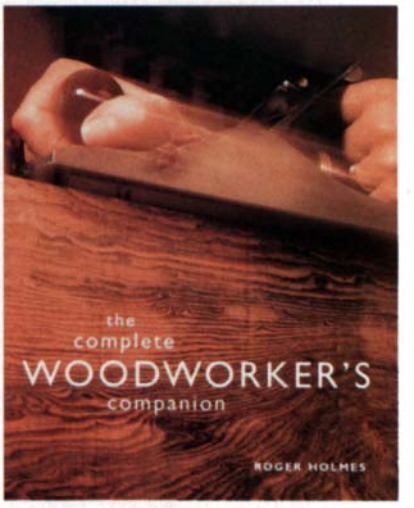
Dismantling furniture is often half the job in repair work. The authors do a thorough job describing how to soften glues and work joints apart with little damage. Those brave enough to tackle veneer repair will appreciate the 14 pages devoted to this skill.

The section on finishing will be helpful for the beginner. Practicality is a by-word. Instead of the arcane ritual of melting shellac sticks with a burning-in knife, Jackson and Day use a soldering gun.

As much as I admire this book, it would benefit from some better advice on tenons and dowels. Many pieces of furniture, especially chairs, suffer from shrunken joints. The authors recommend moistening compressed tenons to swell them. In my experience, this is unwise. It is best to use a piece of veneer to build up the joint. And I never presume a dowel is done shrinking until it has spent some time in a warm oven right before use.

Jackson and Day offer the expected cautionary messages on the hazards of the trade, but they could add one more: Letting friends and relatives know you can repair furniture, especially chairs, is hazardous to your free time. *—John Sillick*

The Complete Woodworker's Companion by Roger Holmes. *Watson-Guptil Publications, New York, N.Y. (800-451-1741); 1996. $29.95, hardback; 192 pp.*



Roger Holmes has done a good job of covering the basics in a book that is both visually appealing and well-written. It's not truly complete, as he admits, or even as comprehensive as other woodworking tomes—the Tage Frid series published by The Taunton Press or Ernest Joyce's *Encyclopedia of Furniture Making*, for example—but it is lively and attractive.

There are sections on tool selection, sharpening, stock preparation, joinery and surface preparation. Holmes is disarmingly direct, unpretentious and has a warm teaching style. In one section, he acknowledges that after a few sessions with sharpening stones "you may well feel like cursing. Things do not always happen in the ideal way outlined here."

To his credit, Holmes is no tool snob. Although his chisels are beautifully sharpened, they show spots of corrosion or old glue here and there. Sawhorses are paint-splattered. His router is from Sears. There is a sense of woodshop realism that makes his advice all the more credible.

In addition to the basics, Holmes covers several furniture projects as a way of showing how joinery lessons can be put to work. He also includes dozens of examples of contemporary furniture as further illustration of what can be done with the techniques he's describing.

Attractive as it is, the book would have been improved by more information on seasonal wood movement, which Holmes just glances over. The quality of the drawings and photos is high, although readers may wonder what's going on with one photo caption that gets a jointer and a tablesaw mixed up. Holmes probably winced when he saw this, but these things happen. The error doesn't detract from the book's handsome presentation or its usefulness. *—Scott Gibson*

Paint Recipes by Liz Wagstaff. *Chronicle Books, San Francisco, Calif. (800-722-6657); 1996. $19.95, paperback; 192 pp.*

This book will help anyone turn an ordinary piece of furniture (even an entire room) into something dramatic. Wagstaff provides recipes—formulas, really—and techniques for a range of decorative finishes in a short, cookbook-style format. You'll find recipes for gilding and woodgraining, crackle finishes and faux marble among many others. Each recipe comes with a list of all the necessary tools and materials.

This book doesn't offer comprehensive treatment of decorative finishing; these are microwave recipes for the amateur. The professional will find it lacks detail.

I like Wagstaff's encouragement to be adventurous and experiment with the recipes and techniques. After all, art should define itself, shouldn't it?

—Dwayne Stewart

John Sillick builds and repairs furniture in Lyndonville, N.Y. Scott Gibson is editor of FWW. *Dwayne Stewart is a decorative finisher in Independence, Mo.*

Listings of gallery shows, major woodworking fairs, lectures, workshops and exhibitions are free but are restricted to happenings of direct interest to woodworkers. Only workshops sponsored by not-for-profit groups are listed. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ALABAMA: **Meetings**-The Alabama Woodworkers Guild meets the second Thursday of each month at 7:00 p.m. at Acton Moulding & Supply Co., Helena. For info, contact Steve Onisick at (205) 942-8075.

ALASKA: **Meetings**-Alaska Creative Woodworkers Association meets at 7:00 p.m. on the fourth Monday of each month at the Anchorage Museum. (907) 345-3077.

ARKANSAS: **Meetings**-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m.; Central Arkansas Woodcarvers meets the second Tuesday at 7:00 p.m. and the fourth Tuesday at 6:30 p.m. Genuine Hardwoods, 200 Municipal Drive, Jacksonville. For more info, call (501) 985-1118
Meetings-Ozark Woodturners meets the third Saturday of each month in Mountain Home. For more information, call Michael Kornblum at (501) 424-5893.

CALIFORNIA: **Exhibitions**-Expressions in Wood: Masterworks from the Wornick Collection, thru July 20; Art of John Cederquist, Sept. 13-Nov. 30. Oakland Museum of California, 1000 Oak St., Oakland. (510) 238-2200.
Lecture-American Decorative Arts Forum presents Anna T. D'Ambrosio: With Style and Propriety: Furniture from the Munson Williams Proctor, Sept. 9. M.H. de Young Memorial Museum, Golden Gate Park, San Francisco. For more information, call (415) 499-0701.
Exhibition and classes-Woodfair '97, July 11-13; planemaking, July 28-Aug. 1; marquetry, Aug. 4-9. College of the Redwoods, 7351 Tompkins Hill Road, Eureka, 95501-9300. (707) 445-6700.
Show-Central Coast Woodcarvers 20th annual show, Sept. 13-14. For info, call (805) 927-4718 or (805) 528-8107.

COLORADO: **Workshops**-Woodworking and furniture design. Anderson Ranch Arts Center, P.O. Box 5598, Snowmass Village, 81615. (970) 923-3181.
Show-Annual Showcase of Just Wood, Aug. 8-10. The Apple Shed Complex, 250 S. Grand Mesa Drive, Highway 65, Cedaredge, 81413. (970) 856-6266 or (970) 856-6007.

CONNECTICUT: **Workshops**-Woodworking workshops held year-round. Brookfield Craft Center, P.O. Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Call for entries-Gallery 12's woodworking show, Oct. 5-Nov. 2. Deadline: July 12. Gallery 12, 29 Whitfield St., Guilford, 06437. (203) 458-1196.
Exhibit-Woodworkers Guild 10th annual fall members show, Oct. 24-Nov. 30. Call Randy Bemont (860) 653-0316.

DELAWARE: **Exhibition**-Wood Dreaming in America, Sept. 27-Oct. 31. Creations Fine Woodworking Gallery, Powder Mill Square, Greenville. For info, call John Sherman at (302) 655-8311.

FLORIDA: **Meetings**-South Florida Woodworking Guild meets every second Monday at 7 p.m. American Legion, 2102 Lee Road, Orlando. Call Bob Lamprey at (407) 292-8324.
Meetings-Central Florida Woodworkers Guild meets the second Thursday of each month. Woodcraft Supply, 246 E. Semoran Blvd., Casselberry. For info, contact Bob Elliott (407) 695-8960.
Meetings-Tallahassee Woodcrafters Society meets the second Tuesday of each month. For info, contact Walt Behrle at (904) 668-6653 or Austin Tatum at (904) 386-6876.
Meetings-St. Petersburg Woodcrafters Guild meets the fourth Thursday of every month at 7 p.m. Montgomery Electric and A/C, 1200 19th St. N., St. Petersburg, 33713. Contact Don Montgomery (813) 898-0569.
Call for entries-Art show and festival, Nov. 15-16. Deadline: Aug. 1. For more information, contact Linda Piper, Downtown Festival and Arts Show, Station 30, P.O. Box 490, Gainesville. (352) 334-2197.

GEORGIA: **Meetings**-Woodworkers Guild of Georgia meets the second Monday of every month. Southern College of Technology, 1100 S. Marietta Parkway, Marietta. (404) 299-3972.

ILLINOIS: **Classes**-Ongoing woodworking classes, all levels. Elston Woodworking School, 2228 N. Elston Ave., Chicago, 60614. (312) 342-9811.
Meetings-Fox Valley Woodworkers Club meets at 7:30 p.m. on the first Tuesday of every month in Batavia. For more information, call (708) 469-9517.
Expo-Valley Woodland Expo, Aug. 15-16, Marshall-Putnam Fairgrounds. For more info, contact Kimberly St. John, Prairie Rivers Resource Conservation and Development, 400 Edward St., Henry, 61537. (309) 364-3979.

KENTUCKY: **Meetings**-Kyana Woodcrafters meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. (502) 426-2991.

MAINE: **Meetings**-Guild of Maine Woodworkers meets the first Wednesday of every month. Call (800) 805-5100.

MARYLAND: **Classes**-Woodworking classes, May thru December. Glen Echo National Park, 7300 MacArthur Blvd., Glen Echo, 20812. (301) 492-6266.
Classes-17th-century joint stool with draw bored mortises and tenons, July 21-26; ladder-back chair, Aug. 18-23. Call John Alexander, 1406 Light St., Baltimore. (410) 685-4375.

MASSACHUSETTS: **Classes**-Woodworking classes, most of the year. Contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
Classes-Year-round intensives in woodworking and wood carving. Horizons New England Craft Program, 108 N. Main St., Sunderland, 01375. (413) 665-0300.
Classes-Woodworking classes held year-round. North Bennet Street School, 39 North Bennet St., Boston. For more information, call (617) 227-0155.
Classes-Woodworking for beginners, women and retirees. New England School of Architectural Woodworking, Box 7, One Cottage St., Easthampton, 01027. (413) 527-6103.
Workshops-Traditional timber framing, Sept. 24-28. Hancock Shaker Village, Hancock. (413) 684-3223.

MICHIGAN: **Meetings**-Michigan Violinmakers Association panel discussion on violin making, July 27. For info, call David Brownell (313) 665-4255.

MINNESOTA: **Meetings**-Minnesota Woodworkers Guild meets the third Tuesday of each month at 7:15 p.m. Demonstrations each month. Contact Richard Gotz (612) 544-7278.
Workshops-Finishing, refinishing and conservation, thru July. Dakota County Technical College, 1300 145th St. E., Rosemount, 55068-2999. (612) 423-2281.
Classes-Woodcarving, more, July thru August. North House Folk School, Box 759, Grand Marais, 55604. (218) 387-9762.

MISSOURI: **Meetings**-Kansas City Woodworkers' Guild meets the third Wednesday of each month. Contact Eugene Caples (816) 452-6379.
Symposium-Joy of Turning, Sept. 13-14. Woodturners of St. Louis, 430 Bryan Ave., Kirkwood, 63122. (314) 966-2268.

NEBRASKA: **Meetings**-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Westside Community Center, Omaha. Call John Cahill (402) 334-5550.

NEW HAMPSHIRE: **Classes**-Various woodworking classes. The Hand & I, P.O. Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
Auctions-Antique and craftsman's tool auctions, year-round. Contact Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723.
Gathering-Scroll Saw Central invites scroll sawyers across the northeast to share their information and work, Oct. 18. For more info, send and SASE to Scroll Saw Central, 44 Timber Swamp Road, Hampton, 03842.

NEW JERSEY: **Workshops**-Furnituremaking, carving, finishing, more (beginner to advanced), thru August. Peters Valley Craft Center, 19 Kuhn Road, Layton, 07851. (201) 948-5200.

NEW YORK: **Meetings and classes**-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd St.), New York City. For more information, contact Howard Alalouf (914) 337-0226.
Classes-Traditional and contemporary woodworking with Maurice Fraser, Bill Gundling and Susan Perry. The Craft Students League at the YWCA, 610 Lexington Ave., New York City. For more information, call (212) 735-9731.
Classes-Experimental woodworking: designing with directly harvested (green) wood, thru July 30. Purchase College, State University of New York, 735 Anderson Hill Road, Purchase, 10577-1400. (914) 251-6500.
Conference-The Furniture Society presents: A Celebration of The Art of Furniture Making, July 10-12 at Purchase College in Purchase. Call (804) 973-1488 or (914) 251-6763.

NORTH CAROLINA: **Meetings**-North Carolina Woodturners meets the second Saturday of each month. For more information, contact the North Carolina Woodturners, P.O. Box 1833, Hickory, 28603. (704) 324-5960.
Symposium-Second Carolinas woodturning symposium hosted by North Carolina Woodturners and Triangle Woodturners of North Carolina, Oct. 25-26. Contact Roger Austin 210 Wilmot Drive, Raleigh, 27606-1231. (919) 851-4361.
Fair-Craft Fair of the Southern Highlands, July 17-20, Oct. 16-19. Ashville Civic Center, Ashville, 28815. (704) 298-7928.

OHIO: **Workshops**-Various woodworking workshops, July thru September. Conover Workshops. (216) 548-3491.
Workshops-Lenox Windsor Workshops, July 20-March 21. For information, call (216) 576-0311.

OKLAHOMA: **Show**-Eastern Oklahoma Woodcarvers Association's 21st annual woodcarving show, July 18-20. Eastland Mall, 14002 E. 21st, Tulsa, 74134. (918) 749-8909.

OREGON: **Meetings**-Cascade Woodturner's Association meets every third Thursday. Cascade Woodturners, 11575 S.W. Pacific Highway, #104, Tigard, 97223. (360) 834-6325.
Meetings-The Guild of Oregon Woodworkers meets the third Wednesday of each month (except December) at 7 p.m. For further information, contact the guild at P.O. Box 1866, Portland, 97207-1866. (503) 492-1515.

PENNSYLVANIA: **Show**-Cook Forest Sawmill Center for the Arts' all-wood festival, July 12-13. Call (814) 927-6655.
Conference-1997 World Turning Conference, Sept. 25-28. For info, contact Wood Turning Center, P.O. Box 25706, Philadelphia. (215) 844-2188.
Classes-Various woodworking classes. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, 17402. (717) 755-8884
Call for entries-Craft Forms 1997, Dec. 5-Jan. 22. Deadline: Oct. 6. For info, send an SASE to Wayne Art Center, 413 Maplewood Ave., Wayne, 19087. (610) 688-3553.

TENNESSEE: **Workshops**-Turning, carving and more, year-round. Arrowmont School of Arts and Crafts, 556 Parkway, Gatlinburg, 37738-0567. (423) 436-5860.
Classes-Lumber selection and more. Tennessee Valley Authority, 17 Ridgeway Road, Box 920, Norris, 37828-0920. (615) 632-1656.
Call for entries-12th annual Master Woodworkers show, Oct. 24-26. Deadline: Aug. 1. Candy Factory, Knoxville. For info, contact Tim Snow, East Tennessee Woodworkers Guild, P.O. Box 21, Powell, 37849. (423) 687-7474.

TEXAS: **Meetings**-Woodturners of North Texas meets the last Thursday of every month, 7:30-10:00 p.m. Paxton Beautiful Woods Store, 1601 W. Berry St., Fort Worth, 76110. (817) 927-0611.
Meetings-North Texas Woodworker's Association meets the third Tuesday of each month. For info, contact Bruce May, P.O. Box 831567, Richardson, 75083. (214) 271-0125.
Symposium-American Association of Woodturners, July 18-20. Municipal Auditorium, San Antonio. Call Mary Redig (612) 484-9094.

VERMONT: **Classes**-Woodcarving with Pat De Angelis, July 7-11, 14-18, 21-25, 28-31 and Aug. 1. Fletcher Farm School, 611 Route 103 S., Ludlow, 05149. (802) 228-8770.

WASHINGTON: Northwest Corner Woodworkers Association meets the first Tuesday of every month year-round. For information, call (360) 398-1637.

CANADA: **Association**-Canadian Woodturners Association, Markham, Ont. (905) 479-0755.
Association-Superior Woodworking Association meets 7:00 p.m. the last Monday of each month. Confederation College, Ont. Contact Vic Germaniuk at (807) 767-5964.
Exhibition-Southern Alberta Woodworkers Society, September 1997. (403) 240-4227.
Calling for entries-Canadian Woodturning Championship, Vancouver, B.C., Oct. 24-26. (604) 533-1142.

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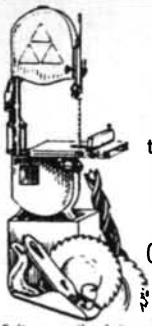

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23-880	8" Bench Grinder 1/2 HP	134	109
11-950	8" Drill Press	176	119
31-460	4 "Belt/6" Disc Sander	198	135
31-340	1" Belt/6" Disc Sander	270	225
31-080	1" Belt/5" Disc Sander	113	89
40-560	16" 2 speed Scroll Saw	230	169
11-990	12" Bench Drill Press	255	184
11-090	32" Radial Bench Drill Press	405	309
43-505	1/2" Bench Router/Shaper	398	299
22-540	12" Bench Top Planer	557	329
36-220	10" Compound Mitre Saw	294	199
14-650	Hollow Chisel Mortiser	380	239
37-070	6" var. speed Bench Jointer	351	265
36-275	8-1/4" Builders Saw	358	268
36-285	8-1/4" Builders Saw with stand	Sale	285
36-210	10" Compound Mitre Saw	344	225
36-040	8-1/4" Compound Mitre Saw	190	144
36-070	10" Mitre Saw	217	165
34-182	Tenoning Jig	113	89
34-555	Sliding Table	487	325
31-780	Oscillating Spindle Sander	253	194
23-710	Sharpening Center	217	169
28-185	Bench Band Saw	213	168
37-190	6" Deluxe jointer	603	445
36-250	10" Slide Compound Saw	Sale	489
31-695	6" Belt/9" Disc Sander	441	349
40-650	Q3 18" Scroll Saw	600	479
40-540	16" var/spd Scroll Saw	249	189
36-075	10" Compound Mitre Saw	256	189
28-195	NEW 10" Band Saw	390	309

22-560 NEW 12-1/2" Bench top Planer Sale 429.95

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36-865	NEW Versa Feeder Stock Feeder	325	249
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34-080	10" Mitre Box	Sale	218
33-990	10" Radial Arm Saw	981	799
33-055	8-1/4" Sawbuck comp with legs	846	639
36-540	10" Table saw	229	178
34-670	10" Motorized Table Saw	492	395
32-100	Stationary Plate Jointer	351	278
36-905	30" Unifence	346	245
36-906	50" Delta Unifence	444	325
34-444	10" Contractor's Table Saw	Sale	659
46-700	12" Wood Lathe	575	465
28-275	14" Band Saw 3/4 HP	Sale	635
28-280V	14" Band Saw w/enc stand 1 HP	Sale	798
34-445	10" Table Saw with 30" unifence	Sale	839
22-675	DC380 15" Planer	Sale	1175
43-355	3/4" Shaper 1-1/2 HP	Sale	799
37-154	DJ15 6" Jointer	Sale	1289

DEWALT TOOLS

DW321K	Top Handle Jigsaw Kit	300	164
DW364	7-1/4" Circ. Saw w/brake, 13 amp	294	162
DW306K	8.0 amp Recip Saw v/s w/ case	291	155
DW610	1-1/2 HP 2 handle Router	266	152
DW411	1/4 sheet Palm Sander, 1.7 amp	88	58
DW705	12" Compound Mitre Saw	734	359
DW705K	DW705 with 80 tooth blade	Sale	395
DW704	12" Mitre Saw	570	329
DW100	3/8" Drill, 4 amp, 0-2500 rpm/rev	118	68
DW274	Drywall Gun, 0-4000, 6.3 amp	160	95
DW268	Tek Gun, 0-2500 rpm, 6.5 amp	288	159
DW402	4-1/2" Grinder 6 amp	166	89
DW682K	Biscuit Joiner with case	448	199
DW625	3 HP Electronic Plunge Router	520	279
DW625	router comes with DW6913 edge guide !		
DW621	NEW 2 HP Plunge Router	400	218
DW621	comes w/ FREE fine height adjuster !		
DW675K	3-1/8" Planer with case	292	164
DW431	3 x 21 var. speed Belt Sander	338	188
DW420	Palmgrip Random Orb Sander	124	69
DW421	above Sander with dust collector	144	74
DW423	Palm Random Orbit Sander variable speed	170	94
DW444	6" Random Orbit Sander	266	145
DW443	DW444 with hook & loop pad	266	145
DW935K	14.4V 5-3/8" Trim Saw kit	444	237

DEWALT CORDLESS DRILLS

DW952K-2	3/8" v/spd w/two 9.6V batt	284	129
DW972K-2	3/8" variable speed w/two 12V XR batteries	362	182
DW904	12 volt flashlight		29.95
	DW972K-2 drill & DW904 flashlight		*Sale 199*
DW991K-2	3/8" v/spd w/ two 14.4V XR batteries	415	209
DW994KQ	1/2" variable speed w/ one 14.4V XR battery	458	239
DW996K-2	1/2" v/spd Hammer drill w/ two 14.4V XR batteries	396	259
	Above drill kits come w/charger & steel case !		
DW991KS-2	DW991K drill, DW935 saw, &case		349

DeWalt 18 volt Cordless Tools

DW938K	NEW Recipro Saw Kit	520	289
DW995K	1/2" Drill Kit	428	229
DW997K	1/2" Drill / Hammer Drill Kit	454	249
DW936K	Saw Kit	458	249
DW995KS-2	DW995K Drill, DW936 Saw, and case	Sale	395

WAP VACUUMS

Model	Description	List	Sale
766RDF	10 gallon turbo vacuum	845	465
766RDF-D	"Drywaller" 10 gal turbo vac	915	549
766RDF-DAS	Same as above w/auto start	950	589

CLAYTON OSCILLATING SPINDLE SANDERS

140	Portable sander w/ 4-1/2" spindle	625	559
146	Portable sander w/ 9" spindle	685	609
100	Floor mount sander w/4-1/2" spnd	785	709
106	Floor mount sander w/ 9" spindle	845	759

DREMEL TOOLS

3955	Moto Tool Kit with bits & case	134	75
3956	Super Moto Tool Kit w/ acc.	152	85
1672	16" Scroll Saw - 2 spd "Best buy"	302	174
1695	16" var. speed Scroll Saw	408	229
290	Electric Engraver with point	25	16
1731	5" Disc1" x 30" Belt Sander	189	114

JORGENSEN ADJUSTABLE HANDSCREWS

Item#	Jaw Length	Opening Capacity	List	Sale	Box of 6
#3/0	6"	3"	17.05	9.90	56.50
#2/0	7"	3-1/2"	18.30	10.70	60.95
#0	8"	4-1/2"	20.35	12.10	66.95
#1	10"	6"	23.30	12.90	71.95
#2	12"	8-1/2"	26.75	14.90	83.95
#3	14"	10"	33.85	18.55	105.75
#4	16"	12"	44.05	24.65	140.95

JORGENSEN STYLE 37 2-1/2" Throat 1/4"x3/4"

Item#	Jaw Length	List	Sale	Box of 6
3706	6"	10.85	6.20	33.50
3712	12"	12.05	6.80	37.25
3718	18"	13.25	7.60	41.05
3724	24"	14.55	8.15	43.95
3730	30"	16.20	9.05	48.85
3736	36"	17.70	10.20	54.95

JORGENSEN STYLE 45 5"Throat 1-3/8" x 5/16"

Item	Jaw Length	List	Sale	Lots of 6
4512	12"	34.50	20.75	114.95
4518	18"	36.35	22.30	122.95
4524	24"	38.50	23.65	129.95

JORGENSEN STEEL "I" BAR CLAMPS

Model	Size	List	Sale	Lots of 6
7224	24"	35.75	20.30	112.95
7236	36"	38.35	22.35	124.75
7248	48"	42.15	24.45	134.95
7272	72"	48.50	29.60	168.75

PONY CLAMP FIXTURES

Model	Description	List	Sale	Lots of 12
50	3/4" Black Pipe Clamps	15.45	8.10	92.50
52	1/2" Black Pipe Clamps	12.65	6.95	74.95

MKTILE SAWS

Model	Description	List	Sale
MK270	1/2 HP - 7" blade, light -30 lbs	415	299
MK770	1/2 HP - 7" blade	795	589
MK660	3/4 HP - 7" blade	795	595
MK880	1 HP - 8" blade	986	859

We stock all replacement blades for above saws.

Msxe6362	FEIN Triangle Sander v/spd	Sale	199
Msx625	FEIN NEW Air Triangle Sander	Sale	195
LPN672	PONY Air Palm Nailer w/ glove	Sale	89
LPN672K	LPN672 w/ case & 3 special tips	Sale	109
RTM01	ROTOZIP Drywall cutout unit	Sale	68.95
SCS02	ROTOZIP NEW cordless unit	252	169

BLACK & DECKER

1166	3/8" Drill 0-2500 rpm 4 amp	118	68
2600	3/8" Drill 0-1200 rpm 4.5 amp	173	98
WM425	NEW Workmate 425	191	109
1350K	1/2" Timberwolf Drill 2 speed	573	335
1180	3/8" Drill rev. 0-1200 rpm 5 amp	215	119
2670	1/2" Impact Wrench w/ detent pin	298	169
2038	Drywall Gun 0-2500 rpm 5 amp	178	95
2054	TekGun 0-2500 5.0 amp	289	159
2750	4-1/2" Grinder 10,000 rpm 6 amp	159	89
2694	7-1/4" Super Sawcat Circ Saw	294	149
2695	8-1/4" Super Sawcat Circ Saw	328	169
3339	Elu 3 HP v/spd Plunge Router	520	269

CRAIN FLOOR COVERING TOOLS

800	Super door jamb saw kit	Sale	275
520	Swivel-lock stretcher	Sale	489
499	Junior power stretcher	Sale	419
507	Stairway stretcher	Sale	135
600	Adjustable deluxe knee kicker	Sale	93
612	Knee kicker 17-1/2" to 21-1/2"	Sale	86
505	Economy adjustable knee kicker	Sale	69
506	Mini knee kicker	Sale	65
785	Toe-kick saw - 110 volt	Sale	188
890	6" S/C pro iron 250° - 375° F	Sale	125
920SC	Deluxe heat bond iron - 800 watt	Sale	83
245	Deluxe carpet trimmer	Sale	49

DURA III- ADJUSTABLE STILTS

Model	Description	List	Sale
D1422	14"-22" extension	270	209
D1830	18"-30" extension	288	229
D2440	24"-40" extension	304	249

Above models include strap adapter kits

SIOUX TOOLS

8030	3/8" variable speed Drill	263	149
8000	3/8" variable speed close quarter Drill 0-1300rpm	211	125
8005	Same as 8000 but is 0-2500 rpm	221	139
690	5" Air Random Orbit Sander	228	132
790	NEW lightweight 5" Sander	235	138

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Model	Accepts Stage Width	Spans	Attaches to Rung	Sale
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10-20-02	20"	3 rung	2 rungs	89.95
10-20-03	20"	3 rung	3 rungs	99.95

ALUMINUM ARTICULATED LADDERS
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Model	Length	Weight(lbs.)	Sale
M7-14	7'	43#	159.95
M8-16	8'	46#	179.95

FIBERGLASS STEP - TYPE 1- 250# RATING

6004	4'	13#	57.95
6005	5'	16#	67.95
6006	6'	18#	69.95

FIBERGLASS STEP - TYPE 1- 250# RATING

6004-S	w/pail shelf 4'	15#	63.95
6005-S	w/pail shelf 5'	18#	70.95
6006-S	w/pail shelf 6'	20#	74.95

FIBERGLASS STEP - TYPE 1A- 300# RATING

6204	4'	14#	66.95
6205	5'	18#	72.95
6206	6'	20#	79.95

ALUMINUM FLAT STEP TYPE 11- 225# RATED EXTENSION

Model	Size	Working Length	Weight(lbs)	Sale
D1224-2	24'	21'	33#	184.95
D1228-2	28'	25'	42#	215.95
D1232-2	32'	29'	53#	249.95
D1236-2	36'	32'	62#	279.95

ALUMINUM FLAT STEP TYPE 1- 250# RATED EXTENSION

D1324-2	24'	21'	39#	209.95
D1328-2	28'	25'	50#	239.95
D1332-2	32'	29'	62#	268.95
D1336-2	36'	32'	77#	328.95
D1340-2	40'	35'	85#	369.95

ALUMINUM FLAT STEP TYPE 1A- 300# RATED EXTENSION

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D1524-2	24'	21'	45#	234.95
D1528-2	28'	25'	56#	259.95
D1532-2	32'	29'	66#	299.95
D1536-2	36'	32'(250# rating)	79#	339.95
D1540-2	40'	35'(250# rating)	89#	389.95

FIBERGLASS FLAT STEP TYPE 1A- 300# RATED EXTENSION

D6216-2	16'	13'	34#	209.95
D6220-2	20'	17'	40#	228.95
D6224-2	24'	21'	53#	264.95
D6228-2	28'	25'	60#	298.95

FIBERGLASS FLAT STEP TYPE 1A- 300# XTRA HEAVY DUTY EXTENSION

D7116-2	16'	13'	37#	259.95
D7120-2	20'	17'	43#	289.95
D7124-2	24'	21'	58#	319.95
D7128-2	28'	25'	66#	359.95
D7132-2	32'	29'	79#	409.95

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STABILA LEVELS

Model	Description	List	Sale
24740	24" Angle Setter Level	Sale	20.95
24640	24" Level w/ hand holes	62.20	43
24670	48" Level w/ hand holes	79.70	55
24680	72" Level w/ hand holes	145.45	99
27170	48" Level w/o hand holes	71	49
27000	78" Level w/o hand holes	146	105
80LMS	Laser Level System	532	365
21990	NEW 10" Torpedo Level	Sale	14.95

RECORD WOODWORKING VISES

Model	Jaw\Width	Opening	List	Sale
53E	10-1/2"\15"	Quick release	248	109
52D	7"\8"	Quick release w/dog	169	79
52-1/2D	9"\13"	Quick release w/dog	231	95

KRAUSE MULTIMATIC LADDERS

Model	Description	List	Sale
121482	12' Aluminum Multi Purpose	264	128
121499	16' Aluminum Multi Purpose	286	148

HITACHI TOOLS

Model	Description	List	Sale
C8FB2	8-1/2" Slide Compound Saw	1169	489
998862	8-1/2" Carbide blade - 60 tooth	Sale	44.95
C10FS	10" Slide Compound Saw	1627	739
C7SB	7-1/4" Circular Saw	Sale	105
M12V	3 HP variable speed Router	541	245
TR12	Plunge Router 3 HP	377	189
SB-75	3 x 21 Belt Sander w/ bag 2 spd	315	158
DH24VBK	15/16" SDS Rotary Hammer	298	179
C10FC	10" Mitre Saw	533	199
C15FB	15" Mitre Saw	1346	659
DN10DYK	9.6V Right Angle Drill Kit	370	159
G12SA	4-1/2" Grinder 6.9 amp	177	95
FDS10DVA	9.6V Drill Kit w/ flashlight	Sale	99
DV14V	3/8" Hammer Drill with case	230	115
NR83A	Framing Nailer 2- 3-1/2 Full Head.		389
NR83AA	Framing Nailer 2- 3-1/2 Clip Head		369
NT65A	16 ga. Brad Nailer 1 - 2-1/2	749	365
NV45AB	Coil Roofing Nailer 7/8 - 1-3/4	935	399
N5008AB	7/16" Stapler 16 ga. 1 - 2 lgth	679	305
EC6B	1 HP Oil Compressor	540	279
EC6C	1 HP Oil-less Compressor	580	295

WAGNER PAINT & SPRAYER PRODUCTS

959	Power Roller	140	109
255	Airless Kit	180	135
375E	Airless System	195	164
404	Airless Painter & Roller	320	265
505	High performance Airless Painter	440	369
HVLP	Fine coat finishing HVLP System	195	159
CS2000	Profine finish HVLP System	339	278

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Model	Description	List	Sale
LP6-20	Sight Level package - 20x	329	215
LP6-20XL	LP6-20 with 9056 tripod & 7620 rod	409	269
L6-20	Meridian Level - 20x	309	199
LT8-300	Level Transit - 26x	739	489
LT8-300P	above Level with optical plum	869	565
LT6-900	Level Transit - 20x	419	269
LTP6-900	Above Level with tripod & rod.	615	389
ALT6-900	Automatic Level - Transit - 18x.	666	429
ALTP6-900	above Level with tripod & rod	799	499
ALP6-18HD	Auto. Level-18x with tripod & rod	599	395
AL8-22	Automatic Level - 22x	583	339
AL8-26	Automatic Level - 26x	854	379
ALP8-26	above Level w/ tripod and rod .	977	499
ML100I	Laser Level	1099	945
ML100	Laser Level w/detector	1249	1075
ML200	Visible Beam Laser	979	799
ML200I	ML200 w/o detector & bracket.	749	625
LL100	Finish Line Laser Level	199	135

QUAL-CRAFT JACKS

Model	Description	List	Sale
2200	Pump Jack	79	58
2201	Pump Jack Brace	30	20
2203	Pump Jack guard rail holder	31	21
2204	Work Bench & rail holder combo	53	39
2500	Adjustable Roofing Bracket	9.95	7.95
	Buy any 6 (can be assorted) deduct additional 10%		
2601	Wall Jack	167	108
	Lots of 4 deduct additional 10%		

PASLODE IMPULSE GUNS

Model	Description	List	Sale
IM250	Trimpulse Finish Nailer Kit complete drives 3/4" - 2-1/2" brads	1130	548
IM325	Impulse Framing Nailer Kit complete drives 2" - 3-1/4" nails	1130	548
CT325SS	Cordless Framing Nailer Kit complete drives 2" - 3-1/4" nails	1120	495

SENCO AIR NAILERS

Model	Description	List	Sale
SFN1+	Finishing Nailer 1" - 2" w/ case.	448	345
SFN40	Finish Nailer w/case 1-1/4"-2-1/2"	569	389
SN325	Nailer 1-7/8" - 3-1/4"	665	419
SLP20	Pinner w/case 5/8" - 1-5/8"	422	279
SKS	Stapler 5/8" - 1-1/2"	390	279
M2	Stapler 1-3/8" - 2" length	535	375
SN70	Framing - Clip Hd 2" - 3-1/2"	725	449
SN60	Framing - Full Hd 2" - 3-1/2"	708	459
SN65	15% more power than SN60	709	465

JAMERCO AIR NAILERS

Model	Description	List	Sale
JTBN1832	Brad Nailer - 5/8" -1-1/4"	96	69
JTSO61825	Narrow Crown Finish Stapler 1/2" - 1"	96	69
JTFN1650	Finish Nailer - 3/4" - 2"	245	139
JTAFN1464	Angle Finish 1-1/4"-2-1/2"	360	225
JTFN1664	Finish Nailer 1" - 2-1/2"	360	225
	Above nailers come with case!		

AIRY AIR NAILERS

Model	Description	List	Sale
0241SK	Brad Nailer 3/8" - 1-9/16"	180	98
0250SK	Brad Nailer 3/4" - 2"	296	164
0626SK	1/4" Crown Stapler 3/8" - 1"	194	104
0645	1/4" Crown Stapler 3/4"-1-9/16"	310	175
EZ-2	NEW Multi-purpose nailer & stapler	240	139
	Above nailers come w/case, fasteners, oil & wrenches		
0565T	Angle Finish Nailer 1" - 2-1/2"	386	205
8290	Framing Nailer 2" - 3-1/2"	475	315
	Airy nailers use Senco brand fasteners		

DUO-FAST AIR NAILERS

Model	Description	List	Sale
LFN-764	Finish Nailer 1" - 2"	611	329
CN-350	Framing Nailer - Full Head	702	369
CN-325	Framing Nailer - Clip Head	682	369

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READER SERVICE NO. 33

Inspired by television

Photos: David Marsden

***A new career is born**—David Marsden went back to school at age 44 and found he enjoyed learning how to build furniture. This globe secretary, which stands about 43 in. tall, was his third furniture project.*

The idea to make this globe secretary came while watching a television show that visits fancy homes and shows off fabulous antiques. During a tour of a stately home, the camera focused on a rare Pitt's cabinet globe writing table made of mahogany. The piece was made in London in 1811 by the cabinetmaking company of Morgan and Sanders. My wife was quite taken with it and asked me to make one. The look on my face told the story, but I thought about it and decided to give it a try.

At the time, I was not an accomplished woodworker. I was 44, unemployed and in my first year of furnituremaking classes at the local college. I had only built two other pieces of furniture.

I built my secretary using bendable plywood, cherry veneer and solid lumber. The globe is 43 in. tall and 28 in. wide. I entered the piece in England's National Woodworking and Furniture Exhibition in 1996, and I won a silver medal (second place). Life really does begin at 40.

—David Marsden, Bridlington, East Yorkshire, England

Continued on p. 112

Mr. Sawdust: 1921-1997

Wallace M. Kunkel, the pitchman for the Mr. Sawdust line of circular sawblades he designed for Forrest Manufacturing Co., died April 6 after a long illness in Hackettstown, N.J. He was 75. Kunkel founded the now defunct Mr. Sawdust School of Professional Woodworking in Chester, N.J., wrote about woodworking and built reproduction American furniture.

In the 1980s, Kunkel was a fixture at woodworking shows, where he preached about the versatility of the radial-arm saw. Whether it was cutting oddly shaped stock or machining tricky gooseneck moldings, Kunkel figured out a way to get a radial-arm saw to do the job.

"Dad was passionate about the radial-arm saw," says his son Marc A. Kunkel, who's also in the woodworking business. "He once challenged someone to a woodworking duel: radial-arm saw vs. the tablesaw, but the other party declined....My dad's legacy is a house full of very fine 18th-century American pieces, mostly built with the radial-arm saw." Kunkel also wrote a book on using the radial-arm saw. It is available only via the family's web site, http://www.maracorp.com/sawdust. Kunkel is survived by his wife, Jean, six sons, a daughter and several grandchildren.

—Anatole Burkin, associate editor

Know of a good woodworking school?

If you haven't yet had the chance to visit *Fine Woodworking* magazine on the Internet, give us a try. You can find us at http://www.taunton.com. Among the offerings we'd like to add to our site are these: a list of woodworking schools and their specialties, a more complete calendar of upcoming woodworking classes than we are able to publish in the magazine, and a list of woodworking guilds and associations. We will begin compiling this information right away and get it on our site as soon as possible. Suggestions may be sent to the magazine. Or e-mail us at fw@taunton.com. *—Scott Gibson, editor*

A gathering of furnituremakers

Here's a chance to rub shoulders with some of the most creative and talented studio furnituremakers in the country. The Furniture Society will hold a three-day conference July 10-12 in Purchase, N.Y. Participants include Garry Knox Bennett, Brian Boggs, Michael Fortune, Gail Fredell, Kristina Madsen and Alphonse Mattia.

The purpose of the forum is to exchange ideas and information about studio furnituremaking. Specific programs include demonstrations and discussions on design concepts, advanced woodworking techniques, marketing and publishing.

Michael Monroe, the executive director of the American Craft Council, is the keynote speaker. For more information, call the society at (804) 973-1488. *—A.B.*

In the surreal world

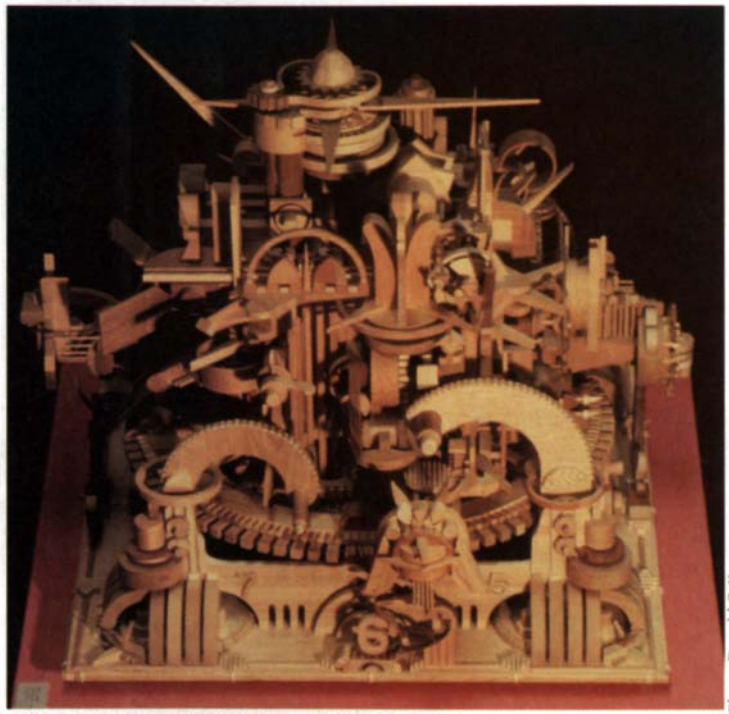


Photo: Donald C. Keeney

Keeping time— *Donald C. Keeney builds complex clocks and other creations out of wood. This clockwork, which measures 38 in. by 41 in. by 41 in., is called* Where You Are... When You Are.

Wood artist Donald C. Keeney has no trouble letting his imagination run wild. He shapes wood into fanciful creations inspired by architecture, anthropology, nature and the concept of time.

"My entire body of work is a blending of three subject matters...time (past, present and future), life (animals: preservation and respect for) and humankind, as it is influenced by and affects the aforementioned," writes Keeney.

Some of his works contain moving parts; others just suggest it through their shapes and juxtaposition against other elements. Keeney, of San Angelo, Texas, spends up to 1,000 hours on his sculptures, which have won him several awards and can be seen in museums and galleries. Brief, contemplative verses accompany the pieces. The piece shown above stands about 3 ft. tall and is a functional timepiece, with the hands oriented horizontally. It incorporates shapes that suggest architectural forms.

He is busy working on his biggest project, *Noah's Ark*. It will be 21 ft. long, 7 ft. tall and contain up to 7,000 figures. *—A.B.*

Notes and Comment

We welcome news stories, anecdotes about the triumphs and pitfalls of woodworking, tales of government regulators, photos of unusual work—anything you think other woodworkers would like to know about. We pay for material we use. Send submissions to Notes and Comment, Fine Woodworking, *P.O. Box 5506, Newtown, CT 06470-5506.*

INDEX TO ADVERTISERS

The nature of a profession

I have heard many stories of heroic professionalism: the fireman who not only puts out the fire but also risks his own life in trying to save others, Coast Guard rescue units that attempted to save sailors in trouble and lost their own lives in the process, a merchant who long ago went through an unbelievably large storm to deliver goods from western Japan to Tokyo for a festival—his courageous act is well recognized even today in Japan.

In the old days, the responsibilities and obligations of a profession were clear. Today, almost every small detail of work is specialized, and things aren't as clear. For instance, you call a plumber and one plumber does the inside of the house and the other does the outside faucets. In a fire, who does emergency treatment? The policeman or the fireman? Often, this confuses us.

The natures of some professions, however, are still clear and simple. A craftsman's job is one of them. At one time in Japan, sword smithing was the highest craft; both the sword and the craftsmanship became renowned. In modern Japan, the samurais are gone and society does not need the sword any longer, so the sword smith has disappeared.

When I was working as a *tategu-shi*, or sliding-door maker, in Japan, my master and I often worked together with a sawyer named Tenjin. He was more than 6 ft. tall. In Japan, this tradesman was called a *kobiki-shokunin*, whose specialty was to mill wood using a large rip saw.

Tenjin was fast and skillful. His wide boards were known for their smoothness. Tenjin was famous throughout the area for the quality of his work, and he was much in demand. Tenjin would build a scaffold-like horse. Then he would pick up a large log from the ground, hoisting one end over his head to get it up on the horse. After stabilizing the log, Tenjin would attack it with such absorption that he seemed oblivious to everything around him except his saw and that log.

His concentration and commitment to his task made his work magical. But this great trade and *kobiki-shokunin* are now figures of history. The highly mechanized milling systems regrettably led to the disappearance of the great *kobiki-shokunin.*

A craft depends on society. Society demands, then a craftsman tries to fulfill those demands with his best ability. However, if society does not seek the craft, then the craftsmen and the skill will disappear, no matter how high the quality.

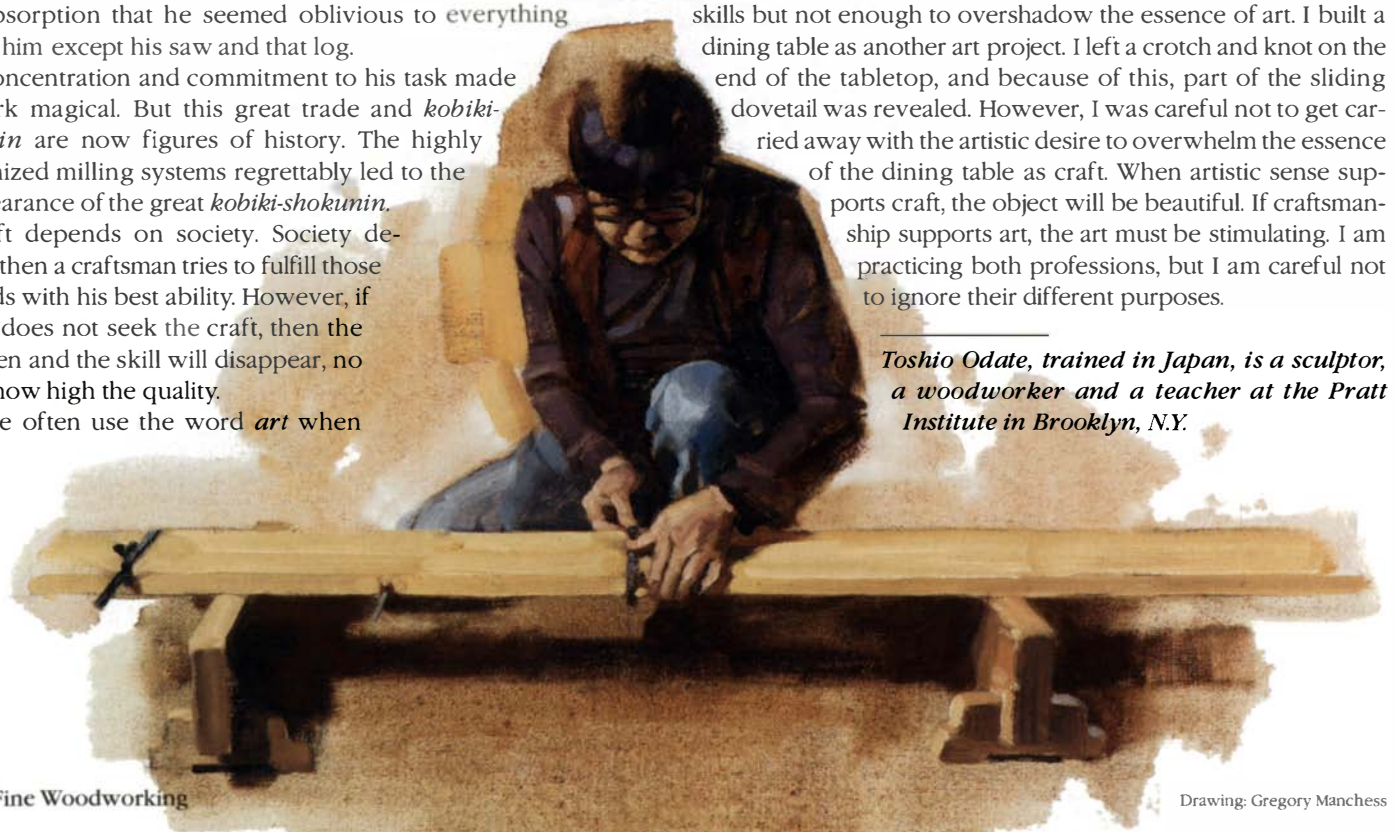
People often use the word *art* when they talk about craft. Sometimes this just means fine work, and sometimes its meaning is closer to fine art. Yet those who produce fine art and those who produce crafts have very different social responsibilities and obligations. On this supposition, consider the teacher who took off his right shoe in the classroom and put it on the table. He told his students to make a sculpture of the shoe with any kind of material. One of the students, the son of a shoemaker, made an identical shoe, only it was the left one and the two together looked just like one pair of shoes. But the shoes are not the same. The right shoe is made for people to wear. The left shoe is made for art. Even though it was made as a size 10, just like the right shoe, the left shoe could have been 10 ft. long or any size the artist thought would express his artistic goal. The people who made each of these shoes have different commitments.

Some young woodworkers attempt to make unique furniture or cabinets but often fail to meet their social responsibilities and obligations. Consider someone who calls himself a carpenter and makes a dovetail joint where a pillar meets a beam because it is a popular joint. It's not the best way to stabilize the house structure, even if it is well-made. He is not a carpenter but a joint maker.

I met a young, proud woodworker at a seminar. He called himself a toolmaker, and he showed me a plane he had made. It was of a beautiful, exotic wood: reddish, waxy and very hard. The wedge holding the plane iron in place was made from the same wood. Adjusting the blade was almost impossible because of the character of the wood. The block and the wedge did not hold the blade firmly. It was just a beautiful plane-shaped object, not a tool. So he was not really a toolmaker.

I am a sculptor and a woodworker. In building a miniature cathedral as part of a sculpture, I showed professional woodworking skills but not enough to overshadow the essence of art. I built a dining table as another art project. I left a crotch and knot on the end of the tabletop, and because of this, part of the sliding dovetail was revealed. However, I was careful not to get carried away with the artistic desire to overwhelm the essence of the dining table as craft. When artistic sense supports craft, the object will be beautiful. If craftsmanship supports art, the art must be stimulating. I am practicing both professions, but I am careful not to ignore their different purposes.

Toshio Odate, trained in Japan, is a sculptor, a woodworker and a teacher at the Pratt Institute in Brooklyn, N.Y.



Drawing: Gregory Manchess

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READER SERVICE NO. 159

A table made by a piano man

Rudolf Hieke spent 36 years building pianos at the Steinway factory in New York City after completing formal training in Austria. He's retired now, although he still does marquetry for Steinway once in a while.

Hieke spent 350 hours making this table, and then he sold it to his family physician. Using a homemade knife, he cut the rose-pattern inlays from birch and holly veneer. The darker shades were created by dipping the veneer in hot sand. He made the poplar veneer for the leaves from scraps of lumber redeemed from an old dresser. The inlay patterns are set into an unusually dark walnut butt veneer on the top and the apron. No stain was used in the finishing.

Hieke salvaged the cabriole legs with carved knees from showroom samples at the Steinway pattern shop.

Photos: William Duckworth