February 1999
No. 134

TAUNTON'S

Fine WoodWorking

Dovetail jigs put through their paces

A working guide to wood glues

Three ways to cut a bead

Basement shop

A quick way to rub out wood finishes

More power for cordless tools

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Fine WoodWorking®

Departments

On the Cover:
Windsor-chair guru Mike Dunbar reproduced an antique blanket chest using the same tools and techniques that would have been used on the 18th-century original (see p. 48). Photo: Michael Pekovich

A review of dovetail jigs, p. 84

Modern polishing techniques, p. 45

Bead-cutting choices, p. 40

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Articles

Frame-and-panel cherry bed, p. 74

Complete guide to wood glues, p. 60

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Contributors

William Tandy Young ("A Working Guide to Glues") is the author of *The Glue Book* (The Taunton Press, 1999). He took an interest in glues when his seventh-grade shop teacher had him laminate a small pine block to a big hunk of walnut so he could mount the work on a lathe and turn a bowl. While turning, he accidentally cut through the lamination line, giving the bowl a striking two-tone look that it still has. Nowadays, if he makes a mistake, any distress he feels is offset by knowing he's using the right glue for the job.

Jan Carr ("The Almost Perfect Basement Shop") worked in book publishing in New York City for many years. In 1977, the architect for his loft renovation hired an old master cabinetmaker, named Artie Becofsky. Carr recalls watching the grizzled old master install some complicated casework. At one point, Becofsky said to him, "You could do this, too. All it takes is patience." With that began a modest interest in woodworking that has become a passion. Carr now spends most days in a great basement shop at his home in St. Paul, Minn.

David Fay ("Frame-and-Panel Bed") developed an interest in making things after he graduated from college in 1988. The catalyst was meeting and talking with a carpenter who was building an addition to Fay's house. Fay said, "It was his ability to visualize and build a project from start to finish that inspired me to want to make things for myself." Fay worked in construction, then made the switch to furniture making. He has been designing and building custom furniture in Oakland, Calif., since 1992.

Hank Gilpin (Master Class) has been making custom furniture in his shop in a converted church since 1976. His passion for the material of his trade is evident in his office, which is filled with hundreds of samples and planks of wood; on his bookshelves, which overflow with books on the botany, history and identification of trees; and in his conversation, which is rich with the lore and behavior of trees from seedling to sawdust. He claims not to be an athlete, but he will squash you on the racquetball court.

Garrett Hack ("Soften Hard Edges with a Side Bead") is a farmer, writer and professional furniture maker in Thetford Center, Vt. Hack trained as an architect at Princeton University and as a furniture maker in the Program in Artisanry at Boston University. He specializes in interpretations of the Federal style. He is a regular contributor to *Fine Woodworking* and the author of *The Handplane Book* (The Taunton Press, 1997).

Paul Manning ("Bench-Mounted Router Table") is a retired electronics engineer who does part-time consulting for the FAA's radar and electronics systems. He spends his remaining time on woodworking, especially clock cases. Manning plans to move to Pennsylvania, where he and one of his sons are going to build a shop that's a lot bigger than the small basement where he now works wood.

Craig Vandall Stevens ("Chip Carving Limbers Up"). When Ohio State lost to Southern Cal in the Rose Bowl in 1980, Stevens was on the field. At halftime, anyway. He was one of 28 tuba players in OSU's storied marching band. Having attained marching-band nirvana, he transferred to the Columbus College of Art and Design. After graduation, he designed and built log homes and then studied furniture making under James Krenov. A master of marquetry as well as low-relief carving, Stevens now makes furniture full time in Sunbury, Ohio.

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Letters

Finishes author credits previous article—It was recently pointed out to me that the testing methods I used to evaluate water-based finishes in my article (*FWW* #133, pp. 68-73) bore striking resemblance to the tests performed by Chris Minick in his article on water-based finishes three years ago (*FWW* #115, pp. 48-53). Because the idea behind my article was to pick up where Minick left off by evaluating the newest generation of finishes, these similarities are more than coincidence.

My article should have noted that I was trying to re-create the tests Minick performed as closely as possible so the reader would be able to make relatively fair and accurate comparisons between the finishes I tested and those Minick sampled in 1995. Although a few of the tests I performed varied slightly from Minick's, others, such as the heat resistance and adhesion tests, were done almost exactly the same. I even used the same rating system and number of points in the stain-resistance test specifically to allow comparisons to be made between the finishes tested in the two articles. That Minick was not given proper credit for developing the original test procedures was an oversight on my part, for which I apologize. In fact, my article would not have been written if Minick had not already provided the standards and ground rules for testing water-based finishes. *—Andy Charron, Windsor, Vt.*

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

The demise of woodworking education—Your magazine is excellent. I have been a subscriber for years and plan to continue for many more. I do agree with those who say that you have far too much advertising. However, your photography is great, and the articles are great. It gives me a real laugh to read the "fundamentalist" opinions of egomaniacs who believe that there is no room for workers such as Norm Abram.

As a teacher of woodworking for 20 years, I have found that whatever it takes to interest someone in this craft is worth pursuing. Magazines such as yours should do whatever it takes to interest as many people as possible. We are currently seeing a demise of woodworking in the schools. The two new high schools in my district do not have shops, and the shops have been removed from all junior high schools here. So keep up the great work.
—McKay Sleight, Orem, Utah

Cutting double-blade tenons safely—I enjoy your magazine very much. You publish many well-written articles by knowledgeable authors while leaving room for thought. I have a question about the procedure shown in Bruce Cohen's article, "Large Case-Construction Strategies" (*FWW* #131, pp. 84-87). In one photo, you show him cutting cheeks (with the shoulders already cut) using a tenoning jig with a double-blade setup. Wouldn't that trap a free piece of wood between the inner blade and the jig? I know you would never show an unsafe practice, so please explain.
—Herman Spaeth, South Lyon, Mich.

EDITOR REPLIES: Many woodworkers, and most of the editors here, prefer to follow the guidelines laid out in Mac Campbell's excellent article on "Double-Blade Tablesaw Tenoning" (*FWW* #95, pp. 72-75). He cuts his cheeks first, then cuts the shoulders with a crosscut sled. In Cohen's preferred method of cutting tenon shoulders before the cheeks, he makes the throat on his tablesaw insert large enough to allow the offcut to fall straight down into the cabinet.

More on tablesaw blade guards—Howard Lewin's article on "Safe Procedures at the Tablesaw" (*FWW* #132, pp. 84-89) was particularly timely, as I was in the process of deciding which tablesaw best met my needs. I settled on a Powermatic, because one of the features I liked was a sturdy blade guard.

I used a radial-arm saw for many years and found the blade guard quite satisfactory, but I quickly realized that the tablesaw guard gets in the way, and it is no longer in place on my machine. When

Writing an article

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

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I see other saws in professional shops or lumberyards, the blade guard is almost always gone. I suspect that a survey of your readers would find that the blade guards and possibly the splitters supplied by the manufacturers are rarely used. If that is the case, perhaps you, as an influential magazine, could pressure the manufacturers to come up with a better design as standard equipment. Lewin implies that the European guard designs are better, and I wonder whether this is due to the generally tighter workplace safety standards there.

–Ric Scott, Bobcaygeon, Ont., Canada

Check your doctor's dovetails— Recent articles and letters have highlighted the similarities between some surgical procedures and woodworking. It is no surprise that many of your readers are doctors. Of course, there is the question of the judgment of a skilled surgeon who lets his hands get within 10 ft. of a tablesaw. Readers who are seeking the help of an orthopedist should be reminded of a fundamental rule in making this selection: always ask to see a kitchen cabinet he or she has made.

–Albert D. Wood, Dataw Island, S.C.

Are we bats?— As a charter subscriber, with all 133 issues stored in my custom-made, hand-dovetailed, walnut bookcase, I eagerly look forward to the next copy arriving in my mailbox. As an avid woodworker and high school woodworking teacher for the past 35 years, I am keenly interested in information related to woodworking.

A quote in the "Tool for hitters" item in Notes & Comment (FWW #133, p. 28) prompts me to write to you to express that I do not believe that on a baseball bat "you can feel a difference in diameter of 1/20,000 in." With no disrespect intended, may I offer the following: 1) That dimension is 100 times thinner than the sheet of paper on which I am writing this letter; 2) no one I know can work wood to that tolerance; and 3) merely breathing on a piece of wood would probably cause more expansion than that from the moisture in one's breath.

–James Vasi, Williamsville, N.Y.

EDITOR REPLIES: After getting several letters like the one from Mr. Vasi, we talked to Thomas Bednark of Barnstable Bat Co. We were wrong. Bednark told us that professional baseball players, whose livelihoods depend on their proficiency at swinging turned ash bats at 90 mph, can tell the difference in a bat's diameter of 0.020 in., not 1/20,000 in.

Owner takes exception to our review— In the Tools & Materials section of your December issue (*FWW* #133, p. 44) Senior Editor Anatole Burkin published his test results of our cyclone lid, stating that he found it to be 65% efficient, not 90% efficient, as we claim. My understanding is that he tested the unit as an in-line component of a continuously running air-filtration system, not as a component of an "on-demand" dust-collection system. We would like to clari-

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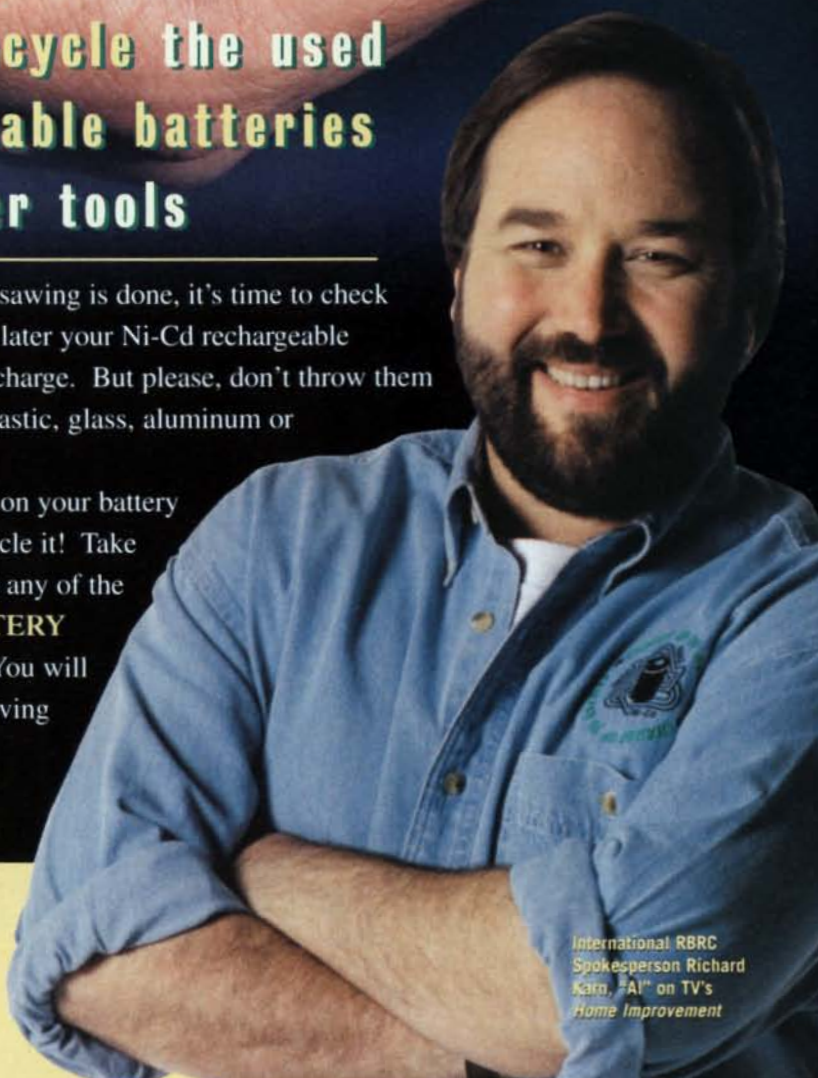

International RBRC Spokesperson Richard Karn, "Al" on TV's *Home Improvement*

Rechargeable Battery Recycling Corporation (RBRC) is a non-profit, public service organization whose mission is to be the international leader in the environmentally-safe collection, transportation and recycling of rechargeable batteries. Nickel-Cadmium (Ni-Cd) rechargeable batteries can be found in power tools, cordless and cellular phones, camcorders and remote control toys. Any of the following stores also recycle Ni-Cd rechargeable batteries: in the US — Ameritech, Batteries Plus, BellSouth Cellular, Car Phone Store, Circuit City and RadioShack; in Canada — Astral Photo Images, Battery Plus, Black's Photography, Authorized Motorola Dealers and RadioShack Canada.

READER SERVICE NO. 145

fy for your readers that when the cyclone lid is used as part of a regular 4-in. pipe, on-demand shop system, it is more than 90% efficient. We not only stand by our earlier claim but also would point out that we consistently exceeded the claimed efficiency in our own shop tests.

—Leonard Lee, president, Veritas Tools, Ottawa, Ont., Canada

ANATOLE BURKIN REPLIES: I checked the performance of the Veritas cyclone lid three times over several months and got results consistent with what I reported. When I'm busy on a big project, moving between the jointer, planer, tablesaw and router, I don't always shut down the dust collector between each operation. That's like dragging the Hoover into the living room, turning it on to suck up one spot of dog hair, then shutting it down before moving on to another spot.

The problem with random-orbit sanders—The review of random-orbit sanders (*FWW* #132, pp. 58-65) fails to address the most annoying problem of all with these machines. The PSA (pressure-sensitive adhesive) pads begin delaminating after two pieces of sandpaper, then fail completely after 20 to 25 pieces of paper. The hook-and-loop system is no better. At $15 per pad, this is quite a problem.

—Al McClain, Kent, Conn.

More on finishes, please—First off, I'd like to say that I consider *Fine Woodworking* to be the premier woodworking magazine available. I have a very sincere request. Please provide information on how the piece was finished in every article. I am an avid reader, and I have read all of the finishing books available. What I have learned from my reading and my attempts to put a finish on my projects is that there is no substitute for experience. For example, on the cover of your December issue (*FWW* #133), you have a beautiful cherry computer desk made by Stephen Lauziere. My first thought was, "What a gorgeous finish." You can imagine my disappointment when not one line in the article was devoted to the finish.

—Allan Chaney, Tulsa, Okla.

EDITOR REPLIES: Sorry about the omission. Mr. Lauziere first put on one coat of Watco Danish Oil Finish and let it dry and cure for two weeks. He then applied two coats of General Finishes' Royal Finish Satin oil and urethane topcoat. Both coats were applied with a gray 3M pad and wiped off with a lint-free cloth.

Connect articles to videos on the web site—I have noticed that your sister publication *Fine Cooking* shows some techniques in videos on its web site. You ought to try that technique for *Fine Woodworking,* even though it's more difficult to show how to build a highboy in one or two minutes than it is to demonstrate making toast.

—Robert A. Speir, Falls Church, Va.

EDITOR REPLIES: We also thought it was a good idea. You can watch two videos on

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Porter-Cable is proud to be a co-underwriter of The New Yankee Workshop on public television.

our web site (www.taunton.com) relating to articles in this issue. One shows author Gary Rogowski demonstrating the use of one of the router dovetail jigs he reviewed. The other shows author Garrett Hack making and using scratch stock to cut a side bead.

Giving credit to a turning pioneer— Normally the striking back cover of the December issue of *Fine Woodworking* (*FWW* #133) would have been a wonderful tribute to the field of wood turning, had you not so accurately depicted another turner's technique, use of material and even typical vessel form. Ron Kent, my friend and renowned wood turner from Hawaii, has been doing this work for at least two decades, much of it residing in many prestigious museums and private collections. In addition, through conferences, videos and publications, he has for years unselfishly demonstrated his technique and use of Norfolk Island Pine to many aspiring wood turners.

Do I fault your featured turner, Gene Blickenstaff, for his fortuitous circumstance? Perhaps, but I doubt that any woodworker would reject the opportunity to be showcased so prominently on the back cover of a benchmark journal. It's quite a feather in one's cap. As I see it, however, the very prominence of such depiction lends a great deal of weight to the presumption of originality by an uninformed reader.

I realize that as a publisher you are probably under no obligation nor have a desire to distinguish original vs. derivative work. That you choose to feature someone's work so distinctively, however, makes me think that you owe your readers, especially those unfamiliar with the field, the responsible act of making sure the feather is in the right cap.

—J. Paul Fennell, Scottsdale, Ariz.

EDITOR REPLIES: Perhaps we should have given a nod to Ron Kent and his excellent work. The fact that we did not in the short write-up on Gene Blickenstaff's bowls was our oversight. Kent, who is a friend of Blickenstaff's, has encouraged Gene to seek recognition for his work. As I'm sure our readers know, a great deal of woodworking, perhaps all of it, is derivative to some degree. We try to give credit to originators whenever we can.

A call for wooden chests

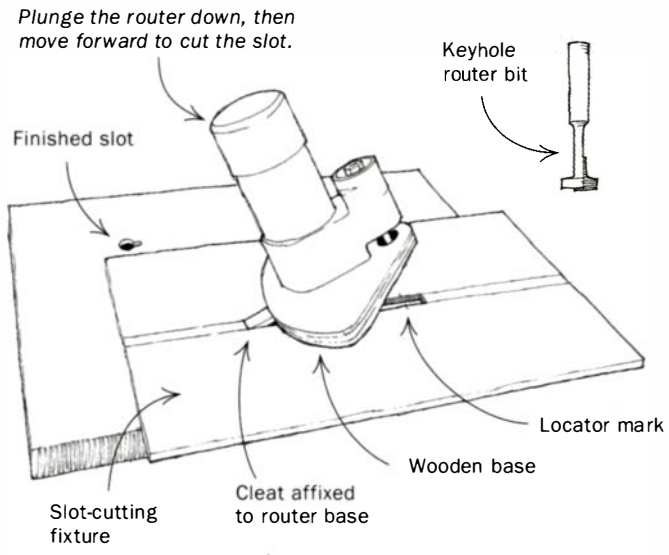
The Taunton Press is seeking examples of wooden chests, old and new, for an upcoming book. The types of chests we're interested in include hope chests, blanket chests, campaign chests, trunks and toy chests. Have you made a beautiful one lately? Do you have a family heirloom in the attic? All submissions will be acknowledged, and material that can't be used will be returned. Please send photos (35mm slides or larger-format transparencies) along with a description of the chest to Strother Purdy, The Taunton Press, P.O. Box 5506, Newtown, CT 06470-5506. Deadline for submissions is Feb. 1, 1999.

READER SERVICE NO. 50

Methods of Work

EDITED AND DRAWN BY JIM RICHEY

Mounting panels with keyhole slots



A keyhole router bit cuts a T-shaped slot that is useful for hanging picture frames. However, with a couple of simple fixtures, you can also use this bit to mount large panels flat to the wall. The benefits are many: The slots allow solid wood panels to expand and contract; a damaged panel can easily be taken down, repaired and reinstalled; and finally, there's no visible means of attachment, such as wires or nail holes.

To mount a panel with keyhole slots, you'll need a slot-cutting fixture and an alignment template. The alignment template is simply a piece of hardboard or plywood drilled with a pattern for mounting the screws. Attach the template to the wall, drill holes in the wall and insert pan-head screws, tightening them against a ¼-in.-thick scrap of wood to leave a consistent gap between the screw head and the wall. Transfer the template to the back of the panel and mark each screw location.

To make the slot-cutting fixture, glue up several pieces of ¼-in.-thick material, leaving a ¾-in.-wide, 6-in.-long slot in the middle of the fixture (as shown in the sketch). To ride in that slot, make a ¾-in.-wide, 5½-in.-long maple cleat, drill a hole through one end of the cleat, then screw the cleat onto the bottom of your router base with the hole centered over the bit. (A wooden base added to your router makes this easier.) It is important that about 1 in. of the cleat hang over the edge of the router base to provide a lever arm for plunging the router. The cleat should slide freely in the slot.

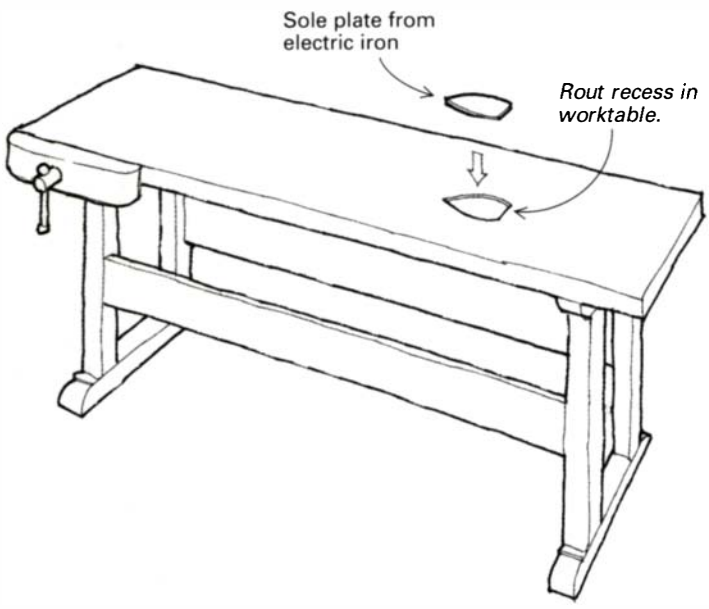
Place the fixture on the back of the panel, aligning it with the screw-location marks, and clamp the fixture in place while you make your plunge cuts. You may need to adjust the depth of the screw heads on the wall for a perfect fit.

—Tom Griffin, Pleasanton, Calif.

A new reward for your best tips

Beginning with our next issue (April 1999), Fine Woodworking *will present an engraved Lie-Nielsen plane to the author of the featured tip in each issue's Methods of Work. We will continue to pay for the other tips, jigs and tricks published in Methods of Work. Send details, sketches (we'll redraw them) and photos to Methods of Work,* Fine Woodworking, *P.O. Box 5506, Newtown, CT 06470-5506. We will return only those contributions that include a SASE.*

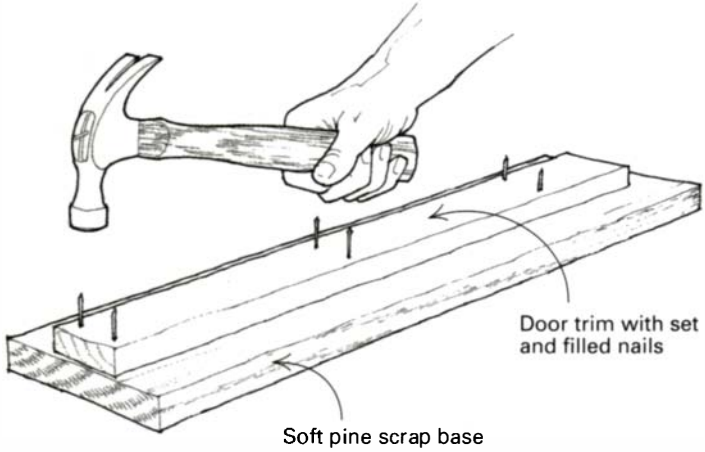
Workbench anvil



One of the things missing in my workshop was a hard surface to hammer against. I solved this problem by routing out the top of my workbench and inlaying the sole plate of an old electric iron. An 8-in. square of ⅜-in. steel plate would work just as well. If possible, locate the inlay over a structural member.

—Bruce Revell, Magill, South Australia

Split-free nail removal



When removing nails from window and door trim that will be reused, the heads invariably splinter the face of the trim when the nail is backed out. To avoid this, place the trim upside down on a

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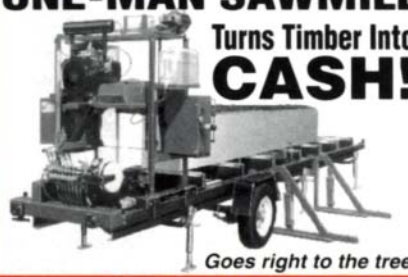

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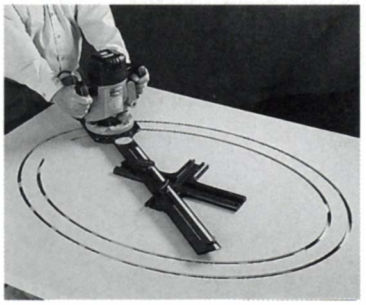

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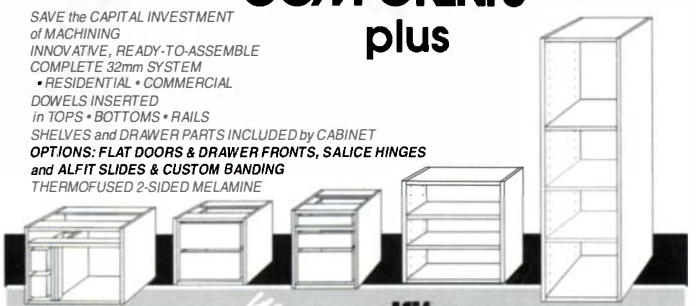

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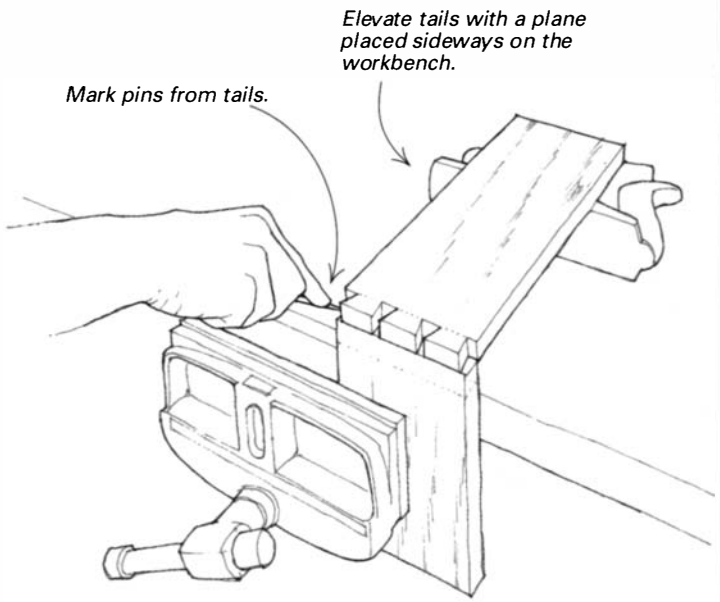
soft pine scrap, and drive the nail heads into the pine. The pine supports the wood around the head and reduces splintering.
—*Tom Quinn, Auburn, N.Y.*

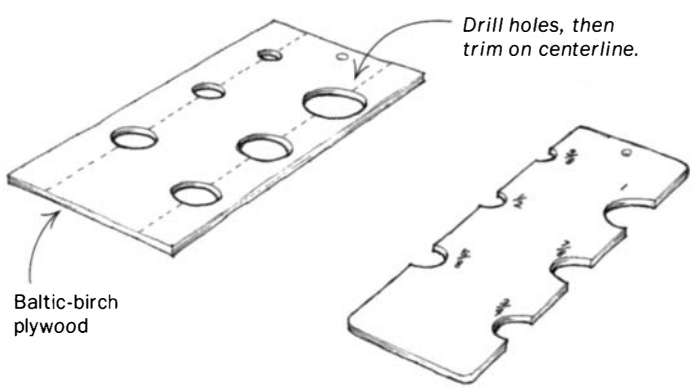
Marking dovetail pins



Here's a trick that simplifies the critical step of marking dovetails. Cut the tails in the drawer side first. Lay a handplane on its side on the bench, and clamp the drawer front (on which the pins will be marked) in the vise to the height of the plane. It's easy to lay the drawer side across the plane body and the clamped drawer front and transfer the outline of the tails to the pins by marking with a knife or an awl. —*Anthony Guidice, St. Louis, Mo.*

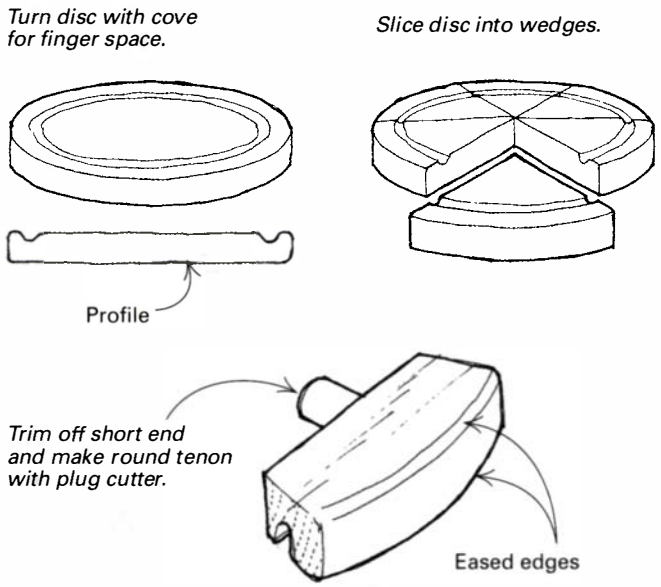
Quick tip: The world's finest sanding block for curved surfaces is a piece of piano felt 7/16 in. thick. A piano tuner will know where to get the stuff. —*David Sawyer, East Calais, Vt.*

Tenon gauge



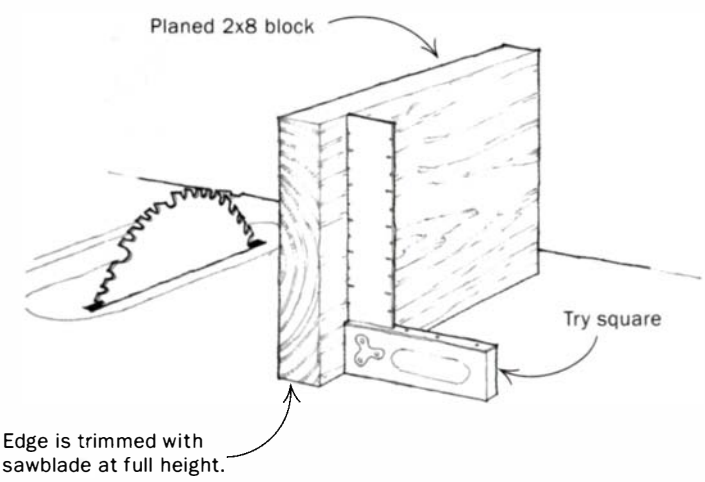
This gauge lets me check the size of turned tenons in a flash. Make the gauge from Baltic-birch plywood, which resists dimensional changes with fluctuations in humidity. Sand and finish the gauge before you drill the holes so that the operations will neither add nor subtract from the final dimensions.—*R.B. Himes, Vienna, Ohio*

Drawer pulls from a turned block



To make unique walnut drawer pulls for a bird's-eye maple bureau, I turned a 2-in.-thick, 8-in.-dia. disc on my lathe with a cove-shaped groove on the underside for finger space. On a bandsaw, I sliced the disc into six pie-shaped pieces and trimmed off the short ends of each. Next I cut square tenons on the short ends of each piece and made those into dowels, or round tenons, using a plug cutter. I then drilled holes for the tenons in the drawer faces for installing the pulls. —*David St. George, Old Lyme, Conn.*

Setting a tablesaw blade at 90°



The time-honored way for setting a tablesaw blade so that it cuts a true 90° angle is to raise it up to its full height and put a square against it, carefully avoiding any of the teeth. I used this method

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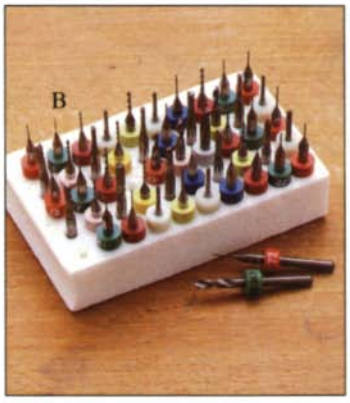

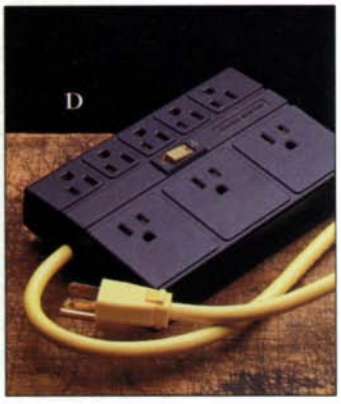

SALE E / Iron Backed Tenon Saw Combines The Best Of Western & Japanese Style Saws

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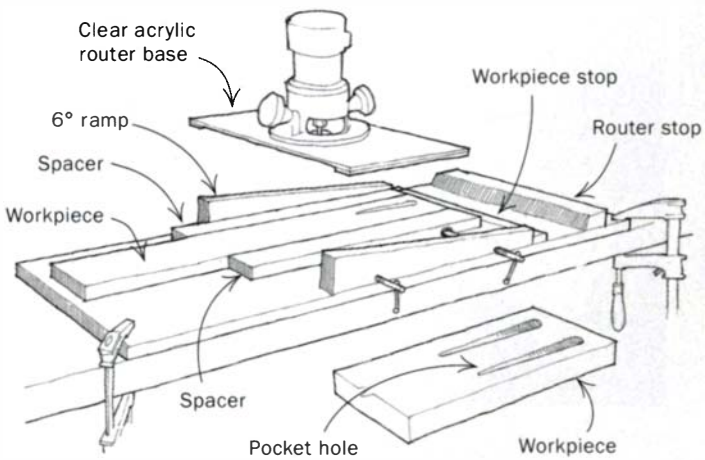
for many years but never found it completely satisfactory for two reasons. If you have a wobbling blade or a throat insert that isn't level, you don't get an accurate reading.

I now use another technique that's easy to set up and totally accurate. Select a piece of 2x8 scrap a foot or so in length and plane both sides of it. Trim both edges of the block with the blade fully raised. Remove the sawdust from the saw table and stand the block on one of the freshly trimmed edges. Place a try square against the block. A board this wide and this thick will give a highly accurate reading against a good square. Adjust the tilt of the blade and trim the block again, until the cut is perfectly square.

—Thomas J. Brooks Jr., Jackson, Miss.

Quick tip: Use a lever-arm paper cutter, available at any office supply store, to cut sandpaper. The built-in ruler makes the job simple and quick. Also, the cutter does not get dull quickly, as you might expect. Mine has been in use for more than five years and still cuts like new. *—Ed Reiss, Berea, Ky.*

Router ramp for pocket holes

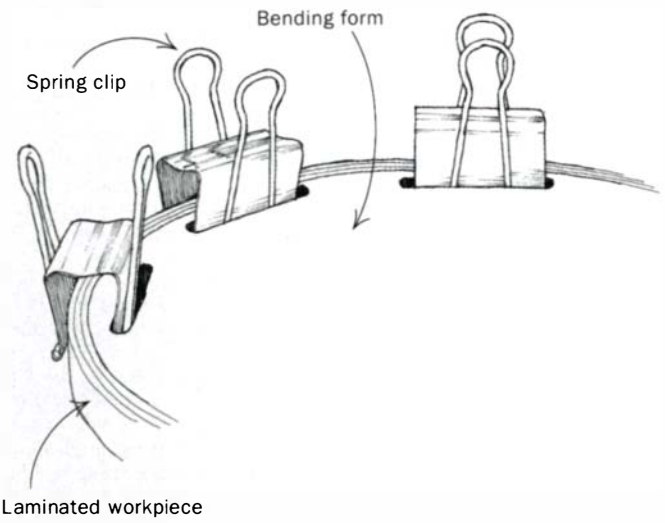


I built this router-based pocket-hole ramp when I became frustrated with my drill fixture. The router slides down the ramps to cut a low, 6°-angle pocket hole. It's quick and simple. There's no shifting of the workpiece and no frayed edges on the cut.

To make the fixture, attach two 6° ramps on each side of a plywood base. Install T-nuts and bolts in one of the ramps to provide a clamping system for the workpiece. Attach stops for the workpiece and the router at the base of the ramp. The distance between the router stop and the workpiece stop will determine the depth of the pocket hole, so position the stops carefully. Also, you will need to make an acrylic or Plexiglas base for your router. Add ¼-in.-thick guide rails to the underside of the base to ride on the outside of the ramps.

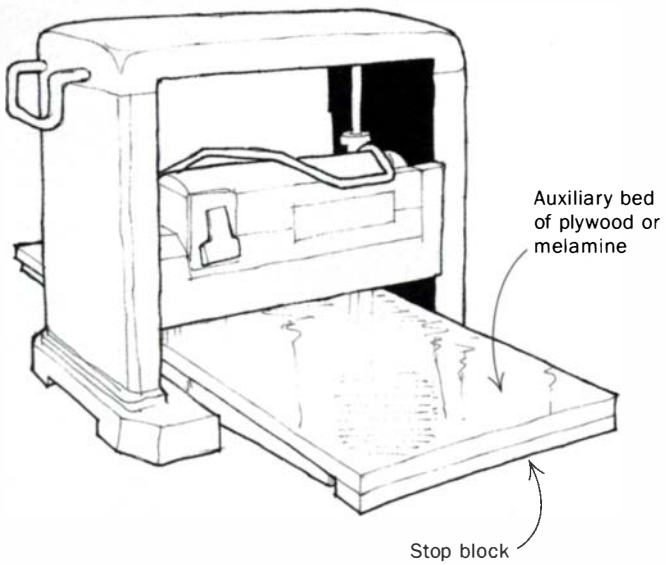
To set up for a cut, place the workpiece in the fixture against the stop, positioning the workpiece so that the pocket cut will be in the right location. Drop in some scrap spacers to hold the workpiece in position. Tighten the clamps. Chuck a ⅜-in. round-nose bit into the router. With the router in place at the top of the ramps, turn it on, and slide it down to the router stop to make the pocket hole. Drill the pilot hole in the pocket after the workpieces have been clamped together. Use a 6-in. pilot bit and driver to keep the screw angle low. *—Michael Csontos, Prescott, Ariz.*

Spring clips for clamping



When making bentwood laminations, I had never had enough clamps, until I began using spring clips available at the stationery store. The clips come in several sizes and are cheap, lightweight and strong. *—Steve Borton, Vancouver, B.C., Canada*

Auxiliary planer bed



I use a piece of ¾-in. plywood over the bed of my thickness planer when I plane thin boards, to avoid lowering the head so tightly. This fixture also reduces snipe. Attaching a stop block to the underside of the fixture will prevent it from moving through the planer. For better wear and reduced friction, you could also make the fixture from melamine. *—Omar Showalter, Harrisonburg, Va.*

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Saw Tooth Bit

Forstner Bits/Saw Tooth Bits
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Saw tooth bits (usually over 1″ in diameter) are primarily for use in a drill press. They are most useful for boring smooth, clean holes in all wood varieties at any angle. The double chip channels are less subject to rim heat than forstners and are easier to sharpen. Although their edge-holding ability in overlapped holes is slightly less than forstners, the difference is negligible in drill-press use.

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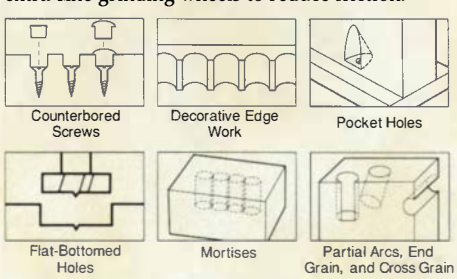
The rim on the forstners is proud of the chippers by only .005″, reducing rim heat. The saw tooth styles are true saw tooths, not forstner bits with rim notches. The teeth have a skewed shear-cut design to prevent fiber pull and to give clean holes. Both styles have slightly sloped chipping bevels so that bits ride a shallow cone of wood to keep them boring straight. Center brads can then be shorter, increasing bit versatility in thin material. As a last touch, bits have been finished with extra-fine grinding wheels to reduce friction.



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1/2	FW508	$ 4.70	15/16	FW515	$ 6.25
9/16	FW509	$ 5.00	1	FW516	$ 6.50
5/8	FW510	$ 5.30			

Individual Saw Tooth Bits

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1 1/8	FW518	$ 7.15	2 3/8	FW538	$16.25
1 3/16	FW519	$ 7.25	2 7/16	FW539	$17.25
1 1/4	FW520	$ 7.40	2 1/2	FW540	$18.15
1 5/16	FW521	$ 7.55	2 9/16	FW541	$18.75
1 3/8	FW522	$ 7.65	2 5/8	FW542	$19.40
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Sizes 5/8" to 1" cut 2 3/4" long tenons and are typically used for rustic furniture. Sizes 1 1/2" and 2" cut 4 1/4" long tenons for larger structural connections such as fence rail to post. Each has a non-slip hex shank; sizes 5/8" to 1" are for use in an electric drill with a 3/8" (or larger) chuck, while sizes 1 1/2" and 2" are for use in an electric drill with a 1/2" (or larger) chuck. The square-shanked adapter is for use in a hand drill. Patent pending.

	FW580	Power Tenon Cutter – 5/8"	$ 52.75
	FW581	Power Tenon Cutter – 3/4"	$ 54.75
D.	FW582	Power Tenon Cutter – 1"	$ 56.75
	FW583	Power Tenon Cutter – 1 1/2"	$ 59.75
E.	FW584	Power Tenon Cutter – 2"	$ 61.75
	FW585	Set of 3 Cutters (5/8" to 1")	$145.00
	FW587	Set of all 5 Cutters	$250.00
	FW586	Repl. Blade	$ 11.50

Veritas® Mini Tenon Cutters

We developed these smaller-diameter tenon cutters for use with small stock. Available in four cutting diameters: 1/4", 3/8", 1/2" and 9/16". The 9/16" tenon is the size used historically for chair rungs. The other sizes (1/4" to 1/2") are useful in many areas, e.g., members within trellis or lattice work. All sizes have a straight blade that cuts a 60° shoulder tenon (not a radiused shoulder tenon as on the larger sizes). The 1/4" and 3/8" sizes cut tenons up to 1" long, and the 1/2" and 9/16" sizes cut tenons up to 1 1/2" long. A plug gauge is included for easy blade setting. For use in any hand drill. 3/8" round shank. Patent pending.

F.	FW590	Mini Tenon Cutter – 1/4"	$17.50
	FW591	Mini Tenon Cutter – 3/8"	$19.50
	FW592	Mini Tenon Cutter – 1/2"	$21.50
G.	FW593	Mini Tenon Cutter – 9/16"	$23.50
	FW594	Repl. Blade	$ 1.95

H. Silicon Carbide Sleeves

These silicon carbide sleeves are specifically for sharpening our power tenon cutter blades. Available in either 80x or 120x as packages of three. Although they fit a standard 1 1/2" × 1 1/2" sanding drum, we have a single drum listed separately in case you do not have this size in your shop.

	FW597	80x SiC Sleeves, pkg. of 3	$2.50
	FW598	120x SiC Sleeves, pkg. of 3	$2.50
J.	FW596	Sanding Drum, 1 1/2" × 1 1/2"	$2.50

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READER SERVICE NO. 94

Tools & Materials

Power planer excels at trimming curved work

Fair that curve. *The Virutex curve planer has an adjustable sole plate. It will cut concave radii as tight as 17 11/16 in. or convex radii as tight as 16¾ in.*

The Virutex curve planer is a big improvement on the only other tool made for this kind of work, the old-fashioned compass plane. Unfortunately, the hand tool is difficult to use without getting some tearout because the wood's grain often changes direction at some point on curved work. But the Virutex is easy to use and produces a very clean cut. (For a discussion on using a classic compass plane, see Master Class on p. 114.)

Spinning at 16,500 rpm, the two blades in the Virutex cutterhead make 33,000 cuts per minute. That's 550 cuts per second. Even when planing against the grain, tearout is minimal. The Virutex's flexible steel sole can be adjusted to the radius of a concave or convex curve. The tool also can be used on flat surfaces.

I make a lot of curved handrails, window and door jambs. It's tough to justify a router or shaper setup for one or two parts. With the electric planer, I can bandsaw the part to the right radius, then simply plane it smooth. The Virutex can be adjusted to a minimum concave radius of 17 11/16 in. and a minimum convex radius of 16¾ in.

Made in Spain, the tool is stoutly built, has plenty of power and comes with a dust-collection vacuum hose adapter, reversible blades and a fence guide.

Compared with the $175 price tag for a Record compass plane, the only such tool still made, spending $299 on the Virutex seems reasonable. *—Lon Schleining*

TransTint concentrated dyes resist fading

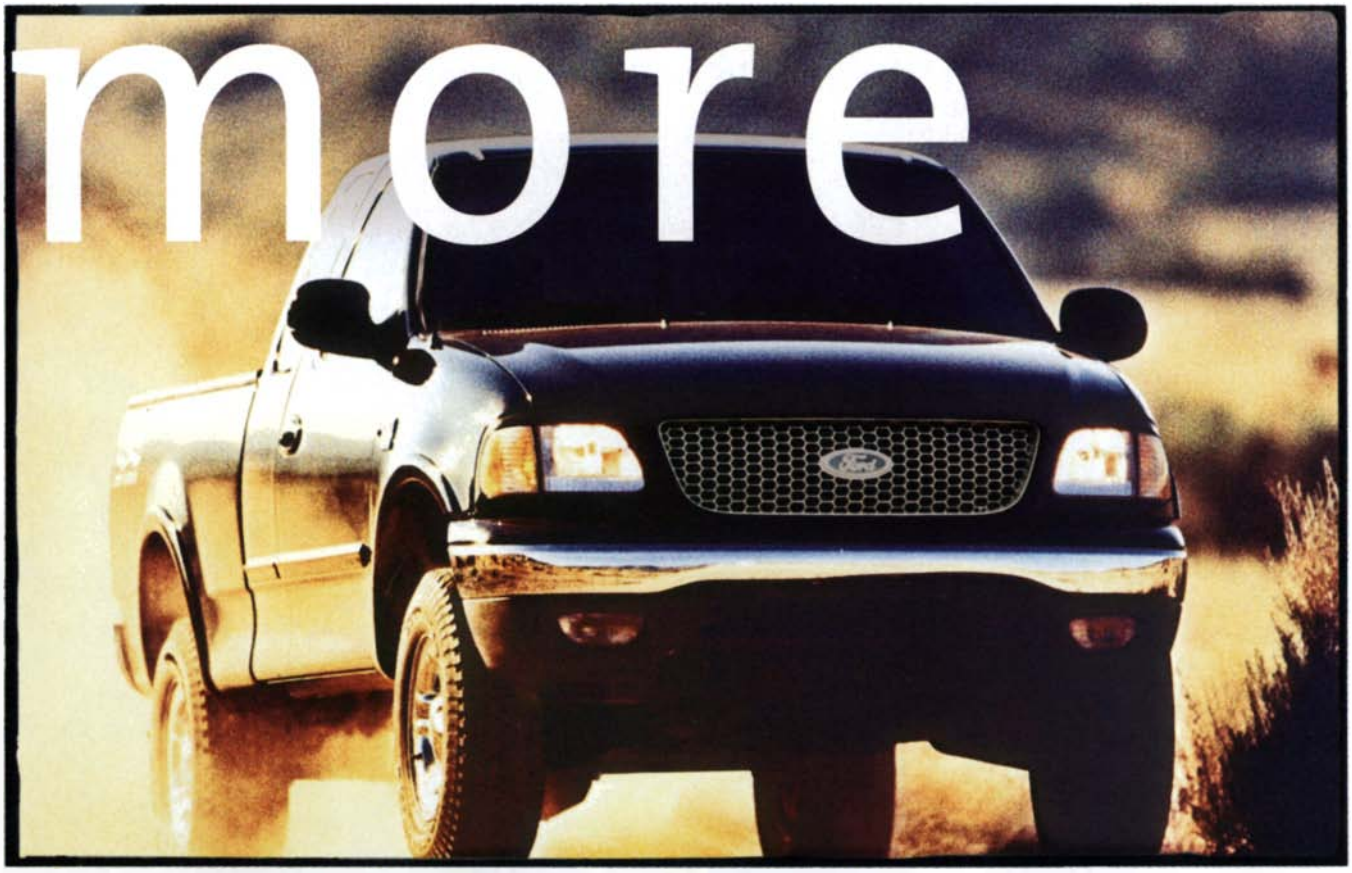
There is nothing new about liquid dye stains—they have been around for years. What makes Homestead Finishing Products TransTint concentrated dyes noteworthy is their resistance to fading.

I tested several different shades of TransTint wood dye for light fastness in an industrial accelerated weathering chamber. I found that the TransTint dyes are superior to powdered alcohol dyes and equivalent to or slightly better than powdered water-soluble dyes (considered the most lightfast variety of dye).

As an added bonus, the colors are gor-

Liquid dyes. *TransTint dyes, which are available in wood tones as well as in primary colors, resist fading.*

Photos: Top: Lon Schleining; bottom: William Duckworth



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geous. The wood tones look like they should—natural with no odd-colored overtones or artificial appearance. The primary colors are vibrant and bright.

A 2-oz. bottle of TransTint dye concentrate makes up to a half gallon of stain when dissolved in two quarts of water or alcohol. Custom shades are easily produced by mixing two or more TransTint colors and adjusting the dye-to-solvent ratio. You can also make toners by adding the dye directly to shellac, water-based finishes or solvent-based lacquers.

TransTint dyes are soluble in water, alcohol and lacquer thinner. They are not soluble in VM&P naphtha or mineral spirits. If you wish to use them in oil-based varnishes (which are thinned with mineral spirits), the manufacturer recommends mixing the dyes with acetone, then adding that mixture to the varnish. Substituting lacquer retarder for acetone gave me better results. TransTint dyes cost $15 per 2-oz. bottle. For availability, call (440) 582-8929.

—Chris Minick

Diamond bench stones from Norton

Why should you consider sharpening with diamond bench stones? They cut fast, they're flat, and they stay flat. Need more reasons? Oh yes, the only maintenance required is an occasional rinsing with water.

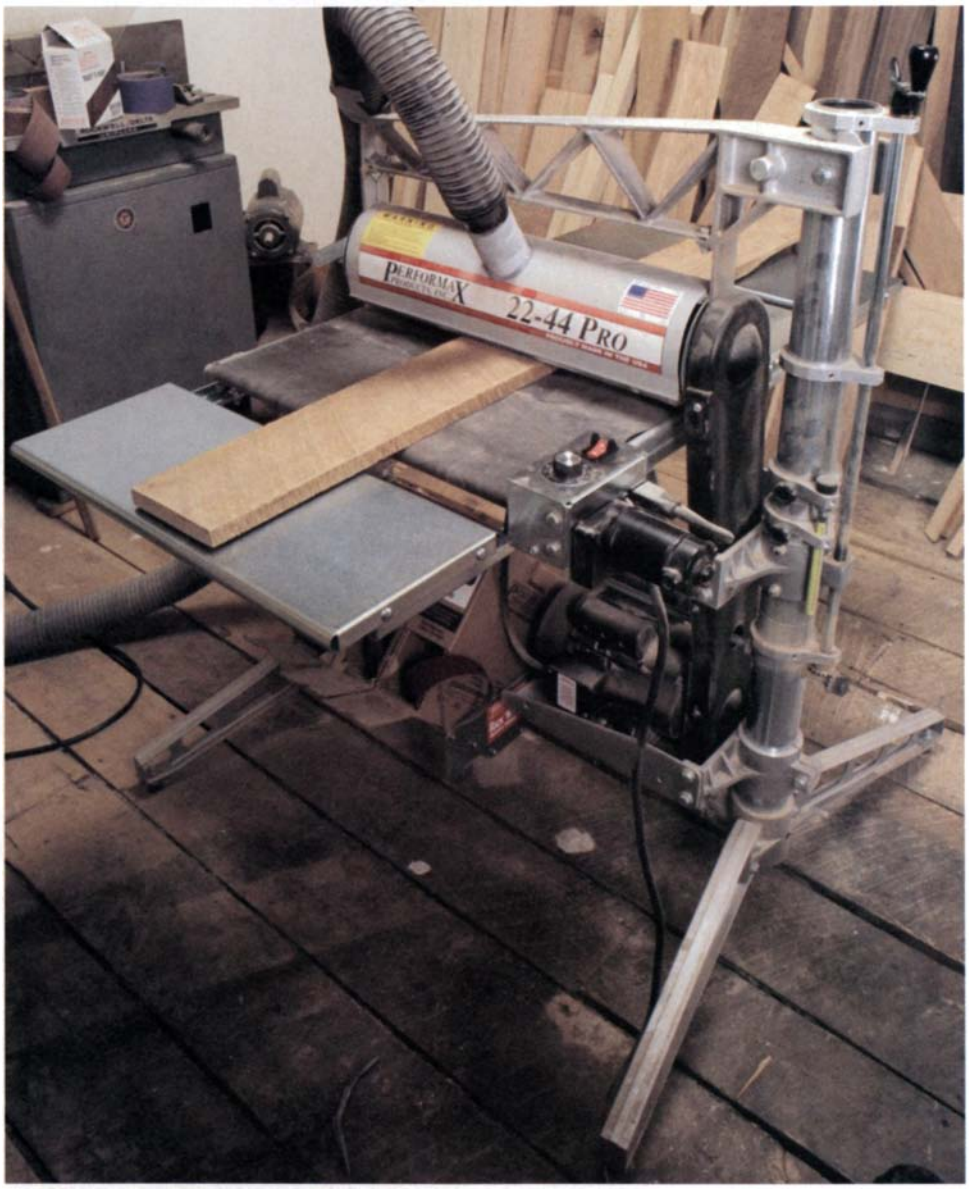
Norton is the latest company to introduce diamond bench stones. Four grits are available: extrafine (1,200 grit), fine (600 grit), coarse (325 grit) and extracoarse (220 grit). Unless you plan to grind rough castings or severely pitted tools, the fine and extrafine stones are all you need. (For a really fine edge, add a Japanese 6,000-grit stone to the routine.)

The diamond stones are good for lapping the soles of planes and for sharpening hand tools, including carbide-tipped tools. The stones come in several sizes, but we like the largest plates, which are ⅜ in. thick by 2½ in. wide by 11½ in. long.

We measured the stones, and they were within 0.0015 in. flat in either direction. The company aims for a tolerance of 0.002 in. The large stones cost about $50 apiece. For availability, call Norton at (800) 848-7379.

—Fine Woodworking staff

An affordable drum sander for the small shop



Reasonably priced drum sander. *The Performax 22-44 Pro is a good compromise between a hand scraper and an expensive, commercial sander.*

Two weeks of hand-scraping a large, curly cherry sideboard using a Stanley No. 112 scraper convinced me it was time to invest in a power drum sander. I couldn't justify a large commercial machine for my shop, so I decided to buy a Performax 22-44 Pro sanding machine. I figure I avoided another 40 or so hours of scraping by running the rest of the sideboard stock through the Performax.

I like the simplicity of the 22-44 Pro. It seems rugged enough, and adjustments are easy to make. While the machine is super for a small shop doing limited production, I would not recommend it for a midsized or larger shop. It's a nice compromise between a hand scraper and a commercial belt sander costing thousands of dollars more. Although the Performax will thickness-sand too, I won't retire my thickness planer, which works faster.

A key to the success of the Performax is using high-quality abrasives, which are available from Klingspor or 3M. Abrasives are spiral-wrapped around the machine's 22-in.-wide aluminum drum. Changing paper takes only a few minutes. Because all sandpaper stretches initially, be sure to ad-

Photo: Ernie Conover

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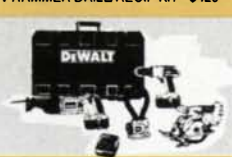

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just the tension after the first pass. It's also important to start with a sufficiently coarse grit and not skip any. I start with 36 grit for rough-sawn boards and 80 grit for most everything else.

The 22-44's cantilevered design, which is open on one side, allows you to sand a wide panel in two passes by sanding one half at a time. I can sand a panel just a hair under 44 in. wide. The machine accepts stock up to 4 in. thick. You can also sand very thin stock. I took some curly maple down to 0.040 in. with no problem.

The Performax has an infinitely variable feed rate from 0 ft. to 10 ft. per minute. Although the manufacturer claims the machine can remove up to 1/16 in. per pass, I found that lighter passes, especially with the finer-grit papers, work best. Running a batch of panels through four grits can take some time, but it beats scraping. I wonder whether that Stanley No. 112 would make a nice lamp. The Performax 22-44 Pro sells for about $1,800. For more information, call Performax at (800) 334-4910.

—Ernie Conover

Frederick Wilbur

Quick-cutting rasps. *Microplanes come in about a dozen shapes. They leave a finer surface than steel rasps do.*

Microplanes cut aggressively

Grace Manufacturing's line of Microplanes work on a principle similar to the Stanley Surform files and planes. Both employ perforated sheet-metal cutters, but the stainless-steel Microplanes cut finer and come in about a dozen shapes and sizes.

The flat and half-round shapes are held in a hacksaw frame. Some will fit Surform handles. And the round and square files are mounted in turned wood handles.

I got the best results working across or diagonally to the grain. The Microplanes meant to fit Surform handles, where the rows of blades are arranged in a semicircular pattern, work well cutting with the grain. These tools are aggressive; the hacksaw frame allows a two-handed attack.

When trying to make precision strokes, it was difficult to grasp the unhandled end of the round and square tools. Because these tools are light and somewhat flexible, they don't give me the control I get with heavier

steel files. The rounded corners of the square tool make it impossible to obtain a 90° inside corner. For that, you still need a traditional steel file.

As shaping tools, Microplanes have their place. They augment traditional carving tools, such as gouges and files, but won't replace them. For availability, call (800) 555-2767. *—Frederick Wilbur*

Microplanes cut and shape wood. *Standard hacksaw frames and Surform handles will work with Microplane inserts.*

Compact belt sander from Bosch

Scaled down. *Bosch's compact belt sander gets into places other machines can't.*

I get a lot of work restoring the millwork in older homes. These jobs usually require a lot of sanding, and my belt sander is often too much tool, like using a bulldozer to garden in a greenhouse.

Bosch must have realized this, too. Its 1278VS compact belt sander is powerful enough to get the job done quickly without leaving a path of destruction.

The sander has a 1½-in. by 12-in. belt and a 3.3-amp motor with variable-speed control. You can work flush to one side of the belt (by flipping the tool upside down you can work flush to either side). The belt-tracking system is very precise, and there's a dust port that will hook up to a small-diameter hose.

Although the tool is compact by belt-sander standards, it's still too big for comfortable one-handed use. The tool could be improved by scaling it down slightly. Also, the switch is oddly placed midway along the top of the tool, which puts it under my palm rather than near a fingertip.

For certain applications, such as back-cutting miters and trim in millwork or reaching into tight corners, the compact belt sander does a nice job. The machine costs about $135. *—Roland Johnson*

Lon Schleining is a stairbuilder in Long Beach, Calif.; Chris Minick is a contributing editor to Fine Woodworking; *Ernie Conover is an author and woodworking instructor in Parkman, Ohio; Woodcarver Frederick Wilbur works in Lovingston, Va.; Roland Johnson does custom millwork and restoration in Sauk Rapids, Minn.*

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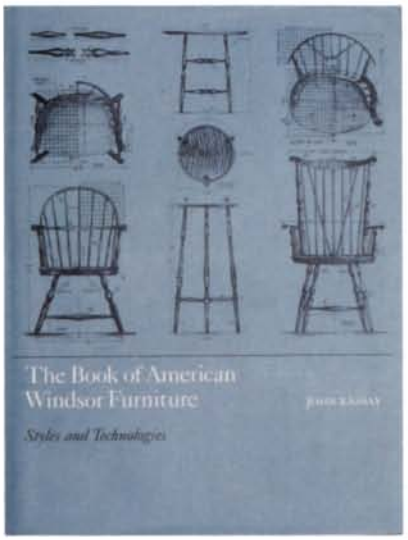
Notes & Comment

New book on Windsors



The Book of American Windsor Furniture: Styles and Technologies by John Kassay. The University of Massachusetts Press, Amherst, Mass. (413-545-2219); 1998. $49.95, hardback; 224 pp.

This is the type of review a teacher likes to write. I am proud to have taught John Kassay to make Windsors in a class he took with me at Brigham Young University in 1981. In chronicling Windsor furniture, Kassay has done for chair making what Lynch, Margon and Salomosky did for cabinetmaking. He has spared chair makers trips to distant museums or lots of trial and error in establishing a chair's critical dimensions. His book stands as the largest source of measurements of Windsor furniture (there is a lot more than chairs here—settees, cradles, stools, candlestands and tables are also discussed). This book is a resource that all Windsor chair makers will want to have on hand.

The book is divided into chapters dedicated to a single style of chair or Windsor form. Each chapter includes one or two drawn examples followed by a number of photographs and brief descriptions of others of the same type. Kassay is an accomplished pre-CAD draftsman and, with his skilled shading technique, imparts critical knowledge about shapes and details not possible with a line drawing. It is too bad the drawings are limited to a single page each, which makes them small and hard to read. The information is there, but I found a magnifying glass helpful.

For the novice, the book is a useful survey of Windsors. But it is more helpful to the experienced chair maker who knows how to interpret the information Kassay has presented. This is the problem: Making Windsors requires different information than is recorded in traditional measured drawings like those in Kassay's book. For example, most Windsor chair parts require trim length that is removed after assembly. The parts have to be made longer than their drawn lengths. When chair making by hand, many dimensions are individual to the chair and will vary slightly from example to example. The chair maker determines the precise length of individual pieces from the chair itself as it is being assembled. The experienced chair maker must draw on his or her knowledge to extrapolate this additional information from a traditional measured drawing.

The reference to technologies in the subtitle is curious in that the book contains no chapters about the process of making a chair. Still, as a source of details and measured drawings, *The Book of American Windsor Furniture* is in a class by itself.

—Michael Dunbar of Hampton, N.H., is a contributing editor to Fine Woodworking *and a master Windsor chair maker.*

Bench built for two

David Joly, a woodworker from Ashland, Ore., writes: "Seven years ago, I built this workbench for myself and my wife, Mary Burgess, who decided to take up woodworking and join me at my hobby (see the photo below).

The first thing to go in the shop, the 5-ft. by 8-ft. bench has two vises and two huge through-drawers, which run on wheels rather than on slides. Mary and I work on opposite sides, often on separate projects. If I just swallow every second helpful comment, it seems to go better."

You stay on your side, I'll stay on mine. *David Joly and his wife, Mary Burgess, share this double-wide workbench.*

Wood webs

"Wood webs" features useful and interesting woodworking web sites. For more sites, check out Sites to See at *Fine Woodworking* Online (www.taunton.com). If you have a woodworking web site you would like to share, send the address to mvassallo@taunton.com.

Turn, turn, turn

Pathways, an international juried exhibition of wood turnings at the Cleveland State University Art Gallery last June, has a web site (www.pathways98.org) that gives new meaning to the phrase "the show that never ends."

The original, real-world show—which was held in Cleveland—featured selected works of more than 40 artists from 20 states and 6 countries. The virtual show—online from now until forever?—is both a treasure trove of fine wood turnings and

Photos: Left, top and bottom: Michael Pekovich; right: David Joly

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READER SERVICE NO. 118

a lesson in good web-site design.

At the site, you can read an introduction by the curators and statements by the jurors, see photographs of the show itself or skip right to pages featuring the works of 47 wood turners, one turning and a short statement from each artist. A full range of turnings is represented: architectural elements, bowls and platters, furniture, hollow vessels, lidded containers, miniatures, sculpture and housewares. There's even a small show within a show of Peaseware, the 19th-century treenware named for its maker, David Mills Pease.

Patrick's Blood and Gore

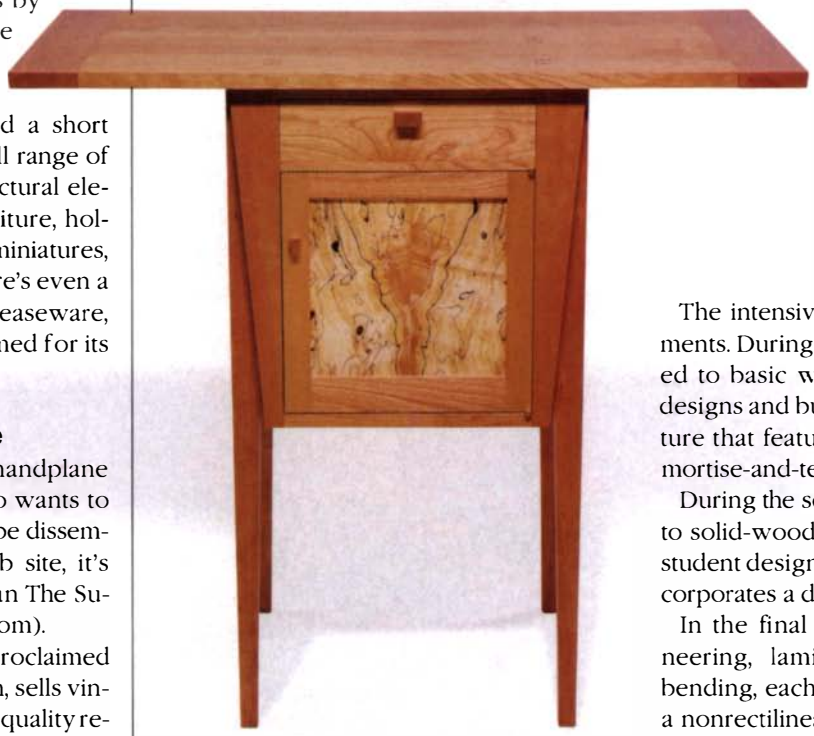
For old tool buffs, especially handplane aficionados, or for anyone who wants to see how much information can be disseminated via one individual's web site, it's hard to imagine a finer stop than The Superior Works (www.supertool.com).

The site's web master, a self-proclaimed tool fanatic named Patrick Leach, sells vintage tools and a handful of high-quality reproductions, including a smart-looking, cocobolo-handled layout knife, a copy of an original that belonged to a turn-of-the-century pipe-organ builder.

Leach says, "The Superior Works is doing its part to stem the tide of 'paint by numbers' woodworking." To that end, presumably, Leach includes on his site several heavily annotated photo galleries of old tools. Any one of these galleries (reached from the home page via a link called Et Cetera) might have been enough to earn the site a place in "Wood webs," but what really puts it over the top is Leach's cybertomb on handplanes, the cryptically titled cult classic *Patrick's Blood and Gore*. (Via e-mail, Leach explained that the title has to do with his anatomical dissection of handplanes and not with roadkill.)

Some may be put off by Leach's occasionally tongue-in-cheek tone, but the information is thorough and rigorous. Patrick's B&G, as it's known, covers Stanley planes by the numbers, from the No. 1 through the No. 608C, always in great detail and with lots of handsome photographs. The first of 15 sections, covering plane Nos. 1 through 8C, alone prints out at 20 pages! Make sure you remember to do a little woodworking in the years it might take you to digest Patrick's B&G.

Give me 12 weeks



Student work. *This hall table in cherry and spalted maple, made by Deneb Puchalski, is among the fine projects completed in the Twelve-Week Intensive at the Center for Furniture Craftsmanship.*

A rightly proud Peter Korn, director of the Center for Furniture Craftsmanship in Rockport, Maine, recently sent *Fine Woodworking* photographs depicting the work of participants in the center's Twelve-Week Intensive. The course is designed to meet the needs of aspiring professional furniture makers and amateurs on sabbatical from other professions. Most of the students begin with little previous woodworking experience.

The intensive is divided into three segments. During the first three weeks, devoted to basic woodworking, each student designs and builds a simple piece of furniture that features hand-cut dovetails and mortise-and-tenon joinery.

During the second three weeks, devoted to solid-wood carcase construction, each student designs and builds a piece that incorporates a drawer and a door.

In the final six weeks, devoted to veneering, laminate bending and steam bending, each student designs and builds a nonrectilinear piece of furniture involving at least one of these techniques.

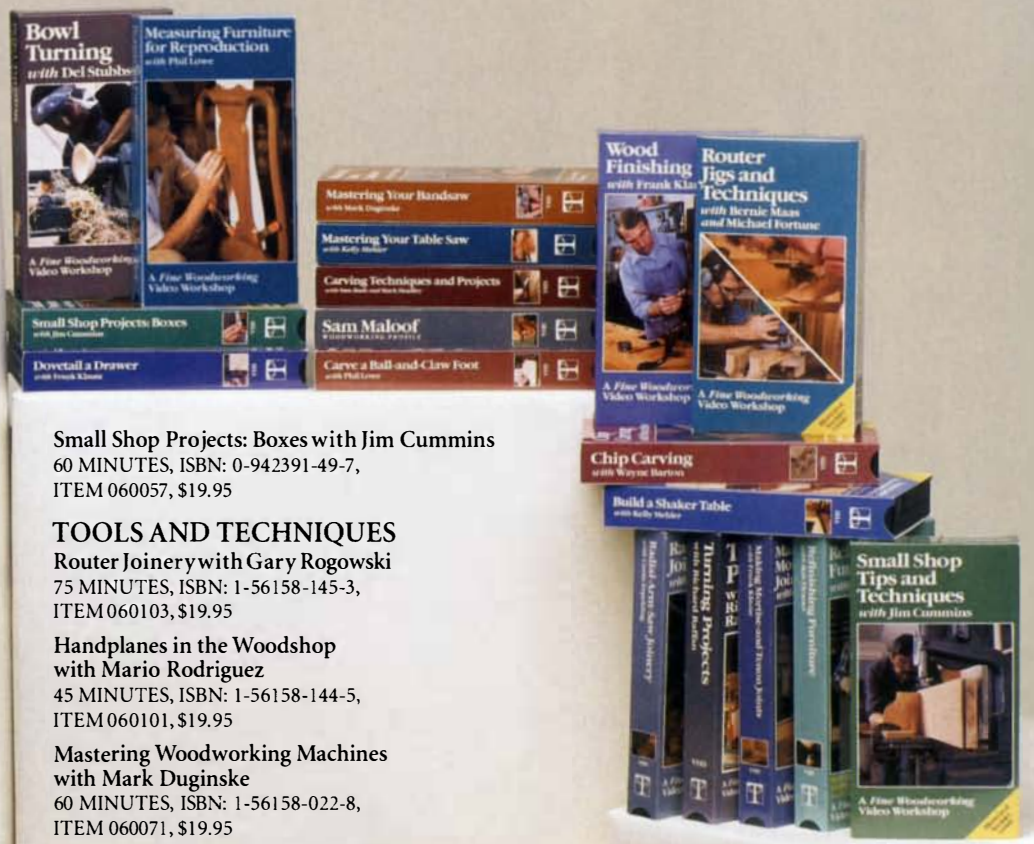
The furniture that results is quite remarkable, but the real story, according to Korn, "is the growth the students go through as craftsmen and as individuals, their motivation and changing perception and mostly their enthusiasm and the joy they take in their work."

For more information on the Center for Furniture Craftsmanship and the Twelve-Week Intensive, call (207) 594-5611 or visit them on line at www.woodschool.com.

Blanket chest in cherry and anigre veneer by Richard Dunham. Wall cabinet in white oak by Chris Cain.

Photos: Dennis Griggs

Sharpen your skills with these all-time video favorites!



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Alfreda Maloof: an appreciation

Alfreda Ward Maloof, Sam Maloof's wife of 50 years, died Sept. 23, 1998, at age 86, after a brief illness. Her health had been delicate in recent years, but that had not kept her from welcoming the hundreds of friends who visited the Maloofs each year at the extraordinary house Sam built in Alta Loma, Calif. Nor had it kept her from accompanying Sam on a packed schedule of travel for chair-making demonstrations, speaking engagements, sightseeing and family gatherings.

The Maloofs nearly always traveled together, which reflected the closeness of their marriage. When he gave a lecture or spoke with someone about his career, Sam would talk about Alfreda—not in passing, but in depth and with great warmth—as being fundamental to his success and to his happiness.

Alfreda was Sam's partner, running the office end of an enormously successful business. But it is for her personality that she will be remembered. Perceptive, unpretentious and kind, she made new friends easily and valued her many old ones. She was a beautiful woman with a natural sense of style and a discerning eye for fine craft and art. Her demeanor was placid, and her sense of humor was gentle and wry.

After earning a teaching degree at UCLA in 1934, Alfreda Ward spent eight years teaching English to Native Americans in New Mexico and Montana before returning to California, where she met and married Sam Maloof. Her experience in the Southwest is recorded in her own accomplished paintings of the time and in a book she published in 1997, *Recollections from My Time in the Indian Service, 1935-1943*. The book's clear, heartfelt writing and its focus on others rather than on herself mirrors her personality.

Alfreda and Sam shared many things, including a feeling of gratitude for the fullness of their lives. Some time ago, while writing an article about Sam, I traveled across the country to visit the Maloofs at their house. Learning that I had been married only two months, Sam exclaimed, "Two months! How can you travel and leave your bride behind?" And then he said, "I remember when Freda and I had been married just a short while, I agreed to go to the Middle East, and Freda couldn't go—that was a nightmare."

Freda, meanwhile, had been listening and calculating. "Sam, we'd been married 10 years when you took that trip."

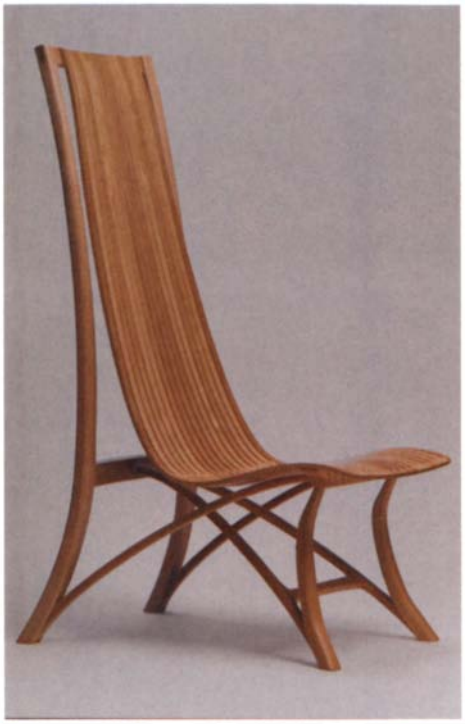
"Yes," he said, "but we were still on our honeymoon."

Her face softened, and she said, "We're on it yet."

And he replied, "We're on it yet."

—Jonathan Binzen, senior editor at Fine Woodworking

Tennis-racquet chair



Fine Woodworking received a tantalizing letter this past summer from Robert Scott of Pietermaritzburg, South Africa. Scott writes: "Some years ago, a leaky roof at a local tennis-racquet factory spoiled a fairly large quantity of English hornbeam strips, destined to have been laminated into racquet frames. Hearing about this on the timber hotline, I was informed upon inquiry that the strips were mine if I came and collected them immediately, which I did. Enclosed are photographs of the above-mentioned hornbeam strips having been spared the waste bin. Rather time-consuming to make, as I work alone, the chairs are entirely my design and concept." Point, game, set and match to Scott.

Courtside seat. *Robert Scott turned hornbeam strips meant for tennis racquets into lithe chairs with a hint of racquet in them. The spoiled hornbeam had been destined for the ash bin before Scott admirably saved it.*

Red oak mouse

It had to happen sooner or later. A Denver-based company called TechStyle Computers has crafted a computer mouse from wood. TechMouse has the usual metal and plastic innards, but its outer shell is made of solid hardwood—everything from red oak, maple and cherry to wenge, cocobolo and bubinga. The wood shell varies in thickness from ¼ in. to ⅝ in.

To make clickable buttons, woodworkers at TechStyle cut kerfs into the shell and then tune each button individually to get just the right amount of spring. In addition to TechMouse (starting at $99), TechStyle makes a full line of computer components trimmed or housed in solid woods, including towers, monitors, printers, speakers and keyboards.

Contact TechStyle at (888) 832-4789 or at www.techstyle-com.com.

Soften Hard Edges with a Side Bead

BY GARRETT HACK

Shakers taught me about beads, the semicircular moldings they ran along the edges of everything from peg rails to door rails. Forbidden superfluous ornament, the Shakers used beads for their practicality, rounding an edge to hide wear. Outlined by a flat-bottomed groove called a quirk, a bead softens an edge, gives it definition and draws your eye along; it can hide the necessary gaps around drawers and doors or the joint between tongue-and-groove boards. Both utilitarian and beautiful, beads are quite easily added to your repertoire.

I cut beads, properly known as side beads, any of three ways: with a Stanley No. 66 beading tool or shopmade scratch stock, with a beading plane or with a router. The method I choose depends on which tool will work best for the least effort, how many feet of bead I need and the size of the bead. With a router or beading plane, I have fewer size options than with a beading tool or scratch stock, for which I can make any size cutter. A router and plane cut the most consistent beads, especially for straight runs, but a beading tool or shopmade scratch stock works best in difficult woods and can follow nearly any curve. Because I usually have just a few yards of bead to cut and prefer to work with hand tools, I most often use a scratch stock or plane. Both tools cut a bead with a hint of handmade irregularity and a fine quirk, more appealing to me than the consistent profiles cut by a machine.

Beading tools go easy around curves

The Stanley No. 66 beading tool (no longer made) and its derivative, the bronze beading tool from Lie-Nielsen (888-751-2106), are the most common of several manufactured versions of the shopmade scratch stock (see the left photo below). All manufactured beading tools and shopmade scratch stocks work with a high-

Use a beading tool, a plane or a router to shape this delicate detail

Beading tool. *All beading tools work with a scratching action. Front to back: two shopmade scratch stocks, Woodcraft's bronze beading tool, the Veritas beading tool, Lie-Nielsen's bronze beading tool and a Stanley No. 66.*

Beading plane. *Antique beading planes are relatively inexpensive and widely available. They come in a range of sizes—one profile per plane—and cut straight runs of nearly polished beads.*

Router. *A router is ideal for cutting long runs of consistent beads. You can find bits for a wide range of bead sizes.*

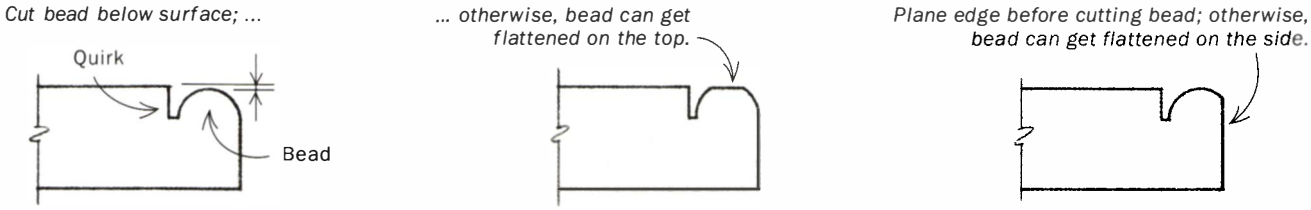
Photos: Michael Pekovich, except where noted

Classic bead with a classic tool. *The prototypical beading tool, a Stanley No. 66, cuts a bead with a pleasing hint of handmade irregularity.*

Many uses for a simple side bead

Bead shapes show up in Greek and Roman architecture and from there seep into furniture design. Colonial craftsmen cut beads along exposed beams to add visual appeal and to eliminate sharp edges, which ignite more easily than rounded ones. They also cut beads along the lower edges of clapboards, again for visual reasons and, supposedly, to shed water better. The Shakers applied side beads to everything from furniture to panel doors to peg rails. Side beads are useful for creating a shadow line and softening or defining an edge, as in the table apron above, and for hiding the joint between parts, as in the panel door (right) and the flush apron drawers (above). The quirk also happens to be a fine place to hide a nail.—*G.H.*

Right photos: Marc Vassallo



angle scraping action—different from the true cutting action of a beading plane—and although they don't cut very quickly, beading tools and scratch stocks will cut any size bead, with or against the grain, even in the most difficult woods. The Stanley No. 66 beading tool, with which I am most familiar, has a flat sole, an adjustable fence and a single cutter, which can be securely clamped into place. All manufactured beading tools come with a number of cutter profiles, as did the Stanley No. 66.

Despite the versatility of manufactured beading tools, I much prefer the control and even greater versatility of shopmade scratch stocks. I make them from worn-out, heavy hacksaw blades, which I attach to a wooden fence (see the story below). A shopmade scratch stock has several advantages over a manufactured beading tool. One is the flexibility I have to tilt it to get the optimum cutting angle or to cut toward me or away using either side of the cutting edge. With the No. 66 beading tool, the wide sole prevents adjustment of the cutter angle, and changing direction requires resetting the fence. The No. 66 is comfortable to use, but it's guided with two hands, so it's easy to skew the cut unless you apply even pressure. With a scratch stock, you can make the fence long enough to hug the edge of the board. You can add a special fence to the No. 66 for beading along curves, something all commercial beading tools and shopmade scratch stocks do very well.

Beading tools, whether manufactured or shopmade, are not difficult to use, as you immediately get a feel for the scraping cut. (The challenge is sharpening the cutter to scrape well.) Slip the

Crafting a shopmade scratch stock

Scratch stocks are good examples of craftsman ingenuity—they are simple to make and work extremely well. A piece of hacksaw blade, bandsaw blade or similar steel makes an excellent cutter and also works as a cutter for a Stanley No. 66 beading tool.

I grind and hone shallow molding shapes into hardened steel, but I file deeper profiles only after softening the blade by heating it red hot with a torch and then cooling it slowly in ashes or sand. Chain saw or round needle files work well for shaping beads. The cutting edges of the blade must be honed very square and polished. A softened blade will cut well, but it will dull after cutting a dozen or so feet of board. For a longer-lasting edge, I heat the shaped cutter red hot again, quench it in water and then rehone the profile.

To complete the scratch stock, I shape a small block of wood to serve both as a handle and as a fence to guide the blade. Typically, I'll chamfer the edges of the block. Then I saw a thin kerf into the block as deep as the blade and tap the blade into position. I like to test the blade on a piece of scrap and make adjustments and refinements as necessary. —G.H.

Watch it on the web!
See a video of a scratch stock in use at taunton.com

Photos this page: Marc Vassallo

Step back and plane forward. *To give the plane some bead to track on, start a plane's length in from the far end. Plane forward to the end, back up a length, then plane forward again. Continue stepping back and planing forward until you've beaded the full length. Then you can plane the entire bead to its full depth.*

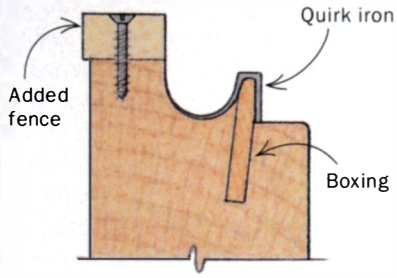
cutter in place with the top of the bead profile just proud of the sole. This will allow you to cut the bead slightly lower than the surrounding surface, which protects the bead somewhat and allows you to handplane the finished surface later without flattening the bead (see the drawings on the facing page). Align the fence with the outside of the bead. It's a good idea to plane that edge before beading, as any smoothing of the edge later cuts into the bead. But don't sand beforehand; a sanded surface will dull your cutter.

Hold the tool with the fence tight to the work and, with repeated cuts as long or as short as feel comfortable, scratch the bead to the final depth. The No. 66 beading tool stops cutting when the sole rides along the surface, but none of my scratch stocks has a depth gauge. Instead, I draw a line on the work at the top of the bead, and when I scrape the line off all along, I know I've cut deep enough. I often sand the bead lightly to even out small imperfections.

Beading planes do a smooth job

Beading planes cut much faster than beading tools or scratch stocks, and except for areas of extreme cross-grain, planes leave a nearly polished bead. A beading plane is a superior tool for cutting a run of straight beads or even for cutting beads along modest curves, as coach makers once did with short-soled planes. Over the years, I've collected a whole range of antique beading planes (see the middle photo on p. 40). The planes cut beads from ⅛ in. to 1¼ in. (these measurements usually include the quirk). Old beading planes are quite common, not very expensive and, once tuned, will work reliably for years with no set-up or trial cuts. Tuning can be tricky, though, unless you buy a plane in good condition to start with.

A plane has a long sole shaped to the mirror image of the bead to guide it and an integral fence and depth stop. A half-dozen or fewer passes leave a perfectly formed bead and quirk. Clamp the work flat on a bench, with the edge you're beading just proud of the bench edge, so that the fence will clear the table. Instead of starting at the near end of the board and planing its full length in one pass, start a plane's length or so in from the far end (see the photo above). Hold the fence tight to the edge and plane forward, the short distance toward the end. Back up a length and again plane forward to the far end. Continue backing up and planing forward, working down the length of the board. The plane will track



Hone and check, hone and check. *As you sharpen a plane iron, stop frequently to sight down the plane (left). The iron should conform to the sole, but keep the quirk iron slightly wider than the quirk boxing (drawing above) to prevent binding. This plane reveals inlaid boxing as well as an extra fence, screwed on to improve tracking and stability.*

Drawings: Vince Babak; bottom photo: Marc Vassallo

Think of a quirk cutter as a miniature plane iron. *Sharpen the bevel of the quirk-cutting portion of the iron on a stone, as you would a plane. Sharpen the curved section that cuts the bead itself with round and knife-edged slip stones (bottom of photo).*

better if it's planing into an area that's already partially molded. Once the quirk has been started, the plane should cut consistently. The major problem with a beading plane is cross-grain, which you can't really do anything about, other than to take a lighter cut. Unusual two-way beading planes overcome this with one side that cuts right to left and another side that cuts left to right.

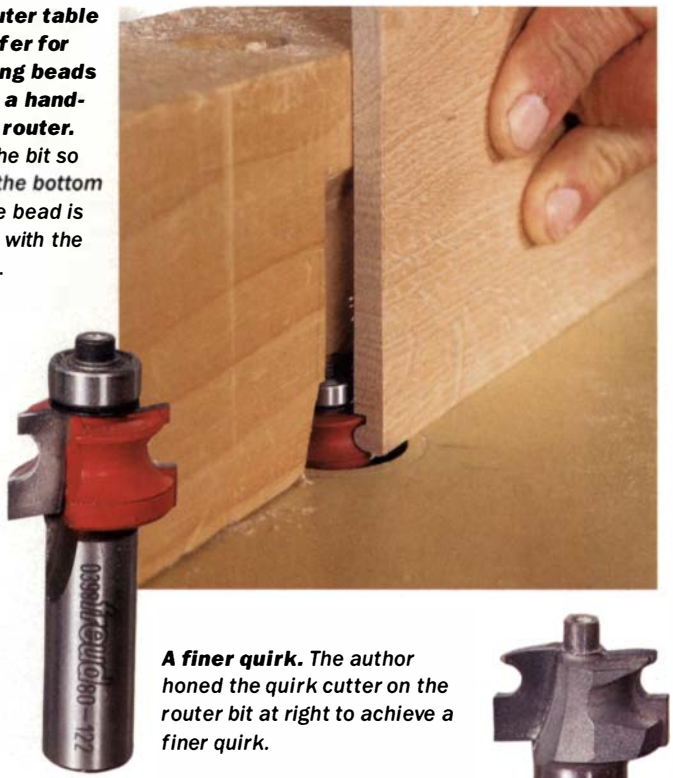
Tuning a beading plane involves sharpening and shaping the iron to the same profile as the sole, repairing boxing, if necessary, and adding a fence for stability. On better beading planes, thin strips of boxwood, known as boxing, are inlaid at points of wear, such as along the quirk. Boxing can wear down, come loose or break, but it can be replaced easily with any hardwood.

Sharpen the bevel of the plane iron with slip stones or fine abrasive paper wrapped around a dowel, and polish the back of the iron on a stone. The part of the iron that cuts the quirk works like a miniature plane iron and should be sharpened as one (see the photo below). Ideally, you want a sharp iron that conforms to the shape of the sole, but small differences are okay. Lightly wedge the iron in place and sight down the sole to see where the iron deviates (see the bottom photo on p. 43). Keep honing and checking—as much as your patience will allow. Finally, add a shallow fence the entire length of the plane, in line with the outside of the bead. Giving the iron a light honing is your only regular maintenance.

A router cuts miles of beads

Routers demand no tuning and cut consistent and handsome beads, as long as you can find a bit the right size and are willing to take the time to set up. You can cut beads around curves with a router, although a router is best for long, straight runs. When I'm making a set of doors with beaded stiles and rails, I prefer a router for this consistency, as I can then make identical copes or miters and know they'll fit. My only complaint is that the part of the bit that cuts the quirk is fatter than I would like, and the bead profile is not as nicely proportioned as the one cut by a beading tool or plane. Presumably this is due to the limitations of the materials and the strength necessary for a bit spinning at 20,000 rpm.

You can cut a bead with a router either of two ways. Most beading bits have a pilot bearing for guiding the router freehand along an edge. I wouldn't recommend this method unless you have a wide edge to support the router—a bed rail, for instance—as the slightest slip or jiggle could easily ruin a small bead. A router table is a safer alternative.



A router table is safer for cutting beads than a hand-held router. *Set the bit so that the bottom of the bead is flush with the table.*

A finer quirk. *The author honed the quirk cutter on the router bit at right to achieve a finer quirk.*

With a router table, the face of the work is vertical against the fence (see the photo above). Be sure that the fence is high enough to support your work and that the table is flat and certainly not hollow around the bit. If it is, the bead will be partially missing as the stock spans either side of the hollow and rides up on the bit. Set the bit so that the bottom of the bead is flush with the table. You may want to remove the pilot bearing so it doesn't get in the way of cutting to the depth you choose. Set the fence (cutting depth) and bit height by test cuts. Cut in two light passes rather than a single, heavy one for the smoothest cut, but still expect to sand a little.

As with any detail, the more you cut and use beads, the more possibilities you'll see. I'm reminded of the Shakers' use of beads throughout their architecture and furniture. They avoided ornament, but not practical and beautiful solutions to problems. □

Garrett Hack is a furniture maker in Thetford Center, Vt.

Left photo: Marc Vassallo

The Quick, Modern Way to a Polished Finish

Combine automotive finishing materials and power-buffing methods to work wonders on furniture

BY JEFF JEWITT

The basic concept of rubbing out a finish is easy: Abrade the surface with very fine sandpaper to remove surface defects and level it out, then polish to the sheen you want. The old-world approach is to do this work by hand, using pumice and rottenstone (*FWW* #119, pp. 46-49), which work well but are time-consuming and physically exhausting to carry out. Some modern products simplify and speed up this process considerably. Combined with power-sanding and buffing equipment, these products deliver an efficient system for rubbing out a finish.

I prefer to wet-sand small surfaces, such as table aprons and legs, by hand. But I switch to air-powered equipment for larger areas, such as tabletops. The best tools for wet-sanding have opposing, in-line pads that vibrate back and forth in a straight-line motion, rather than making a circular scratch pattern. You can dry-sand some finishes, such as oil-based polyurethane and some lacquers, with an electric-powered random-orbit sander, as long as you use very fine (1,000-grit, or higher) stearated, or nonloading papers. Never use electric sanders when wet-sanding because of the risk of electric shock.

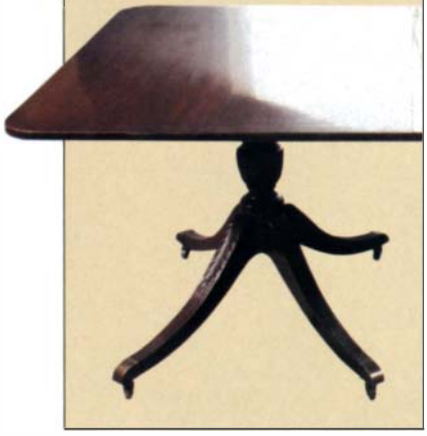
Start the process with the finest grit size that will remove the defects and level the finish. You can begin with 320-grit paper if the surface is badly orange-peeled or shows ridges from brush strokes. Or you can start with 800- or even 1,000-grit paper if you have only minimal surface problems and you're shooting for a gloss finish in the end. I usually start with 400- or 600-grit silicon-carbide wet-or-dry sandpaper, and I use mineral oil cut 50% with mineral spirits as the lubricating medium for all of my oil- or lacquer-based finishes. I spray the mixture with a plant mister. Some people prefer to use water instead of oil. If you use water, add a small amount of dishwashing liquid as a lubricant.

Wet-sand with water or oil. *Either lubricant levels a finish and removes brush strokes or small bits of dust and debris. The author prefers rubbing oil thinned with mineral spirits.*

I always work around the edges of a tabletop first, then move toward the center

Photos: William Duckworth, except where noted

What you'll need for a satin finish. *After wet-sanding the surface by machine, the author accomplished the rest by hand, using 0000 steel-wool pads, Behlen's Wool-Lube and a little soapy water for lubrication. Then he rubbed the surface in long, even strokes to achieve a classic hand-rubbed finish.*



STEEL-WOOL TIP

Improve the ergonomics of steel-wool pads. *Unwrap 0000 steel-wool pads and refold them into quarters so that they will better fit your hand.*

(this routine helps me keep track of where I am), working in sequence up to at least 600-grit paper. If you're aiming for a gloss finish, work up to at least 800- or 1,000-grit paper. Sanding to a higher grit will speed up the polishing procedure later on.

If you want a classic, hand-rubbed satin finish, you can achieve the best results using steel wool and Wool-Lube (a rubbing lubricant made by Behlen) or thinned wax (see the photos above). Squirt a couple of stripes of Wool-Lube on the surface, then mist it with soapy water. (I mix a capful of dishwashing liquid into a quart of water to clean up the mineral oil from the wet-sanding process.) Using moderate downward pressure, about 25 lbs. (you can practice by pushing down on a bathroom scale), rub the surface in straight strokes with the pad, following the direction of the grain. Repeat this process several times, then switch to a clean part of the steel-wool pad and rub the whole surface down again. Wipe the slurry off to check your progress. If you've done it right, the surface should look like brushed metal when viewed in backlighting.

If you are going for gloss, automotive compounds, available from auto-supply stores, offer a real innovation for polishing furniture finishes. Compounds are simply abrasive powders in liquid suspensions, or pastes. Two manufacturers, Meguiar's and 3M, offer products that work very well on wood finishes. They are used in stages to remove defects and scratches from wet-sanding. Some manufacturers sell a single product that breaks down into smaller grits as you use it, but I prefer using more than one compound. Because compound grit sizes vary, you should stick with products from a single manufacturer.

Beware—some buffing compounds create a whitish, hazy look on water-based lacquers. You may simply need to let the finish cure longer, but the haze is usually caused by solvents in the compound that soften the lacquer, making it hard to polish. If this happens, discontinue use of the compound and switch to a different one. (I've found that Meguiar's #10 plastic pol-

Top left photo: Michael Pekovich

Use compounds in a sequence of grits. *After wet-sanding the surface, the author buffed this table first with Meguiar's #1 medium-cut cleaner, then with #2 fine-cut cleaner. After that, he finished with #9 swirl remover to fill in the tiny hairline scratches left by the #2 cleaner.*

BUFFING TIP

Smear it on, then buff it out. *Use the buffer pad first to spread out the liquid compound, then tilt the pad slightly as you move it slowly over the surface. After buffing the surface in two directions, a deep gloss emerges from the surface of the finish.*

ish works well as the final polish for water-based finishes.)

You can use most rubbing compounds by hand, but for a large surface such as a dining-room table, a power buffer is the way to go. The most popular buffers are right-angle sander/polishers. If you purchase one, get a variable-speed buffer or a two-speed tool (rated at a maximum speed of 3,800 rpm). A polishing bonnet of either cotton or synthetic foam is attached to the buffer with a locking nut. Any bonnet can be cleaned, but to ensure efficient polishing, purchase a separate bonnet for each grade of compound that you use.

Polish the furniture in an area where flying compound won't be a problem, and wear an apron. Squirt a few stripes of compound across the surface, about 8 in. apart. With the buffer turned off, smear the compound all over the surface of the finish. Hold the buffer off the surface at a very slight angle, then turn it on and begin moving it slowly across the surface of the finish (see the photos above). Move the buffer about a foot every three to four seconds and work in sequence—edges first, then in toward the center. Work the buffer in smooth, confident strokes, and pay attention to the angle and rotation of the buffer when polishing edges: They may catch the pad and cause kickback.

The scratches from sanding disappear as you buff, and it's easy to see when you're done with the compound. Good overhead lighting or backlighting will highlight errant scratches. Follow the first compound with finer grits until you see a deep gloss appear. Let the compound dry, then wipe it off with a soft cloth.

At this point, some finishers apply a glaze that contains silicone or some other type of oil or polymer emulsion, which fills in the tiny hairline scratches. But I usually finish up with the #9 swirl remover—first with the buffer set on slow speed, then by hand. I apply a little to a soft cloth and polish the surface manually. □

Jeff Jewitt is the author of Hand-Applied Finishes *(The Taunton Press, 1997).*

Top right photo: Michael Pekovich

18th-Century Six-Board Chest

Copying an original is an excellent way to hone your hand-tool skills

BY MIKE DUNBAR

White pine chest made the old way. *Using sharp hand tools, the author made a blanket chest in a few afternoons. The till—a box within the box—is used to hold small items.*

This copy of a ca. 1800 blanket chest—also known as a six-board chest—is an ideal project for honing your woodworking skills. While the chest can be made by machine, its various parts are made equally well (and about as fast) by hand. It was fun to spend a few afternoons making something by hand. It reinforced for me how delightful the shop can be when the only noise is the whisk of sharp tools. I rediscovered how pleasant woodworking is without hearing, eye and lung protection. When a storm knocked out the power one afternoon, I was able to keep working. It was delightful—just me, the wood, the tools and the sunlight.

At first glance the chest appears to be little more than a nailed box. As you make the project, you'll begin to respect simple joinery that requires mostly rabbets and dadoes. You'll begin to realize how much today's woodworking has developed construction into a design element. The original chest from which this one was copied has been in continuous use for nearly 200 years and is still solid and very much intact. Its survival is not unique. The chest seems to violate an important woodworking principle, in that the grain of the ends and sides is arranged in opposite directions. One would expect this to cause the front or

back boards to split. However, that did not happen to the original example or to the untold numbers of other chests like it. Unlike glue, the nailing allows enough movement to compensate.

The original chest is generally referred to as a blanket chest, underscoring its purpose—to store folded items made of cloth. However, this was also a utilitarian piece of furniture usually kept in a bedroom against the wall or at the end of a bed. An average house would have several such chests.

The original piece's everyday function dictated a couple of construction choices for the cabinetmaker. Time-consuming joinery, like dovetails, was replaced with equally strong rabbeted joints. The original was made in New England, where white pine is still sold everywhere. Had the cabinetmaker been working in another region, he might have used yellow poplar. I used 5/4 clear white pine. The original box was made when a 1-in. board was a full inch thick. I felt the proportions of the original were important to the chest's overall appearance, which is why I chose 5/4 stock. The exception is the chest's bottom panel, which I made from ¾-in.-thick #2 pine.

Jointing stock, gluing panels

The original chest was made of six wide boards, excluding the three smaller pieces that make up the till, a small lidded compartment within the chest. Today, 18-in.-wide 5/4 pine is rare, so I bought 5/4x10 boards that could be glued up into six wide panels. Crosscut the stock 1 in. longer than the finished lengths of the panels so that when you glue them together, you won't have to worry about aligning the ends.

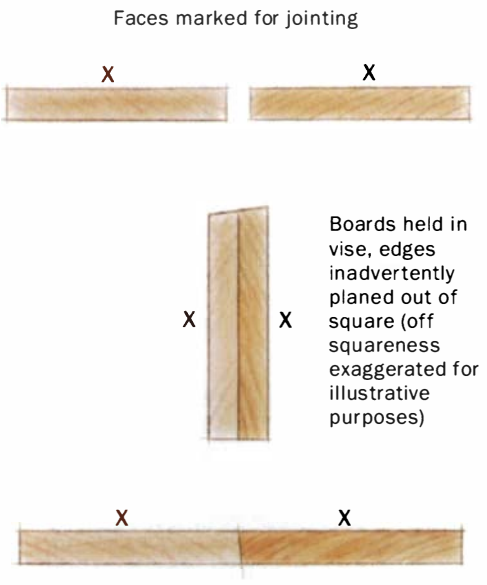
Like all hand-tool operations, cutting with a handsaw is easier when the wood is securely clamped to a bench. For me, it's easiest to follow my pencil line if, with each pull stroke of the saw, I raise the saw's teeth out of the kerf, away from the line, and then push them back into the line with each push stroke. This technique helps prevent the saw from wandering. To make a cut that's square to the face of the board, rather than one that is undercut or overcut, try to stand right over the saw. This way, when you look down, all you'll see is the thin top edge, not the face of either side of the blade (see the photo on p. 50).

Determine and mark the good side of each board—the side you want to face out—and pair up the pieces into panels. Place the paired-up boards together and clamp them in a vise for jointing. Jointing the two boards at the same time ensures that any variation from square on the two edges is equalized and that the finished panel will be flat (see the photos and drawings above).

Use a jointer plane to make the edges straight, which may take a little practice. The key is weight transfer; as you start a cut, exert more hand pressure on the plane's front knob. As you push the plane along the length of the board, transfer pressure to your other hand and to the rear of the plane. The long, straight sole of a jointer plane will remove only the boards' high spots. The first several passes you take will probably result in less-than-full-length curls of wood. Once you are able to plane

PERFECT PANELS

Two edges at once. *Boards that will be edge-glued into panels are folded into a vise so that facing sides are clamped against opposite jaws. Any off squareness in the planed edge will be neutralized when the boards are married into a panel.*



Spring a joint. *After jointing paired boards in a vise, take a final pass that begins and ends several inches from the boards' ends. When placed flat on a bench, the boards' edges will touch at each end and have a two-plane-shavings-wide gap in the middle (left). Two clamps will pull the gap together for glue-up (right).*

Photos: Jefferson Kolle, except where noted

a few full-length curls, sight along the boards for straightness or check them with a long straightedge.

Once the boards are straight, take a final pass with your plane, beginning about 3 in. from the front end of the boards and ending about 3 in. from the far end. This technique, called springing the joints, aids in gluing up boards. This incomplete pass creates a slight gap—two plane shavings wide—in the center of the boards when they are placed together on the bench for clamping. Because the boards touch at each end, one or two clamps spring the middle of the boards together.

Two-handed handsawing. *To avoid breaking a fragile edge, and thus making it difficult to restart a cut, hold the fingertips of your free hand lightly against the thin waste piece. To saw a square edge, stand directly above the cut so that you see the thin top edge of the saw, rather than either side of the blade.*

Surface the panels and cut them square

Surface both sides of the panels to remove thickness-planer marks and to level the sides. As you plane, you'll find that what seemed like flat boards have lots of hollows. The panels are too long for a smooth plane. Its short sole will ride down into the hollows in the surface. I prefer a No. 6 jack plane, which is slightly longer and wider than a No. 5. For surface planing, use an iron with a slight crown honed into it. A crowned iron, as opposed to one with 90° corners between the cutting edge and the sides of the iron, reduces the likelihood of planing sharp ridges into the surfaces of the panels. Instead, the surface will be slightly scalloped, almost unnoticeably so, which is a sign of handplaned work.

One at a time, joint an edge of each panel. Use a framing square to lay out the ends prior to trimming. Lay out the finished width at the same time. Measure corner to corner to be sure the panel will be square; if the diagonal measurements are the same, the panel has four 90° corners. Cut the panels to size using a ripsaw along the length and a crosscut saw on the ends. When ripping, the saw's teeth should just touch the outside of the pencil line. This way, when you joint the edge to remove the saw marks, you will not be undersized.

Because the rough length of the boards are cut very close to the finished length of the glued-up panels, you'll be left with a thin strip to trim off each one. When using a handsaw, a slight twist of your wrist can break the thin strip, and trying to start the cut again in the middle of the edge can make it ragged and uneven. I like to use the fingertips of my free hand to push lightly against the strip to keep it from breaking (see the photo at left).

Cut boot-jack ends and the stop joint

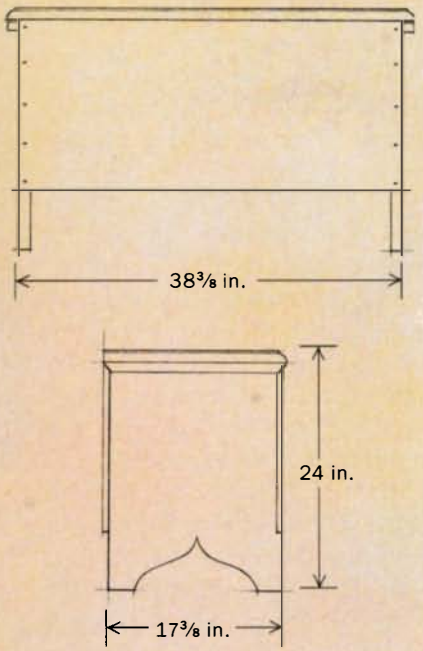
The graceful, curved feet of the blanket chest are referred to as boot-jack ends because their shapes are similar to a once-common device used to help pull off boots by jamming the heel into the V.

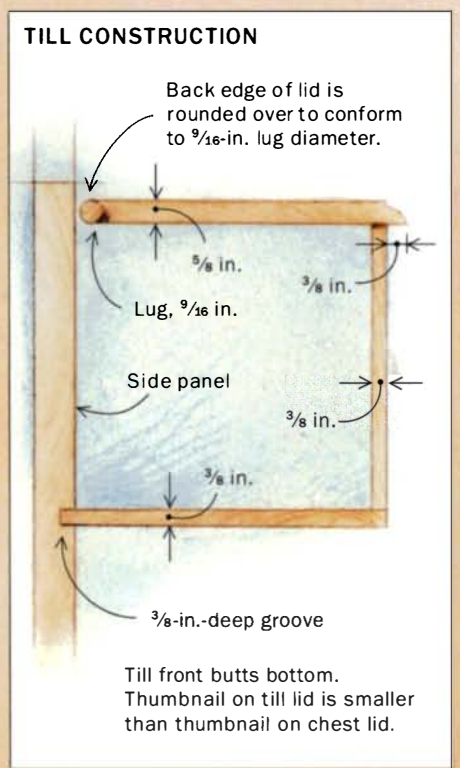
To cut these ends, first make a template half the width of the chest's side and draw a curve that pleases your eye. After tracing the pattern ends of the chest, cut out the pattern using a small bowsaw (see the top photo on p. 56). The saw works best on the pull stroke. Use two hands and try to create a fluid motion that uses almost the entire length of the blade. Clean up the cuts using a spokeshave and a chisel, working from the center out on each side so as to cut with the grain.

Lay out the stop butt joint using a square and a marking gauge. Cut the return with a

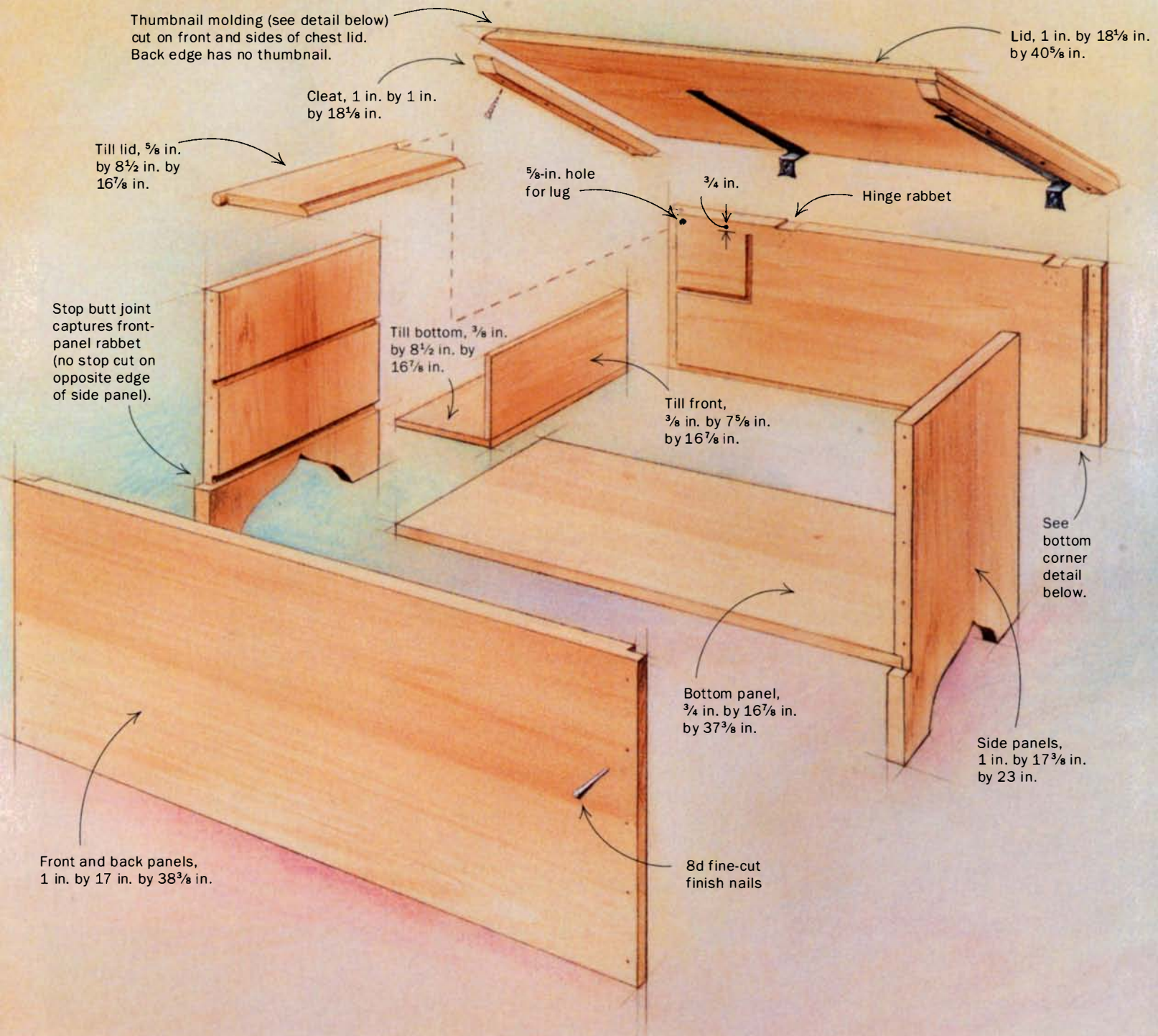
HANDMADE BLANKET CHEST

Chests like this were as common as candles in period homes, which were notoriously devoid of closets. The chests were usually placed at the end of beds and stored cloth goods. Local woods, available in wide boards, were used to make these chests. The boards were held together with rabbets, dadoes and cut nails.

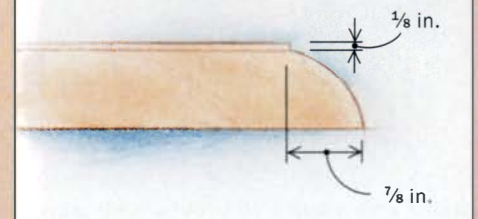




Drawings: Tim Langenderfer



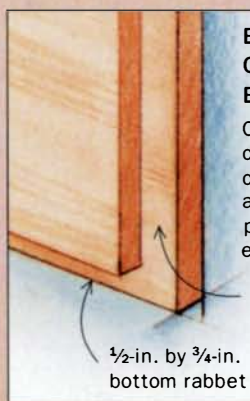
THUMBNAIL MOLDING ON CHEST LID



Rabbet plane is used to make ⅛-in.-deep cut, then edge is rounded over with block plane.

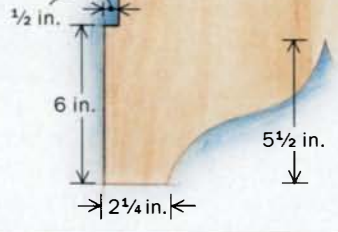
BOTTOM CORNERS OF FRONT AND BACK PANELS

Cross-grain rabbet is cut 1⅛ in. wide. After chest has been assembled, block plane is used to trim edge flush with sides.



BOOT-JACK ENDS

Boot-jack ends are cut with a bowsaw and finished with a spokeshave and chisel.



Bowsawed boot jack. *A plywood half pattern, seen on the uncut panel, is used to trace the bootjack end that forms the blanket chest's feet. If the bowsaw jams in the cut, pop out the waste piece with a chisel blow to the panel's end grain.*

dovetail saw. Cut the length of the joint with a fine ripsaw. The surface needs to be smoothed with a block plane to remove saw marks. By skewing a block plane, you can start close to the stop. Straighten out the plane as you continue the cut. Clean into the stop using a chisel. Test the joint with a straightedge.

Cut the rabbets and dadoes

The front and back of the blanket chest have a rabbet cut across the grain. An iron rabbet plane has an adjustable fence that regulates the width of the cut. Set the plane to cut a rabbet 1⅛ in. wide—wider than the 1-in. width of the sides. The face edge will overhang the sides slightly and can be planed smooth after the chest has been nailed together. The plane's depth stop regulates the depth of cut; set it to cut a ½-in.-deep rabbet. The plane has a scribe (also called a nicker) under the depth stop. The scribe looks like a rounded cross with one corner missing. Each corner is sharpened and, when placed into the opening, projects below the sole. It is used when cutting cross-grain. The scribe severs the wood fibers ahead of the cutter, eliminating dreaded tearout.

To avoid blowing out the end of a cross-grain rabbet, clamp a strip of sacrificial wood to the far side of the board you're cutting. And when starting a cross-grain rabbet, draw the plane backward so that the scribe makes a preliminary cut. When you push the plane, be sure to keep it square with the surface and end of the panel. You need to apply as much pressure in and down with the hand supporting the plane as you do with the one pushing it.

As the rabbet nears completion, the depth stop will begin to ride on the panel's surface. Usually, it comes in contact first on the side nearest you, as it is a natural tendency to decrease the pressure on the plane as your arms become extended. Make sure the rabbet has a consistent depth, then test the fit of the side panel into the rabbet. Cut all of the cross-grain rabbets, then cut the rabbets along the bottom of the front and back pieces to accommodate the chest's bottom panel.

The bottom panel of the chest also fits into dadoes cut in the side panels. In soft white pine, you can cut a dado very easily using a utility knife and a chisel (see the photo below). Lay out the dado and clamp a straightedge along the mark. Score the line several times with a utility knife. Repeat on the other mark. With a chisel, pare the waste from the dado. When necessary, score the dado again and trim to depth.

Making the till

Like most early blanket chests, this one has a till in one end. The till was used for storing small items that would be hard to find if placed in the chest itself. The till fits into stop dadoes cut in the front and back panels and in a dado on one side panel.

Surface-plane all till parts. Joint and cut them square. Thin wood presents a problem when cutting with a handsaw. The saws used in general work are too large and frequently break the piece. I own a number of small handsaws that are cut with 14 teeth per inch for small work.

The till has its own lid that hinges on two wood pins called lugs, which are made by removing all but a short rounded tenon from the lid's end-grain ends. Lay out the lugs with a try square and trace a 9/16-in. circle on the end of each lug. Cut away the waste with a dovetail saw and a small handsaw. Clean up next to the lugs by paring away with a chisel. Using a chisel, undercut the waste on the corners of the square lugs (see the left photo on the facing page). Pare away the waste to round the lug. Test its fit into a ⅝-in. hole drilled in a piece of scrap.

The till lid's front edge is molded with a very traditional profile known as a thumb-

Scribe with a knife, then cut a dado with a chisel. *Soft white pine, used for this chest and for thousands of similar antique versions, cuts easily with sharp hand tools. After a little chisel work, scribe again with the knife to cut cross-grain fibers until the dado is ½ in. deep.*

Wood hinge for the till. *After clamping the chest together for a test fit, mark the dadoes for the till. The till's lid hinges on lugs, small round tenons made by removing a strip of wood from each end of the lid and rounding off the remaining stub with a chisel.*

nail. Make this molding the same way as those on the chest lid (see below).

Final assembly doesn't require glue

Use a square to lay out the dadoes for the till bottom and front, but do not cut them yet. First, test-assemble the chest. This not only allows you to check your joints but also to be sure that the stopped dadoes you've laid out will intersect. Run a clamp through the boot-jack ends to hold the bottom in place and the ends vertical. You can easily assemble the rest from this stage.

Disassemble and make any necessary adjustments. Cut the till dadoes the same way as those in the end pieces. Drill the ⅝-in. holes for the lugs in the locations shown.

When you're sure of the fit, reassemble the chest with the till parts in place and nail the rabbet joints. I used 8d fine-cut finish nails from Tremont Nail Co. (800-842-0560). These nails look the same as those on the original chest.

Because the nails are visible, their spacing is important; use five nails per joint. Drill a 3/16-in. pilot hole for each nail and run the long head with the grain.

Use a low-angle (12°) block plane to trim the rabbets' face edges flush with the chest ends. (Remember that you cut the rabbet joints wide on the front and back panels.)

Make and fit the lid

Cut the lid to size and make the cleats. Trace the beveled ends of the cleats with a bevel gauge set to the desired angle and cut them with a dovetail saw. Strike the bevels with a low-angle block plane to smooth away the saw marks.

Start the thumbnail with a rabbet plane; finish it with a block plane. *The lid of the blanket chest has a thumbnail, a popular edge profile from the 18th century, on the two sides and the front. The thumbnail is made in two steps; first, cut a ⅛-in. rabbet, then round over the remaining square edge with a low-angle (12°) block plane.*

To make the thumbnail molding, start with a rabbet plane to cut a ⅛-in.-deep rabbet on the lid's front and side edges. Again, it's a good idea to clamp a sacrificial waste block when planing end grain. Turn the rabbet into a thumbnail by using a block plane to round the square edge (see the photo above). Check to ensure that the profile is uniform along all edges. Attach the cleats using #10 by 1¼-in. screws.

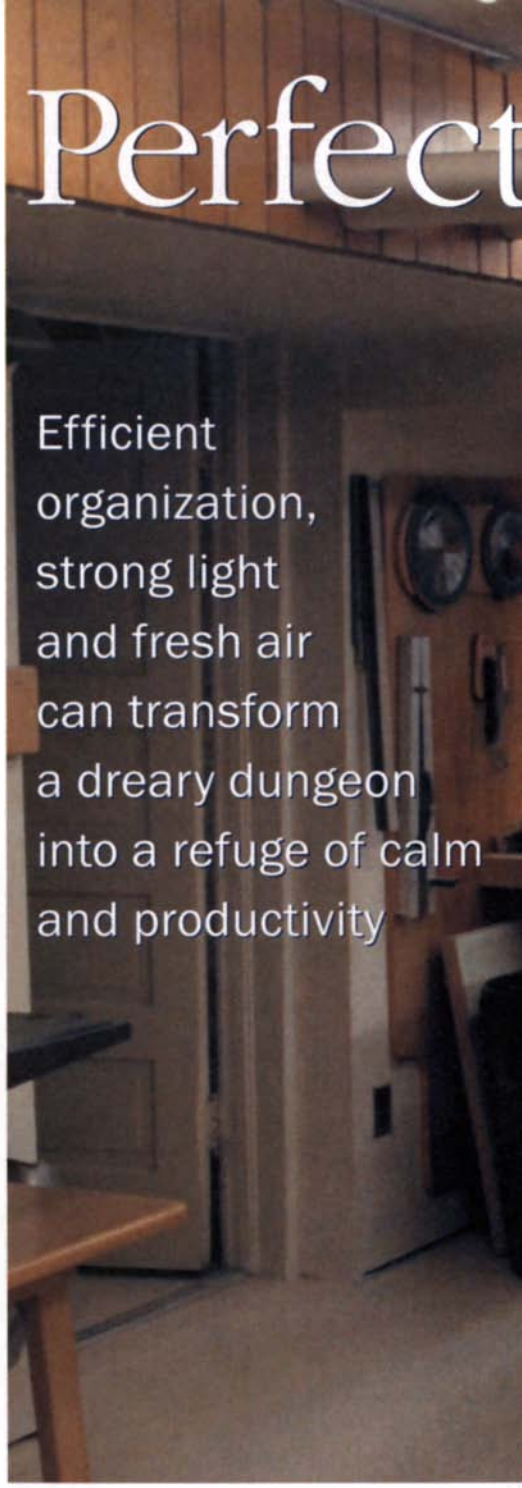
The original chest had snipe hinges, which look like two cotter pins connected by their eyes. The leaves of the snipe hinges were drilled through the chest and clinched over into the wood. Some early blanket chests used butt hinges, while others used blacksmith-made offset strap hinges. Ball and Ball (800-257-3711) sells the handsome wrought-iron reproduction strap hinges I used.

The location of the till makes it necessary to mount the hinges off center, a common practice in the 18th century. To mount the hinges, simply mark their locations on the chest, mortise the short leaves into the chest's back panel and drive in a handful of black iron screws. □

Mike Dunbar is a contributing editor to Fine Woodworking.

Right photo: Michael Pekovich

The Almost Perfect



BY JAN CARR

A basement is hardly the most desirable location for a shop. Yet, for many woodworkers, it's the only alternative. I live in a city, and even if expense were not an issue, there is simply no space for a separate outbuilding. Furthermore, living in a cold climate, a shop in the garage is problematic to say the least.

When my wife and I moved to Minnesota some years ago, we looked for a house that was a candidate for renovation. From my own point of view, I wanted a house with a good potential for setting up a shop. So when we found this house in St. Paul with a large basement sporting 8-ft. ceilings and a separate outside entrance, the rest of the structure looked pretty good to me. With all the renovation work looming, I chose to build the shop first. What follows is an account of what I did and why, with the hope that this discussion will help others develop a strategy that works for them.

A little research and The Rule of Five help make the space habitable

I am a researcher by inclination. When confronted with a problem for which I know of no clear-cut answers—for example, the best way to insulate basement walls—I try to confer with at least five people or sources for the answer. I look for a consensus, if there is any, but mostly use common sense to weigh the options toward a decision. Pablo Picasso supposedly said that all art is derivative, meaning that it's a by-product of others' ideas. That is certainly true in the case of my shop. Nearly every concept of shop design that I've incorporated into my own space came through a process by which I saw someone else's idea, then revised, adapted or tweaked it to meet my own needs.

Before moving to St. Paul, we lived in a loft space in New York City, where I appropriated a finished bedroom for shop space. Though it was small, that shop was extraordinarily comfortable. Once in Minnesota, we spent our first year in a rented house, where I set up shop in a dark, dank, thoroughly depressing basement. Those two experiences convinced me to do whatever was necessary to make this new shop as pleasant as possible. That meant erecting insulated stud walls, installing ceilings, and painting floors and walls. Birch plywood was available for about $30 per sheet at the time, so I hung my tools on stained and varnished birch panels and built simple birch cabinets that were tailored to my storage needs.

Dealing with moisture and ventilation—Any basement with stone or concrete walls will be cold in the winter and damp in the summer, at least in the northern tier of North America. Most states and many localities have some sort of energy-information center that will help you solve the problems common to your area. The energy people here gave me very detailed guidelines for erecting insulated stud walls with a continuous vapor barrier, which I did on all of the exterior walls. That alone made a substantial dent in our heating bills and rendered the space very comfortable through the notoriously cold winters.

In the summer I put screens on the windows and use some cheap 8-in. box fans to provide cross ventilation. Also, I run two 40-pint dehumidifiers during the summer. These devices are expensive to operate—each about equal to what a refrigerator costs to run—but they keep the shop dry and comfortable. I have never had any problems with rusted tools or warped boards, so the dehumidifiers seem well worth the expense to me.

Lights: incandescent vs. fluorescent—Take an informal poll, and you'll find that hardly anyone prefers the look of fluores-

Basement Shop

Once you get past the dog, getting into this shop is easy. *A separate entrance (above left) into the basement from the street level facilitates bringing lumber and plywood into this organized and comfortable workspace.*

cent light to incandescent, but you simply can't beat it on cost and output. I wanted a shop with bright, shadowless illumination, a factor of increasing importance to those of us with the diminishing eyesight that comes with advancing years.

I haven't had good luck with the so-called shop lights available from most home centers for about $8, because they're too noisy. So I bought standard 4-ft. two-bulb fixtures at about twice that price. You can eliminate the ubiquitous hum of the fixtures by going with electronic ballasts (at about $37 per fixture). However, an electrician friend of mine suggested that I return any of the standard fixtures that hummed, because the quality control over ballasts is pretty abysmal. I found about one in three to be defective. As a result, my shop lights are reasonably quiet.

Bulb selection is also important. A lighting expert I talked with suggested the best bulbs for accurate color rendition should be rated at about 3,500° on the Kelvin scale. That's what I installed in the shop, even though each bulb cost about $2.50 at a local electrical-supply house. The result is a very pleasant light that to me is infinitely preferable to those cool-white bulbs you can pick up for a buck apiece.

Keep the noise down—Unless you want to outfit other members of your family with ear protection, you probably need to think

Photos: William Duckworth

MAKING THE SPACE WORK

Blessed with a large basement to begin with, the author improved its efficiency by ganging together specific areas for tool storage and work flow.

1. Every tool has its place. *The author chose birch plywood over Peg-Board to make wall panels and storage cabinets for all of his tools.*

2. Clearly a shared space. *Laundry-room walls double as storage space for brushes and detergent.*

3. There are few shadows on this workbench. *A stickler for having plenty of light, the author ran 4-ft. fixtures continuously along the ceiling in closely spaced rows. All told, he spent about $650 for 26 fixtures and color-correct bulbs.*

4. Small fans throw plenty of air. *This window fan, mounted above the sharpening station, exhausts air blown in by a fan on the opposite wall. The two small fans keep the air from getting stale.*

5. Dehumidifiers help prevent rust on tools. *Two of these devices run continuously from June through August to keep the space dry during humid weather. This one doubles as a support for a chopsaw workstation.*

about shop noise. There are any number of measures you can employ to inhibit sound transmission, but most are rather elaborate and expensive.

I decided to take the simplest route, which was to stuff conventional fiberglass insulation between the rafters and use resilient channels (sometimes available from home centers but always from drywall suppliers) to attach the ceiling drywall. This will certainly not stop all of the sound from drifting upward, but it does bring the roar of machines and tools down to a more tolerable level.

Organizing for efficiency

After you've finished whatever decorating you've chosen to do, the sometimes daunting process of organizing your space begins in earnest. Most experts will tell you to think about work flow in setting up your space. That's difficult advice to follow in a basement, given the fixed obstructions—chimneys, support columns, heating and plumbing fixtures, etc. As a consequence, you are often forced to organize around these various obstructions and give sec-

Drawing: Design Core

A knockdown utility table that sets up in no time

Two sawhorses and three lengths of 2x4s provide me with a quick, no-fuss worktable when I need one. I use it for cutting panels, assembling casework and as a drying rack for finishing. Half-lap joints make this table easy to put together and take apart. It stores readily out of the way (see the photos at right).—J.C.

ondary consideration to the logical flow of work. I knew that most of my shop time would be devoted to renovation tasks such as stripping doors and moldings and building case goods. With that in mind, I located the tablesaw first so that there would be adequate space to cut sheet goods and maintain an open area for stripping.

It makes sense to draw a simple floor plan of the available space. I've found it useful to make scale drawings of the machines, as well as some of the materials you expect to work, such as 4x8 sheets of plywood. You can then move your machines around on the floor plan to determine which placement gives you the most space to work the materials.

Layout, cockpit style—From my days in an office, I came to favor what I think of as a cockpit work environment—sitting at a desk with my necessary office machines and work materials in a U shape around my back and sides. I took that same idea to the shop. As I work at the tablesaw, my workbench is to my left, the tool wall is to my right, and necessary hardware and portable power tools are right behind me (see the floor plan on the facing page). For 90% of my work in the shop, everything I need is within two steps. I left enough room in the middle of this space to assemble cabinets.

Keep the space flexible—Given the obstructions and space limitations of most basements, you have to consider making as many items movable as you can. In my shop, everything can be broken down or moved, with the exception of the benches and the tablesaw. The challenge with machines, of course, is to make them movable, and then—when in use—immobile. I've tried a variety of devices over the years, but my current favorite is the universal mobile machine base made by Delta (available for about $50).

One of the most adaptable devices in the shop is what I call the cutting rack (see the story above). It's simply a knockdown table, consisting of two horses and three 2x4s, with half-lap joints between the top of each horse and each 2x4 to hold it all together. I use this rack for cutting up sheets of plywood, as an assembly bench and, with a sheet of plywood on the top, as a general utility table. And if I need the floor space, the whole thing can be pulled apart and moved aside in about 10 seconds.

Match bench heights to fit—You also need to think about the height of your machines. The top surface of my tablesaw is 34 in. off the floor, which, in turn, determined the height of nearby benches, so I can slide a sheet of plywood over the bench onto the tablesaw. Conversely, the jointer/planer sits at a lower height so that pieces of lumber will slip under the saw's extension table.

The shop as a work in progress

In many respects, designing and building a shop will be the most complicated project most woodworkers will ever undertake. As such, it can be fairly intimidating, if you are as compulsive as I am and want to get it right the first time. However, somewhere along the line, it dawned on me that a shop should be treated more as a work in progress than as a project to be completed. Thus liberated, I felt more comfortable in trying some new arrangement or idea and discarding it if it didn't work as well as I had originally hoped. Any number of my friends seem to find use for my rejects, and there have been many.

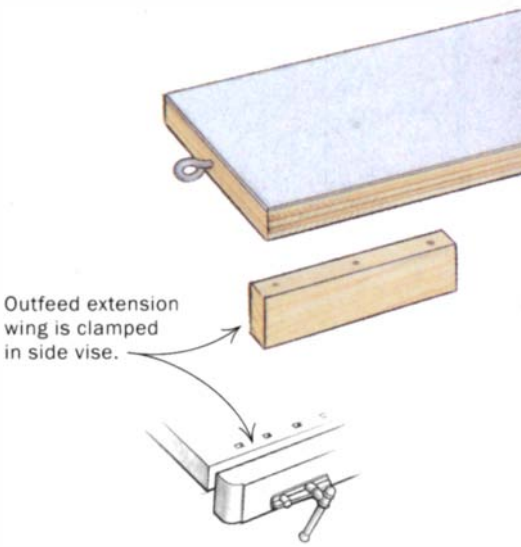
All of which is to suggest that you don't spend too much time or effort trying to devise the ideal shop. Start somewhere and just accept the inevitable reality that you will reconfigure again ... and again ... and again. Even now, on my drawing board I'm trying to come up with another arrangement that would accommodate a dust collector, a 20-in. bandsaw and a shaper. □

Jan Carr builds cabinets and restores the three-story, turn-of-the-century home he shares with his wife in St. Paul, Minn.

Bench-Mounted Router Table

A three-part table clamps to a workbench, and it hangs from the ceiling when not in use

BY PAUL MANNING



I was getting ready to make grandfather clocks—one for each of my three children—and I needed a router table. The clocks entailed routing lots of curved moldings, raised panels and long boards, and their imminence finally forced me to think about designing a router table that would suit my needs. Because of the limited floor space in my basement shop, I hesitated to build a freestanding unit. And I discarded the idea of building a table where the router would sit on my workbench because it would make the work surface too high to work at comfortably.

It occurred to me that I could make a suitable router table that took advantage of the features of my very sturdy 8-ft.-long cabinetmaker's workbench, if I could design the table so that the router hung below the workbench surface. In effect, my router table is really only a router tabletop in that it has no legs and gets its sturdiness from being clamped to the bench. The table has three parts: the main table, which is the center section that holds the router and fence, and infeed and outfeed extension wings, which are clamped in the tails and side vises, respectively. Best yet, when I'm not using the table, the whole thing hangs on hook eyes from my basement ceiling joists, freeing up valuable floor space.

Buy the fence and build the table from scraps

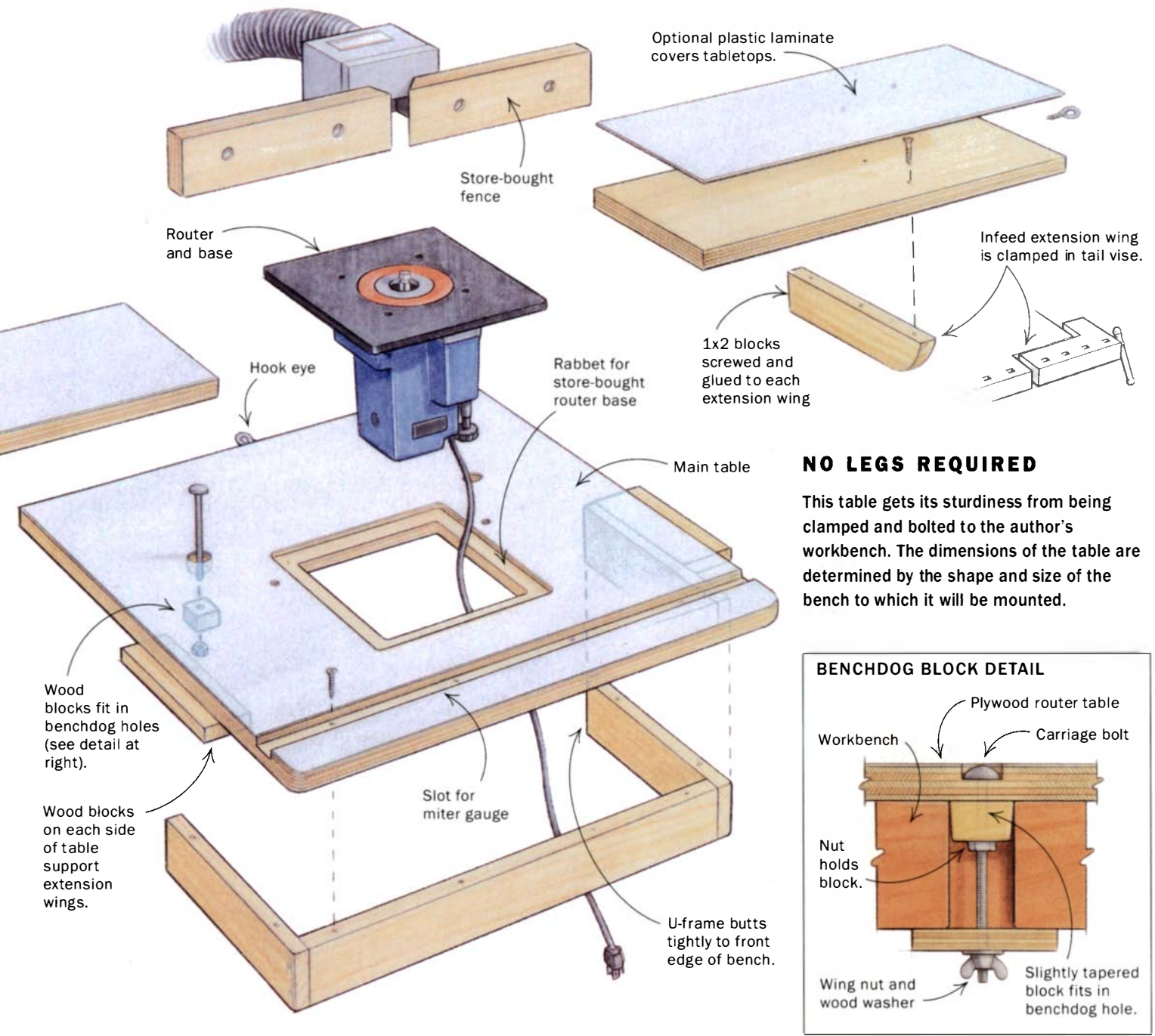
I bought a phenolic-resin router-base insert and a cast-aluminum router fence from Trendlines (888-234-8665) for about $120. I had been thinking about building a fence, and while toying around with a design idea, I came across what I thought was a perfectly adequate system from Trendlines. The system has 14-in.-long adjustable fences and a dust-collection port that plugs right into my shop vacuum.

My bench is very heavy. Even with the weight of the router and the 13-in. cantilever of the router table, the bench is sturdy enough that it won't tip forward, and thus no supporting legs are needed under the front edge of the table.

My main table is 30 in. wide and 24 in. deep, but obviously you'll have to size your table to fit the size and shape of your workbench. The most important dimension is the location of the router itself. It should be mounted as close as possible to the front edge of the workbench. The extension wings can be of any length and width, but I made mine 6 in. narrower than the front edge of the main table so that I can stand close to the working router bit.

The tabletop extends beyond the U-frame, permitting the use of clamps for featherboards and hold-downs and making room for a miter-gauge slot. The exten-

Photos: Jefferson Kolle



NO LEGS REQUIRED

This table gets its sturdiness from being clamped and bolted to the author's workbench. The dimensions of the table are determined by the shape and size of the bench to which it will be mounted.

sions have short pieces of hardwood underneath for insertion into the bench vises.

Assembly suggestions

After cutting the plywood for the main table, I transcribed the locations of two benchdog holes onto the plywood. To register the benchdog blocks in the holes, I glued and loosely bolted each one to the plywood with a short bolt. While the glue was still wet and the bolts were loose, I inserted the blocks into the benchdog holes. I then tightened the bolts and quickly removed the table.

After the glue dried, I replaced the short bolts with long carriage bolts, inserted the table into the benchdog holes and fixed the table to the bench with wing nuts (see detail drawing above). Holding the U-frame tightly against the front of the bench, I clamped it to the plywood, then screwed through the tabletop and into the U-frame.

For the extension wings, I clamped cleats in the bench vises and then aligned the tops of the extension wings, pushing them tight to the main-table edges. Then I screwed through the extension wings and into the cleats.

Note in the drawing that a block of wood is also glued and screwed under the main table's ends and protrudes 1 in. to provide a shelf support for the extension wings and to keep all surfaces in the same plane.

The table is well sealed with polyurethane, and the top surfaces are covered with plastic laminate. The plastic laminate is not an absolute necessity; a table that is well sealed and sanded smooth should be satisfactory. The grandfather clocks, by the way, turned out great. □

Paul Manning lives in North Andover, Mass.

Drawings: Bob La Pointe

A Working Guide to Glues

Choosing the right adhesive for the job might mean more than grabbing that old bottle on the shelf

BY WILLIAM TANDY YOUNG

I worked wood for years before realizing that I knew virtually nothing about the glues I was depending on to hold my joints together. At the time my attention was focused on things like lumber, tools and machines. I took glue for granted, assuming that it would always work and keep joints tightly bonded for years to come. After experiencing a few nightmare glue-ups and hearing from customers that some of my furniture wasn't holding up as well as it should, I finally realized that to improve as a woodworker I had to learn something about glue.

Once I started to understand more about glue, I became aware of more design possibilities and expanded my range of work. As I learned which adhesives were best for particular jobs, the overall quality of my work also improved. Choosing the right glue helps glue-ups proceed smoothly and successfully. It also ensures that your work will have the structural integrity and durability it needs to survive in the world.

How much do you need to know about glue to choose the best one for your work and become a better woodworker? You should know more than you can learn from ads, sales brochures and container labels, which often contain inaccurate or misleading information, but you certainly don't have to become a polymer chemist. What you really need is some useful, well-organized information on adhesives.

The principles of choosing glue

There is no such thing as a miracle adhesive with magical properties that will tackle any task. When I

Glue or adhesive?

Is there a difference between a glue and an adhesive? Technically, there is. Strictly speaking, glues are based on polymers, such as starch and protein, that are derived from natural sources, such as rice flour or cattle hides. Adhesives are based on polymers that are chemically synthesized, like PVA resins found in white and yellow glues. However, most people use the terms glue and adhesive interchangeably on a casual basis, as we do in this article. In general, you won't encounter a formally observed distinction between glues and adhesives unless you read literature of a highly technical nature, such as engineering standards.

choose glue for a job, I try to take as many things into account as I can, without spending a lot of time dwelling on details and pondering different glues. This article is designed to help you choose glue in just such a fashion, so that your work flow won't be disrupted by endless head scratching.

All glues are carefully formulated products with specific properties, and they perform well only if the conditions in your workshop, such as temperature and humidity, are favorable. Gluing well is a matter of knowing how to get the best performance from the glues you use while also knowing their limitations. By keeping an assortment of glues at your disposal and knowing what to expect from different ones, you can choose the adhesive that best suits your needs in any given situation.

It is also important to keep in mind the condition of your work. Glue joints that are skillfully crafted and prepared usually can be bonded successfully with one of several types of glues. Glue joints that are poorly crafted are difficult to bond regardless of the type of glue you use. Gluing surfaces not only have to mate properly, but they also must be free of contaminants (such as oil or grime) and have a moisture content that's appropriate for the work being done and the glue being used.

Although woodworkers have a tendency to seek the strongest glue on the market, glue shouldn't be chosen on the basis of strength alone. While some glues are stronger than others, all of the adhesives discussed in this article—except for wheat or rice paste, hot-melt glue and contact cement—will produce a bond that is "stronger than the wood itself," which means that if a glue joint is stressed to the breaking point, the wood will usually fail before the glue does. For many jobs, all you need to know is that the glue you're using is stronger than your wood. With this in mind, try to choose adhesives based on properties other than strength (such as open assembly time or rigidity), according to the demands of the job.

Comparing the properties of adhesives

As you compare the properties of the adhesives listed in the charts on the next few pages, it may be helpful to evaluate different glues by grouping them into the following categories:

Natural vs. synthetic—Most glues that are derived from natural sources, like wheat paste or hide glue, are reversible, meaning they can be reactivated with water after they harden. Adhesives that are based on synthetic polymers, such as urea resin glue, polyvinyl acetate (PVA) or epoxy, generally can't be reversed after they cure, but they may have other properties that are superior to those of natural glues.

Water based vs. non-water based—Even though water-based adhesives are easy to handle, in general, they can add quite a bit of moisture to glued work. There often are instances when this added moisture is unwelcome. If you're face-laminating an unstable wood like beech or sycamore, for example, you're better off using an adhesive that contains less water. Of the glues in this article, most natural and nonreactive synthetic glues (except solvent-based contact cement and hot melt) are high in moisture content. Of the reactive synthetic glues, only a few resorcinols and ureas contain a significant amount of moisture.

Toxic vs. nontoxic—It's common to encounter a trade-off between toxicity and performance: The glues that offer higher levels of performance and power are often more hazardous to use than those that are not as powerful. This is especially true when comparing different variations of the same kind of glue. For example, high-fume urea resin glue (which emits powerful formaldehyde vapors) usually outperforms low-fume urea resin glue, which is safer and less noxious to use.

The "wooden wonder." *This British-designed World War II plane, called the Mosquito Bomber, was constructed mostly from wood and bonded with urea formaldehyde glue, which had just been developed.*

Using the charts in this article

Here's an example of how I might choose the best glue for a job using the charts on the next few pages. Suppose I need to glue down a metal inlay. Many woodworkers use epoxy for this type of work, but it's not a good choice because scraping or sanding metal inlay flush with the surrounding wood usually creates a lot of heat. Most epoxy has low heat resistance and softens as the inlay is being scraped, which can cause the inlay to lift out of its recess.

As you look at the properties of polyurethane glue, you'll notice that it has high heat resistance, long open and closed assembly times and is very easy to clean up with hand tools after it hardens—all of which make it an ideal adhesive for metal inlay. If you want to use a natural glue instead, you'll notice that fish glue's long

Photos: Facing page: Michael Pekovich; this page, top: courtesy of Imperial War Museum; bottom: courtesy of EAA Photo

NATURAL GLUES

Glues in this group are made of natural ingredients and cure by moisture loss, heat loss or a combination of both. Casein glue is a slight exception, as it is made of milk curd but accomplishes some of its curing by chemical reaction.

RICE AND WHEAT PASTES

Commercial preblended instant formulas require no cooking and are easy to use. They are best for bonding porous, pliant materials (such as paper, cloth and leather) to wood.

FISH GLUE

Handy and versatile, without any fishy odor. A good choice for light-duty, wood-to-wood bonding and repairs. Fish glue also bonds natural nonwood materials (such as cloth, metal and bone) to wood.

HIDE GLUE

Unmatched for its combination of versatility, compatibility and strength. Hide glue is much easier to use than most people think. It is used for edge- and face-gluing, assembling joints, veneering, repairing and bonding natural nonwood materials to wood. It also can be used as a sizing, a wood conditioner and a grain filler.

CASEIN GLUE

Casein glue bonds oily tropical woods well and is used for structural lamination, as well as panel and flush door pressing. Its coarse, grainy, mixed consistency may produce glue lines with a thick appearance.

	Rice and Wheat Pastes
Handling	Mix with water and cook before use (if required); add preservative to prevent mold growth; can be tinted with dyes or inks to match wood color
Open assembly time	15 to 20 minutes
Clamp time	3 to 6 hours
Cleanup	**Tools and hands:** use warm water **Glued work:** pare off hardened excess with chisel
Cured working qualities	Easily cut with hand tools when cured; compatible with stains and finishes; reversible with water
Structural properties	Not strong enough for most structural wood-to-wood bonding
Endurance properties	Subject to bacterial and fungal attack unless preservative is added
Health and safety	Nontoxic

assembly time and high heat resistance make it preferable to hide glue for metal inlay.

Water resistant or waterproof

Over the last few years, the distinction between water resistant and waterproof has become hazy. Inaccurate and misleading claims have been made about the water resistance of various glues. Vague alternative terms like weatherproof and weather resistant have also come into use. To be rated properly for water resistance, a glue must be tested in accordance with established technical standards. There are various moisture-resistance tests for adhesives, such as intermittent exposure to water, continual immersion and boiling. On a practical basis, here's how the most widely used moisture-resistant woodworking adhesives stack up.

Type-II PVA glues are moisture resistant and will withstand intermittent exposure, but they aren't recommended for work that will be fully immersed in water. Polyurethane and urea resin glues are extremely water resistant and are better able to withstand periods of immersion. Resorcinol resin glues and marine epoxies are considered waterproof and can withstand prolonged periods of immersion. Of these last two, epoxy is a better all-around choice because it can be used as a sealant and coating as well as an adhesive, allowing wood to be shielded from moisture to keep it from cracking, splitting or rotting. When choosing glue for a project that will really put glue to the test (like a boat), review your glue's technical specifications carefully to see that it's up to the task.

Altering, combining and customizing glues

You don't always have to use glue right out of the bottle, the way it was formulated. Many adhesives can be altered and customized

Photos: Matthew Teague, except where noted

Fish Glue	Hide Glue	Casein Glue
Ready to use; can be tinted with dyes or inks; refrigerate to extend shelf life	Mix granules with water and heat to 140°F before use; add water if glue thickens; add urea or salt to retard gel rate; add glycerin to plasticize cured glue line; can be tinted to match wood color; premixed, ready-to-use liquid hide glues also available	Usually requires careful two-step mixing with water to prevent lumping
15 to 30 minutes, depending on working temperature	1 to 10 minutes, depending on gram strength, condition of glue and working temperature	15 to 45 minutes, depending on working temperature
2 to 4 hours, depending on setting temperature	10 to 90 minutes, depending on gram strength, condition of glue and setting temperature; some glue-ups, like hammer veneering, don't require clamping	2 to 8 hours, depending on setting temperature
Tools and hands: use warm water **Glued work:** use warm water, either when glue is wet or hardened	**Tools and hands:** use warm water **Glued work:** peel off excess once it gets to rubbery state, then swab area with warm water; remove hardened excess with hot water and heat gun	**Tools and hands:** use soap and warm water **Glued work:** remove hardened excess with power sander
Cures hard; machines and sands well; compatible with stains and finishes; reversible with water	Cures very hard; machines and sands well	Cures hard, sands readily, but dulls cutting tools rapidly; permanently stains the surface of high-tannin woods such as oak and mahogany
Good strength, rigidity and creep resistance; not as strong as hide glue	Excellent strength, rigidity and creep resistance; thick glue layers can be brittle	Excellent strength, rigidity and durability; highly creep resistant; has some gap-filling ability
Excellent heat and solvent resistance; poor water resistance; glue layers desiccate, become brittle with age	Surprisingly resistant to moderate heat and moisture levels, despite reversibility; good solvent resistance and shock resistance; glue layers may desiccate, become brittle with age	High-grade formulas have good moisture and solvent resistance; low-grade formulas have lower moisture resistance; can be subject to bacterial and fungal attack unless preservative is added
Nontoxic	Nontoxic	Dry glue powder can irritate respiratory tract during measuring and mixing

to better meet the needs of the job. For example, I often retard the cure rate of hide glue by adding a gel depressant, such as granular urea. (It can be added in amounts up to about 30% of the weight of the glue granules.) I also regularly tint epoxy and other adhesives with specialty adhesive colorants or aniline dyes and inks to match wood color. Some adhesives, such as epoxy, can be altered and customized to a great extent; other products, like polyurethane glue, shouldn't be altered at all.

Also, glues can be combined to create mixtures that have enhanced properties and performance. For example, I sometimes add a small amount of fish glue to hide glue as a retarder, or some ethylene vinyl acetate (EVA) to PVA as a plasticizer. One of my favorite combinations is a mixture of PVA and urea resin glue. Lots of different results can be obtained by varying the types of glue you mix together and the proportions in which you mix them. You can experiment to find out what works well by making small batches and testing them on scrap wood.

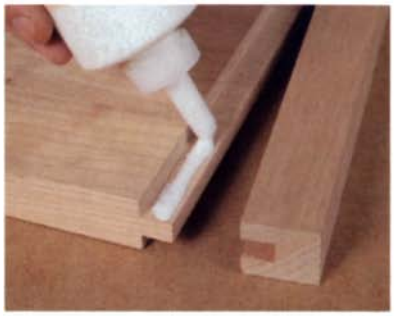
To minimize clamp time, the hardening of some glues can be accelerated. For instance, urea resin glue and resorcinol will harden more quickly if heated to 80°F or 90°F while your work is clamped up. Joints assembled with hide glue can be chilled during clamping to make the glue gel faster. You can also use alcohol, baking soda or an accelerator to speed up cyanoacrylate glue. With polyurethane glue, lightly moistening the gluing surfaces before applying glue promotes faster hardening.

Myths and facts on filling gaps

Many glue manufacturers claim that their products will fill gaps. Whether the products really will or not depends on what sort of gaps you have to fill. Most of the glues featured in this article can

NONREACTIVE SYNTHETIC GLUES

The glues in this group are formulated from synthetic ingredients but cure much like natural glues—by releasing water, solvent or heat.



ETHYLENE VINYL ACETATE GLUE (EVA)

EVAs are very versatile and useful for specialty jobs that rigid glues can't handle. EVA is a good choice for bonding melamine-faced cabinet parts and for gluing cross-grain solid-wood assemblies where wood movement is likely. It's also handy for consolidating wormy or damaged wood.

POLYVINYL ACETATE GLUE (PVA)

Both white and yellow glues are PVAs. "Aliphatic resin" is a meaningless marketing term coined to help identify yellow glue as a distinct product. The two types are low grade (craft, school or hobby glue) and high grade (professional/industrial glue). PVAs are useful for a wide assortment of tasks: edge- and face-gluing, bonding structural joints, bonding plastic laminates, as well as for biscuit joinery.

CONTACT CEMENT

Some of the new water-based cements now available are fast drying and give high performance. Applying significant pressure to the work with clamps or a press greatly increases the strength of the bond. Contact cement is best used for bonding plastic laminates, for installing decorative overlays and for gluing up other rigid sheet materials.

HOT-MELT GLUE

Hot-melt glues and guns are available with high, low or dual melt-point temperatures. High-melt systems are widely available and are commonly used; low-melt systems are safer and less likely than high-melt systems to harm the materials being glued. Hot melt is useful for edge-banding sheet stock and for the rapid assembly of jigs and other temporary fixtures.

	EVA Glue
Handling	Ready to use; can be tinted with dyes or inks to match wood color
Open assembly time	10 to 15 minutes, depending on glue formula and working temperature
Clamp time	30 to 120 minutes, depending on glue formula and setting temperature
Cleanup	**Tools and hands:** use warm water **Glued work:** clean wet excess with warm water; chisel or scrape when partially set; or scrape or machine after hardening
Cured working qualities	Soft and pliable when cured; can be worked with hand tools; machines well; sands moderately well; reversible with water and/or heat; compatible with some stains and finishes
Structural properties	Cures with acceptable strength but with little rigidity and creep resistance (which is an asset when gluing assemblies that incorporate seasonal wood movement)
Endurance properties	Low resistance to heat and moisture; fair resistance to acids and solvents; fair shock resistance; will gradually degrade if exposed to intense UV light
Health and safety	Generally safe to use; some formulas are fairly acidic and can be harsh on skin; clean glue from skin before it hardens

be used to fill small cosmetic gaps, with varying degrees of success. But of the glues discussed here, only epoxy will fill gaps in joints with true structural strength.

Other glues just aren't up to the job of structural gap filling. For instance, PVA and hide glue lose water and shrink in volume as they cure. Two-part urea resin and cyanoacrylate become brittle when they are made to cure in thick bond layers. And regular hot melt simply lacks the adhesive power needed for structural gap filling. Polyurethane glue does expand into gaps as it cures, filling them with a spongy foam, but this foam has little or no structural strength. In most cases, the best way to fill a gap in a bad joint is to shim the joint with wood or veneer.

Work safe, work smart

Many woodworkers think that adhesives are benign and treat them casually, which is a mistake. Avoid skin contact whenever possible when using synthetic adhesives, and be cautious with glue, both when it's in liquid form and after it hardens. Often it's the smaller, less obvious hazards of glue that can cause the most trouble. For instance, thin glue can come streaming out of an ap-

PVA Glue	Contact Cement	Hot-Melt Glue
Ready to use; high in moisture content and can be thinned with water up to 5% to extend working time; can also be tinted with dyes or inks; premixed urea resin glue can be added to strengthen mix	Ready to use; can be thinned before application	Must be applied hot, according to product specifications; low-melt glue shouldn't be used in a high-melt gun
5 to 30 minutes, depending on glue formula and working temperature	Must dry prior to assembly; open drying times: 10 to 20 minutes (water based), 2 to 15 minutes (solvent based), depending on working temperature and humidity; aerosol cements usually have shorter assembly times	5 to 30 seconds, longer if parts are preheated
20 to 90 minutes, depending on glue formula and setting temperature	Briefly clamping or pressing (for 1 to 5 minutes at room temperature) will increase bond strength	No clamping needed; press parts together as firmly and quickly as possible
Tools and hands: use warm water **Glued work:** clean wet excess with warm water; chisel or scrape when partially set; or scrape or machine after hardening	**Tools and hands:** use soap and water for water-based cement; solvent for solvent based **Glued work:** clean excess with solvent or machine it off after assembly	**Glued work:** clean excess with scraper, naphtha or a chisel (soften glue with heat gun) or machine it off after hardening
All PVAs resist stains and finishes and can be softened or reactivated with heat up to several days after application; low grade is fairly soft and workable when cured, can be cut with hand tools, machines well but loads paper when sanded and is reversible with water for 2 to 6 weeks after curing; high grade cures hard, machines and sands well and is not reversible with water after curing	Soft and elastic when cured; can be machined and sanded but will gum up cutting edges and sandpaper; may be softened or dissolved by solvents in stains and finishes	Can be cut with hand tools when hardened; machines and sands adequately but can gum up cutting edges and sandpaper; reversible with heat; may be softened or dissolved by some stains and finishes
Low grade has adequate strength, low rigidity and creep resistance; high grade has much greater strength, rigidity, creep resistance and durability; top-grade PVAs have creep resistance comparable to some epoxies	Does not produce bonds with permanent structural strength but develops increased strength when pressed into thin layer; no rigidity; little or no creep resistance	Does not have enough strength to produce permanent structural bonds; develops increased strength when pressed into thin layer; limited rigidity and creep resistance; has some gap-filling ability but with limited strength
Low grade has low to moderate resistance to heat, moisture, acids and solvents (acetone, etc.) and good shock resistance; high grade has much greater resistance to heat, moisture, acids and solvents and very good shock resistance; type-II PVAs have good to excellent moisture resistance; all will gradually degrade if exposed to intense UV light	Good to excellent heat resistance once pressed into thin layer and cured; poor to fair moisture resistance if subjected to prolonged exposure; poor solvent resistance	Good moisture resistance; no heat resistance; poor solvent resistance; poor to fair shock resistance; will gradually degrade if exposed to intense UV light
Generally safe to use, but some formulas are fairly acidic and can be harsh on skin; clean glue from skin before it hardens	Water based is generally safe to use; solvent based contains elements that are health and environmental hazards; fumes are toxic and explosive	Heated glue guns and glue can burn skin; using low-melt glue in high-melt gun may cause glue to ooze out of the infeed port and burn your hand

plicator tip and douse your face if you squeeze the bottle too vigorously. Hardened excess glue on the surface of your work can fracture and fly about like shards of glass as you scrape it off. Gloves, safety glasses and a respirator are all standard gluing gear in my shop.

Some adhesives have short shelf lives and are sensitive to heat, light and humidity. Others may keep well for years in less-than-ideal conditions. Buy sensitive glues like urea resin and cyanoacrylate in small amounts and check them for freshness by looking for dates of manufacture on containers. Once you buy any glue, store it as well as you can so that it will be in good shape when you need it. Otherwise, you'll end up regularly disposing of spoiled glue and replacing it with fresh material.

Different glues have different life expectancies

While you want your best work to be long lasting, a glued assembly such as a jig may only have a useful life of a day or so. There's no point in carefully bonding the parts of a jig together with epoxy when a few quick dabs of hot melt will do. Similarly, if you expect a plastic laminate kitchen countertop to last only 5 to 10 years,

REACTIVE SYNTHETIC GLUES

The glues in this group are formulated from synthetic components and cure primarily by chemical reaction.

	Urea Resin Glue	Resorcinol	Epoxy
Handling	One-part glue: mix powder with water; two-part glue: mix liquid resin and powdered catalyst; either glue can be mixed slightly off ratio; can be tinted with dyes or inks; can be mixed with PVA	Mix liquid resin and powdered catalyst; shouldn't be thinned; can be tinted black with dye or ink	Mix resin and hardener; can be mixed slightly off ratio; can be thickened with various additives; can be tinted with specialty epoxy tints
Open assembly time	15 to 35 minutes, depending on glue formula, mix ratio, dispersal of glue volume and working temperature	12 to 25 minutes, depending on glue formula, mix ratio, dispersal of glue volume and working temperature	2 minutes to 2 or more hours, depending on epoxy formula, mix ratio, dispersal of epoxy volume and working temperature
Clamp time	4 to 10 hours, depending on glue formula and setting temperature	5 to 10 hours, depending on glue formula and setting temperature	4 minutes to 48 hours, depending on epoxy formula and setting temperature
Cleanup	**Tools and hands:** use soap and warm water (don't use hot water—it will gum up the excess glue) **Glued work:** machine or scrape off hardened excess	**Tools and hands:** use soap and warm water (don't use hot water—it will gum up the excess glue) **Glued work:** machine or scrape off hardened excess	**Tools and hands:** Use hand cleaner, vinegar, alcohol or acetone **Glued work:** machine or scrape off hardened excess
Cured working qualities	Cures very hard; hand-scrapes, machines and sands well but dulls cutting edges quickly; resists stains and finishes	Cures hard to very hard, depending on formula; hand-scrapes, machines and sands well but dulls cutting edges; resists stains and finishes	Cures hard but can be cut with hand tools if warmed with a heat gun; scrapes, machines and sands well; doesn't dull cutting edges as quickly as urea resin glue; resists stains and finishes
Structural properties	Very strong, rigid and creep resistant; good durability; two-part systems (liquid resin and powdered catalyst) have moderate gap-filling ability	Very strong, rigid and creep resistant; slightly less rigid, more durable than urea resin glues when cured	Excellent combination of strength, rigidity, creep resistance and durability
Endurance properties	Fair to good shock resistance; good heat resistance; excellent solvent resistance, depending on formula. Low-grade formulas may craze, become brittle with age (especially in thick bond layers)	Waterproof; excellent heat and solvent resistance; good to excellent shock resistance	Waterproof; may gradually degrade if exposed to UV light; can be weakened, broken down by some solvents; fair to adequate heat resistance; superior shock resistance
Health and safety	Contains furfuryl alcohol and formaldehyde; squeeze-out can harden into sharp edges; cured glue can fracture into dangerous shards when scraped or machined; airborne dust can be hazardous	Contains phenols and formaldehyde; squeeze-out can harden into sharp edges; cured glue can fracture into dangerous shards when scraped or machined; airborne dust can be hazardous	Contains compounds that are respiratory tract and skin irritants; can cause acute irritation with repeated use

UREA RESIN GLUE

High water resistance makes this a good choice for exterior wood bonding, bent laminating, veneering and pressing plastic laminate. In general, one-part ureas are easier and less hazardous to use than two-part ureas. But two-part ureas have better performance and cured properties.

RESORCINOL

Among the best choice for waterproof exterior and marine wood bonding, but the dark red color creates highly visible glue lines in light-colored woods. It is a fine choice for bent laminations or veneering.

EPOXY

Properties can vary greatly from one brand to the next—choose according to the job at hand. Best uses include waterproof exterior and marine wood bonding, bent laminating and veneering. Epoxy is also used for sealing, topcoating, casting and embedding hardware.

Polyurethane	Cyanoacrylate
Ready to use; don't alter glue; work can be moistened before applications to speed hardening; to prolong shelf life, squeeze air out of bottle, keep tightly capped and keep away from moisture and humidity	Ready to use; separate accelerator can be used to speed hardening, but for best results, it's not recommended
10 to 40 minutes, depending on glue formula, moisture content of workpieces, working temperature and humidity	30 seconds to 5 minutes, depending on glue formula, volume of glue applied, moisture content of workpieces, working temperature and humidity
45 minutes to 10 hours, depending on glue formula, moisture content of workpieces, setting temperature and humidity	2 seconds to 4 hours, depending on glue formula, volume of glue in joint, moisture content of workpieces, working temperature and humidity and use of accelerator
Tools and hands: use hand cleaner, alcohol or acetone **Glued work:** pare, scrape or machine hardened excess	**Tools and hands:** swab with acetone or debonder **Glued work:** machine or scrape off hardened excess
Cured foamout is soft and cuts easily with hand tools; scrapes, machines and sands well; compatible with stains and finishes	Cures hard to very hard, depending on formula; scrapes adequately but can be brittle; machines and sands well; resists stains and finishes
Good strength, rigidity, creep resistance and durability; fills gaps but only with foamed glue, which has no structural strength	Very strong and rigid, with fair durability, when used to bond small surface areas
Excellent moisture, solvent and shock resistance; superior heat resistance; not completely waterproof, as advertised	Good moisture and heat resistance; poor solvent resistance and shock resistance; yellows, may degrade with exposure to UV light
Contains di-isocyanate compounds that can acutely irritate skin and respiratory tract	Bonds human skin to itself and workpieces (accidentally bonded skin will release with debonder); fumes of most formulas are noxious and can affect skin and respiratory tract; glue squirted in eyes causes permanent vision damage

POLYURETHANE

Polyurethane is useful for water-resistant exterior wood bonding, laminating, veneering and for bonding nonwood materials, but it's a poor choice for biscuit joinery. It develops full strength only in well-fit, tightly clamped joints. New formulas cure faster than the older ones.

CYANOACRYLATE

Widely sold as all-purpose glue but is best used for rapidly bonding small wood and nonwood workpieces. Not as effective when bonding highly porous materials or large surface areas. Cyanoacrylates are sensitive to joint surface conditions like pH, moisture and grime.

there's no need to bond the laminate to the substrate with urea resin glue when contact cement should hold up sufficiently for that length of time.

As you choose glues for various jobs, it's important to consider how long you expect your work to last once it has been glued up. Unfortunately, there is no such thing as a truly permanent glue joint. Even perfectly crafted and prepared joints made from superb materials and bonded with the strongest adhesives eventually fail. The concept that all joints eventually fail is bothersome to many woodworkers, especially since the adhesives that are rated as being stronger than wood are commonly called "permanent" adhesives—an unfortunate misnomer. This doesn't mean that your best work is going to fall apart in your lifetime, though. Your glue joints may endure for centuries, as other joints have.

Joint failure occurs for a number of reasons—abuse, glue deterioration from ultraviolet light, humidity or just the inevitable seasonal movement of wood. There are, however, things you can do to combat failure. To begin with, design and make the best joints you can. Then bond them together with the highest-quality glue you can get. When you're choosing an adhesive, whenever possible consider using a reversible glue, such as hide glue, rather than a nonreversible synthetic adhesive, such as PVA or urea resin glue.

Reversible glue is easy to remove from the gluing surfaces of failed joints using hot water. This allows joints to be properly cleaned before being reglued. If older joints can't be disassembled, dry, brittle hide glue inside joints can be reconstituted by injecting water with a syringe. On the other hand, it's much harder to clean synthetic adhesives like PVA or urea resin glue without altering or damaging the gluing surfaces—they can't be reactivated with water or other agents.

I'm convinced that the best way to ensure the longevity of your work is to bond it with a reversible glue whenever possible. After all, the reason why so many antiques have survived for hundreds of years is not because the glue joints never failed; it's because those glue joints were easy to repair when they did fail. □

William Tandy Young, author of The Glue Book *(The Taunton Press, 1998), is a woodworker and adhesives consultant in Stow, Mass.*

Chip Carving Limbers Up

The simple tools and techniques of an old art easily adapt to a more flexible use

BY CRAIG VANDALL STEVENS

Traditional chip carving most often takes the form of geometric designs in repeating patterns densely covering a workpiece. The knife strokes are small, and the chips of wood they remove create a kaleidoscope of tiny excavations that form a larger image. But that style is simply the convention. When I began learning to chip carve, I found that the traditional chip-carving knife, with its short, angled blade and the easy way it fits in one's hand, lent itself equally well to a flowing, free-form style of carving. I found that I could use the knife almost like a pen or a brush and compose directly from the point of the blade, pulling it across the wood as if I were drawing in sand. The technique is fairly simple and efficient and requires only a small kit of tools—a chip-carving knife or two and a pair of sharpening stones to keep the knives behaving properly.

THE GRIP

One grip does almost all of the cutting. The grip forms a tripod—the tip of the blade, the thumb and the first joint of the forefinger all contact the workpiece. This gives stability and control to the carving action.

I try to keep my thumb and forefinger in contact with the knife handle at all times rather than stretching out my thumb and using it as a lever, as one would when whittling with a jackknife. But the middle finger, ring finger and little finger are the ones that really grip the handle as you pull.

For a right-hander, the knife blade is always tilted to the right. The basic angle between the side of the knife and the wood surface is about 65°. I raise the angle closer to vertical at the beginning and the end of a tapering cut. And I flatten the angle slightly—to, say, 55° or 45°—when I'm carving a wide cut to prevent the carving from becoming too deep, which is especially important in harder woods. The tendency of most new carvers is to stand the knife up too much, resulting in too deep and difficult a cut.

Photos: Top: Stephen Webster; all others: Jonathan Binzen

THE DESIGN

I begin any design by sketching ideas on large sheets of drawing paper. I sketch fairly quickly using a soft pencil, not worrying about perfecting the drawing. When I'm satisfied with the design, I trace it onto vellum or tracing paper. This is a chance to refine the design, fairing the curves and copying single lines where the initial sketch has multiple ones. I tape the tracing to the workpiece, which I've handplaned smooth in preparation for carving. I slide graphite paper beneath the tracing and then go over all of the pencil lines to transfer the image to the workpiece.

I find chip carving to be an excellent medium for suggesting the flow and movement of natural forms. In my designs I try to emulate the example of the master brush painters of Japan and China, who create the suggestion of shape and movement with only a few lines. I have found I don't have to cover every inch of the board or supply every detail—I can allow the eye of the viewer to complete the image.

Getting to the point

I keep my carving knives razor sharp using two small ceramic sharpening stones: a medium and a super fine. Made of a very hard synthetic material, these stones stay perfectly

flat. Softer stones will dish out with use, resulting in a curved cutting edge on the knife. Ceramic stones need no lubricant and are very portable.

A chip-carving knife comes from the factory with a cutting angle of around 25°. The first thing I do is change this to 10°, which reduces drag in the wood and increases the maneuverability of the knife. Set a dime beneath the back edge of the blade to attain approximately the 10° angle. I use the medium stone to take down the bevel, then use the superfine stone to hone the bevel, polishing and refining the surface. Sharpening is complete when the polished bevels meet and the burr has been honed away. Hold the blade under a bright lamp and look at the cutting edge, turning it in the light. If it is truly sharp, it will reflect no light off the very edge. A glint of light indicates that more honing is required.

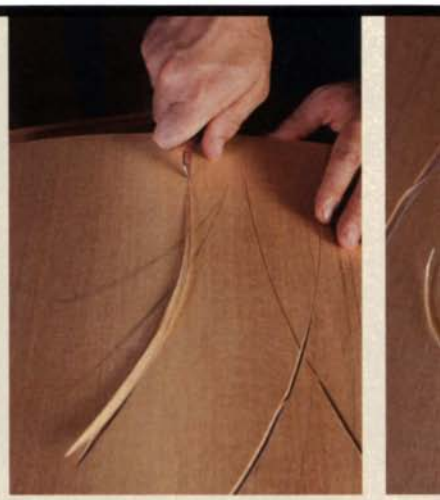
I don't dread sharpening. I use it as a way to begin focusing on my carving. Not only does it prepare the knives for use, but it also sharpens my mind and prepares me for the work ahead. —C.V.S.

MAKING THE CUTS

I use variations on one basic cut (see photos 1 to 3 below) to do nearly all of my chip carving. I focus on the pencil line just ahead of the blade to ensure a smooth line, but I don't always follow the line precisely. In the right wood, a sharp knife tracks pre-

1 ***The fundamental cut.*** *The basic chip-carving cut is made with the knife tilted to the right (for a right-hander). The stroke is always toward you. Use your whole arm to draw the blade along the cut rather than leveraging with your thumb.*

2 ***Return journey.*** *Spin the workpiece end for end to cut the second side of the chip instead of trying to cut with the knife tilted to the left. A carpet scrap beneath the workpiece acts like a lazy Susan while protecting the work from grit on the bench. Apply enough knife pressure to free the chip in one pass.*

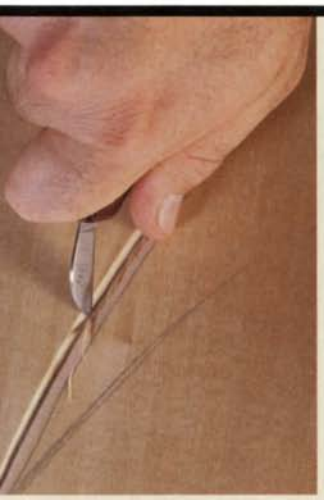


3 ***Releasing the chip.*** *Raise the handle of the knife at the end of the cut and tilt the blade up toward 90°. Gradually diminish downward pressure until only the tip of the blade is in the wood.*

FINISHING OFF A CHIP-CARVED SURFACE

I prefer to finish a carved panel with shellac. With the carving complete, I lightly sand away any remaining graphite lines with 320- and 400-grit sandpaper wrapped around a cork-faced block. I use a small brush to apply thin shellac to the walls of the carving and a cloth pad, called a fad in French polishing, used with overlapping strokes for the panel surface. I build up the shellac with several coats until the panel has the sheen I'm after, burnishing the carved areas with a stiff toothbrush between coats and using 0000 steel wool to even out the uncarved surface of the panel. Once the finish is dry and burnished, I apply beeswax to the panel surface and to the carving. In the carved areas, I use one toothbrush to apply the wax and another to buff it out.

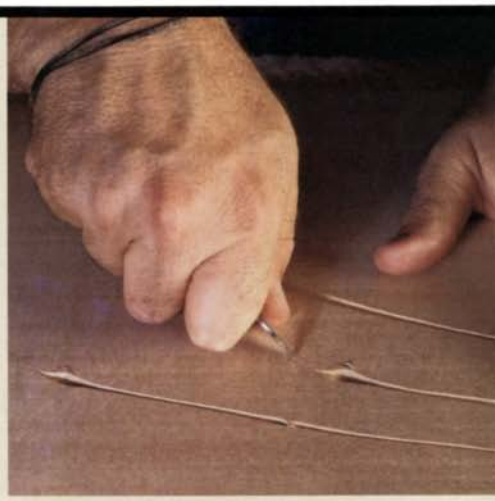
dictably and can carve a beautiful fair curve, cleanly slicing through the wood fibers. Tracking can get difficult when the line of cut is parallel with the grain. I avoid laying out cuts along the grain, and where curving lines are briefly aligned with the grain, I briefly slip the blade most of the way out of the cut while continuing forward progress. Slipping the blade increases control and keeps the blade from taking off. In harder woods, the blade is less prone to take off along the grain, but every cut takes more energy. When working the hardest woods, I often remove a small chip well inside the pencil line and then widen the cut in two or three passes. Or I might clamp the workpiece and use my left hand to help pull the knife along.



Clean up after yourself. *If the two passes don't meet in the valley of a cut, place the side of the blade on the wall of the cut and carefully sever the remaining fibers. Avoid cutting too deep, or you'll lose the crisp line in the valley.*

Stop cut. *When two cuts share a common ridge, use a stop cut to keep the ridge from crumbling. After removing the chip from the first cut, use a plunging action to make a short cut parallel with the edge of the ridge. Then cut the rest of the second chip. Here, as elsewhere, always try to work away from an area that has already been carved.*

Jump cut. *To create the impression that one element passes behind another, the lines of the background element are broken where they cross the foreground element. To make the illusion convincing, cut the two parts of a line in one motion so they line up. Use stop cuts (left) on each side of the element in the foreground.*



Choke up for a delicate cut. *Use your knuckle and thumb as a fulcrum and raise the knife handle to pivot the blade into the work, making a short, decorative plunge cut.*

GOOD WOODS FOR CARVING

Here are some things to consider when selecting wood for chip carving: A wood should be soft enough to carve with hand pressure; have close, fine grain to hold detail; and have mild grain patterns that won't be distracting. Any color is fine, but a light-colored wood will emphasize the shadows that carvings cast. I often compromise on one of these criteria. I sometimes carve European pear, for instance, which is quite hard but has tight, creamy grain and holds detail beautifully. —*C.V.S.*

Better Batteries for Cordless Tools

Nickel-metal-hydride batteries pack a lot of power, keep a charge longer than nickel-cadmium batteries and don't have to be recycled

BY DENNIS PRESTON

More power! More power! More power!" The mantra of TV's *Home Improvement* tool junkie Tim Taylor is shared by cordless-tool users and manufacturers alike. That's why you will soon see cordless tools equipped with a nickel-metal-hydride (Ni-MH) battery pack instead of the familiar nickel-cadmium (Ni-Cd) pack. Continuous improvement of Ni-Cd batteries, the driving force in cordless tools, has fueled the inexorable push for more power. Over the years, Ni-Cd batteries have gotten better—higher output, longer run time and faster recharging. However, after two decades as the industry's prime mover, Ni-Cd battery technology may be topping out while the demand for more power continues.

Initially, Ni-Cd batteries delivered 1.0 amp-hour, the amount of electrical current that can be delivered in a given period of time. They now produce about 2.0 amp-hours—double those first used in power tools in the early 1980s. Ni-Cd batteries will probably max out at 2.4 amp-hours. The power-tool industry is looking at 3.0 amp-hours as the next big step.

High energy density: the holy grail of battery design

Cordless power-tool users want drills and saws that deliver a lot of power for a long period of time between charges. To meet this demand, manufacturers continue to research and develop batteries with high energy density, that is, batteries with more power in smaller, lighter-weight packages.

In the past, cordless-tool manufacturers simply raised the voltage

Packed with batteries. *This 14.4-volt pack contains 12 individual 1.2-volt batteries. Putting more batteries into the pack boosts the total voltage, but there's a limit before the pack gets too bulky and heavy.*

Smart chargers. *Universal chargers will handle both the new nickel-metal-hydride batteries and the old nickel-cadmium batteries.*

to quench the power thirst because upping the voltage is the easiest part of the energy equation to tinker with. A single Ni-Cd battery (or cell) produces only 1.2 volts, so individual batteries are ganged together in series to produce a higher overall output. Six batteries were used in the battery packs of the old, anemic 7.2-volt drills. Eight batteries boosted the output to 9.6 volts, resulting in a tool that actually did some work. Twelve batteries power the 14.4-volt tools (see the bottom photo on the facing page). At some point, though, adding batteries just makes a battery pack, and thus the tool, too heavy and bulky, a common complaint with the current, hefty 18-volt drills.

Another problem is disposal of exhausted batteries from all of those cordless tools. The U.S. government has listed cadmium as a hazardous waste requiring proper disposal (see the related story at right). While handling the battery during use or at the time of disposal poses no problem, once in a landfill, the battery housing deteriorates, releasing the cadmium to leach into the groundwater. If the expired battery is incinerated, fine particles of cadmium are released into the air or collected in the ash. European and Scandinavian countries are making a strong push toward green technology, and eliminating cadmium is high on their agendas. Tool manufacturers, wanting to be part of these markets, are having to respond with batteries containing no cadmium, mercury or lead.

Ni-MH batteries power consumer electronics

Power-tool manufacturers are looking to Ni-MH battery technology as the next generation of portable power. Ni-MH batteries have a higher energy density than Ni-Cd batteries, and because they do not contain cadmium, mercury or lead, Ni-MH batteries don't need to be recycled. The technology is not new. If you recently purchased a laptop computer, video recorder or cell phone, chances are it is already equipped with Ni-MH batteries.

Power tools, however, demand more from batteries than home electronic components do. Initially, Ni-MH batteries did not provide acceptable performance for the high current drain and rough service expected for power tools. Recent improvements solved those problems. Like a Ni-Cd battery, the Ni-MH battery produces 1.2 volts for the same size and weight. The difference is that the Ni-MH battery delivers 2.2 amp-hours, a 10% boost in power over current Ni-Cd batteries. Power tools with 3.0 amp-hour batteries should be available by spring of 1999.

You won't have to replace all of your power tools

Manufacturers have no plans to phase out Ni-Cd batteries, and, in fact, they continue to try to squeeze more power out of them. The new Ni-MH batteries will work with your older power tools because, thankfully, the new batteries are being packaged to fit in the old battery-pack configuration. With Ni-MH batteries, the only difference you'll notice about your cordless tool is longer run time between charging. The downside: A new Ni-MH battery will cost about 20% more than an equivalent Ni-Cd battery, and you will need a new charger. Manufacturers will be offering chargers that are capable of handling either Ni-MH or Ni-Cd batteries. □

Dennis Preston is a woodworker, engineer and writer living in Brookfield, Conn.

Recycling nickel-cadmium batteries

Keeping Ni-Cd batteries out of the solid waste stream is the mission of the Rechargeable Battery Recycling Corp. (RBRC). The RBRC is a nonprofit organization founded in 1994 to educate the public about the benefits of recycling. To promote recycling, the RBRC has launched a nationwide campaign, "Charge Up to Recycle!," featuring Richard Karn, Al in TV's *Home Improvement*, as the spokesman. Stores taking part in this campaign will display collection boxes for spent Ni-Cd batteries (see the photo below). To locate a participating store near you, call (800) 8-BATTERY, or visit the RBRC web site at www.rbrc.com. —D.P.

Photos: Bottom, facing page: courtesy of Energizer; all others: Michael Pekovich

Frame-and-Panel Bed

Design rests on faceted legs with compound curves

BY DAVID FAY

My favorite designs have come to me unexpectedly, in a flash of an idea, far away from the drafting table. The ensuing challenge to develop that vision into a finished product requires a lot of time spent refining what may seem like small details.

I begin with a sketch, nothing fancy or beautiful. The back of an envelope or napkin will do. Drawing this way frees me from the constraints of trying to perfect the piece; all I'm after is getting the inspiration down on paper.

If the piece is a commission, the next step is listening to the customer. That often influences the dimensions of a project. For this bed, the customer wanted a queen-sized frame that could accommodate a futon mattress or a standard box-spring and mattress set. As a result, I had to make the bed rails wide enough to accommodate an adjustable inner rail.

A dimensioned drawing comes next. Although an accurate drawing can help me visualize a piece, this two-dimensional tool has limitations. That's why I build a full-scale model of any tricky parts to work out design and construction needs and to perfect technical skills.

The model allows me to evaluate how the details relate to the rest of the design. For example, I used a model to determine the proportions of the posts and rails. I experimented with the reveal at various widths. A ⅞-in. reveal looked chunky, and a ⅝-in. reveal looked skinny. But when I

A bed made in three types of wood. *The framework, including the posts, is made of cherry. The panels are resawn, slip-matched pear wood. Accent strips along the inside of the frames and along the bottoms of the bed rails are granadillo.*

SHAPING THE BEDPOSTS

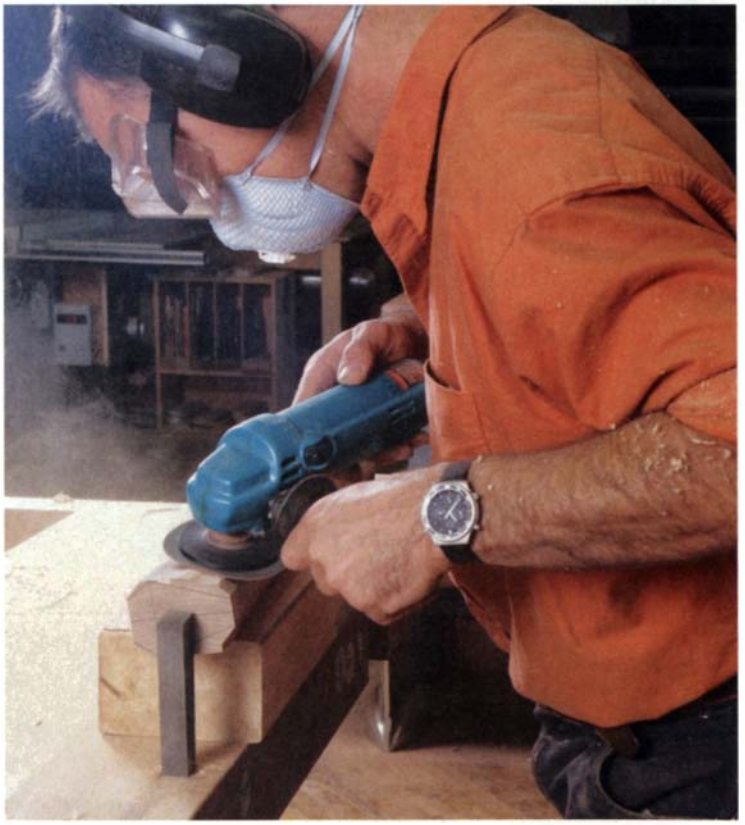
Establish the outside curve ...

Lay out the bedposts. *The six-sided shape is drawn on the end grain first, then the lines are carried over onto the faces.*

Cut the outside curve first. *Bandsaw close to the line.*

Attach the template to the post. *Clean up using a router and pattern-cutting bit.*

... and grind the facets



Shape the facets with an angle grinder. *A 24-grit sanding disc removes material quickly. Use long, fluid motions and take light passes.*

tried a ¾-in. reveal, it looked right. I also used the model to determine the size of the granadillo reveal as it related to the panel and posts and rails. Using the model, I was able to refine subtle details and their proportions. There's nothing scientific here, no golden rules. It's a matter of trial and error and trusting your instincts.

Cut the joinery, then begin shaping

The bedposts are thick at the top and get skinnier near the floor. As the thickness changes, the widths of the two faces also change. But one thing stays constant: the width of the outside edge or reveal.

All of the joints that involve the bedposts are machined while the stock is still square. These joints include the tenons for the upper and lower rails of the headboard/footboard, the mortises in the bedposts, the tenons on the long rails (see the story on p. 78 to learn how to make the hidden post-to-lower-rail joints) and the grooves for the panels.

Next, lay out each post's six-sided profile on the end grain (see the left photo above). Then connect the lines from end to end along the outside of the post—use a black, thin-line pen, which is easier to see than a pencil line.

The posts have three straight, flat sides (inside edge and the two adjoining sides), two curvy sides (on each side of the outside edge) where the plane twists and a curved, tapered side (the outside edge with the ¾-in. reveal). Whenever possible, I make templates to lay out and cut curved parts (see the story on p. 77). I use the templates to trace layout marks, and then, after bandsawing parts to rough dimensions, I attach the templates to the stock and use them with a pattern-cutting bit.

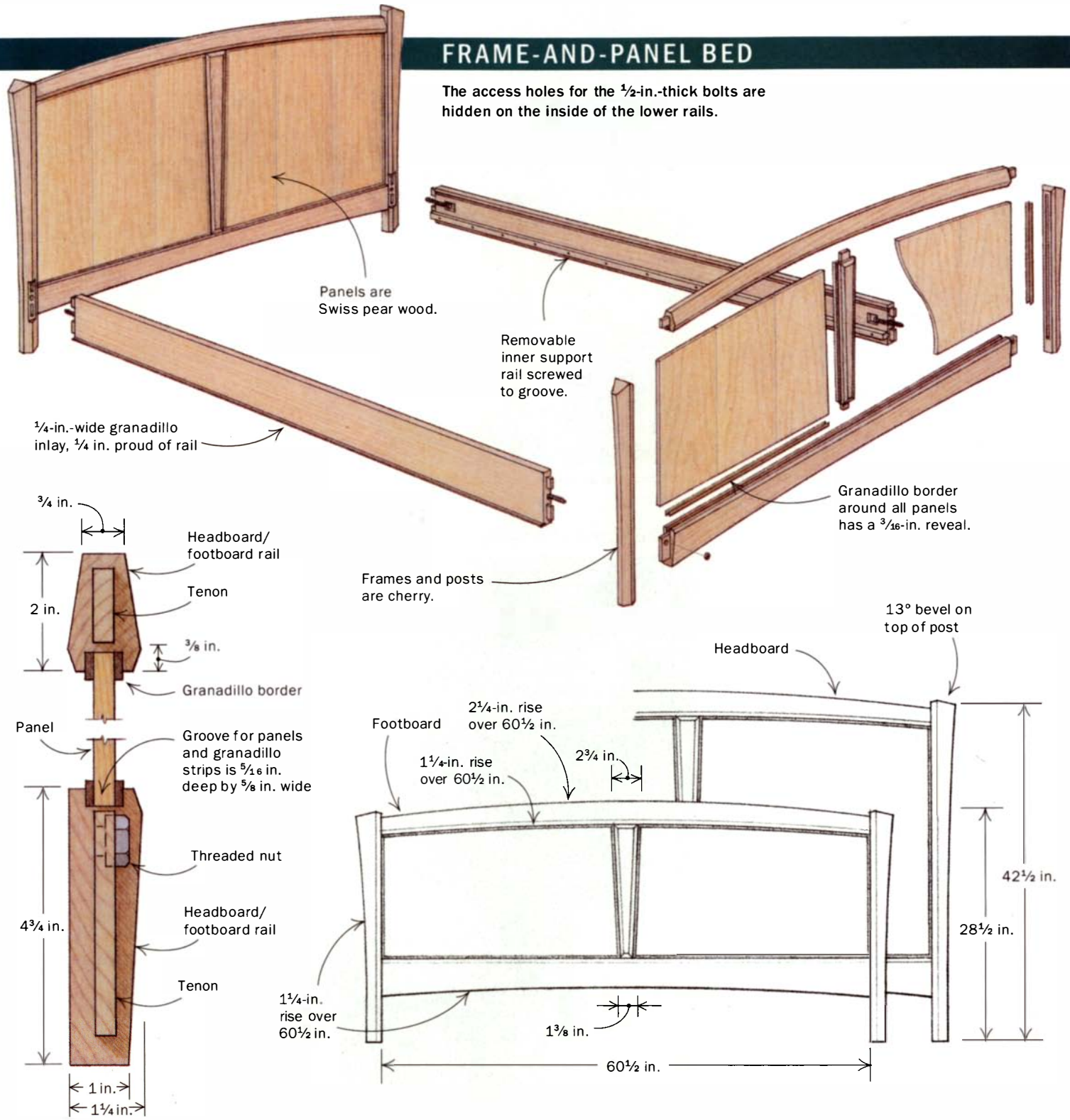
Mark the outside facet of each post using a template and bandsaw the waste (see the middle photo above). Fair the curve by attaching the same template and trimming the post with a pattern-cutting bit, as shown in the right photo above (screw the template to the waste portions of the post). Remove the template and draw the last set of layout lines on the outside face.

Use a router with a 45° bearing-guided bit to remove as much stock as possible

Photos: Facing page: Ira Schrank; all others: Anatole Burkin

FRAME-AND-PANEL BED

The access holes for the ½-in.-thick bolts are hidden on the inside of the lower rails.



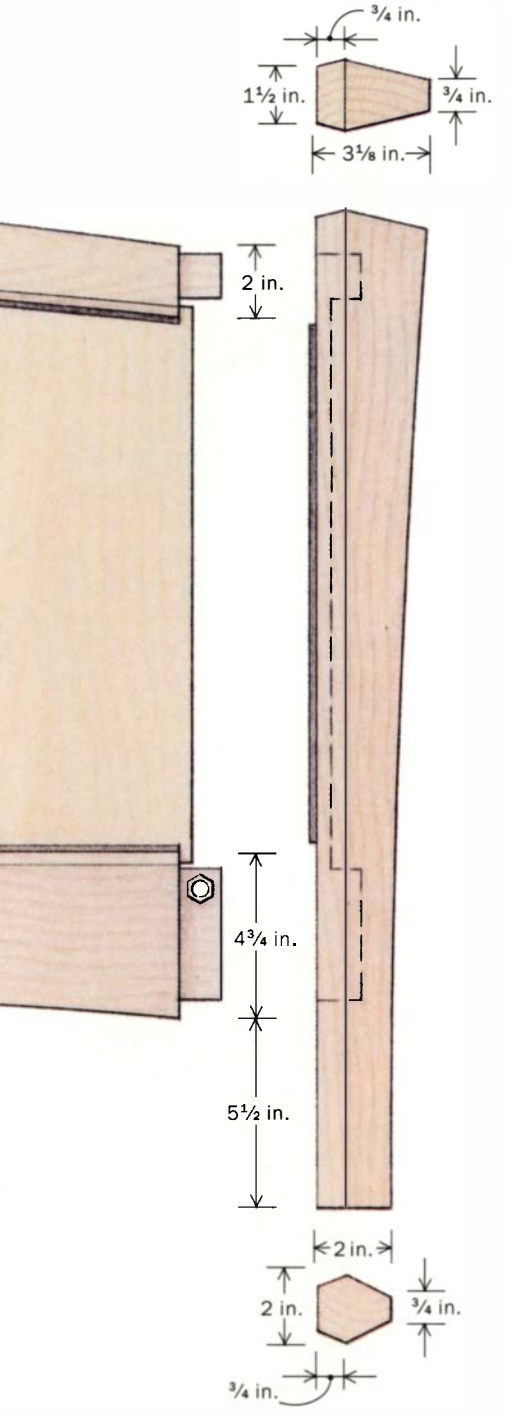
from the corners of the post. Next, use an angle grinder with a 24-grit sanding disc to rough in the shape (see the bottom photo on p. 75) on the two facets of each post that curve and twist. Use long, fluid motions with this tool and don't stop in midcut. Otherwise, you end up with flat spots that break up the curve. With a light touch, you can grind smoothly and get very close to the layout lines. It takes some practice to get a feel for shaping with a grinder, and I fine-tuned my skills using scrap stock.

Clean up the post—A No. 50 Nicholson pattern-maker's rasp is used to fine-tune the shape. A rasp is small enough that you can follow the twist on each post.

To find high and low spots left by the grinder, draw diagonal pencil lines across the faces of each post. The rasp works best cutting in short, diagonal strokes. When the deep scratches left by the 24-grit disc are gone and the curves of the posts look fair, move on to a hand scraper, paying close attention to the layout lines. Hold the post up to a light to see how it's coming along. When you run into domed sections, remove material using long, fluid motions.

Clean up further using a small sanding block. I prefer to use a small piece of medi-

Drawings: Vince Babak



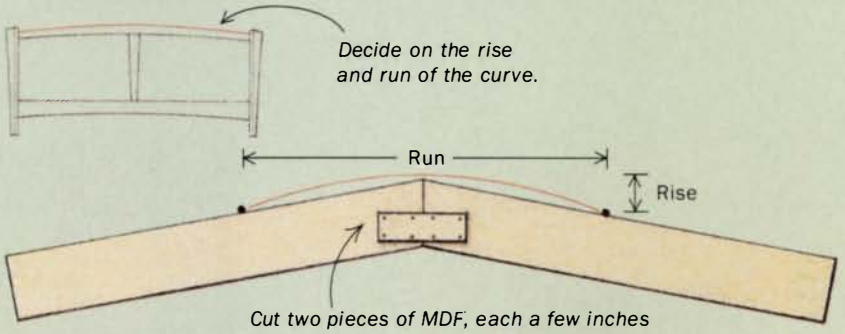
um-density fiberboard (MDF) with cork glued onto the face. It's small enough (approximately 1 in. by 1½ in.) to maneuver along the changing curves of the post. A large sanding block tends to straighten the curves instead of following them.

Start with 180-grit sandpaper and follow up with 220 grit. If you find rasp marks on the surface, go back to the scraper, which works faster than sandpaper. Finally, use a

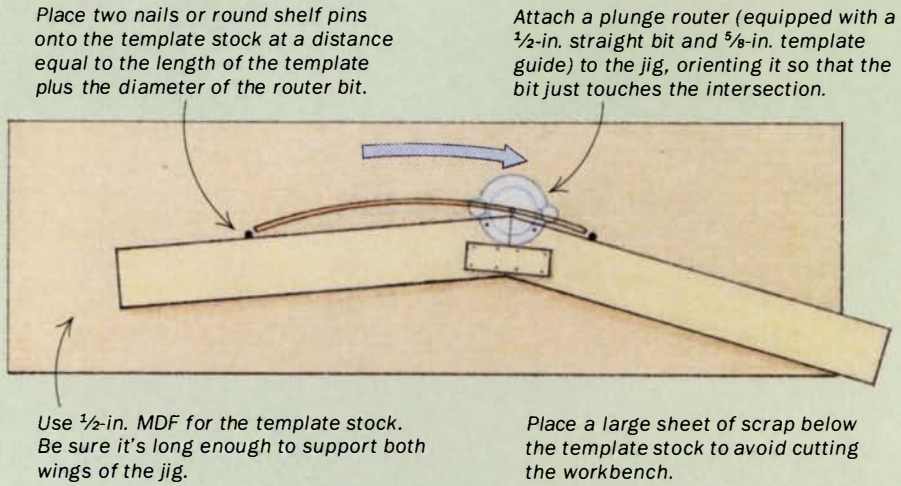
Routing curved templates

You don't have to figure out the radius of a curve as long as you know the rise and run. With this method, you can make perfect templates for curved work, especially wide-radius curves. Because the method involves a trapped cut, there is some danger that the router might want to find its own path, so be prepared to turn the tool off immediately if it starts getting away from you.—*D.F.*

Make the jig



Cut the template

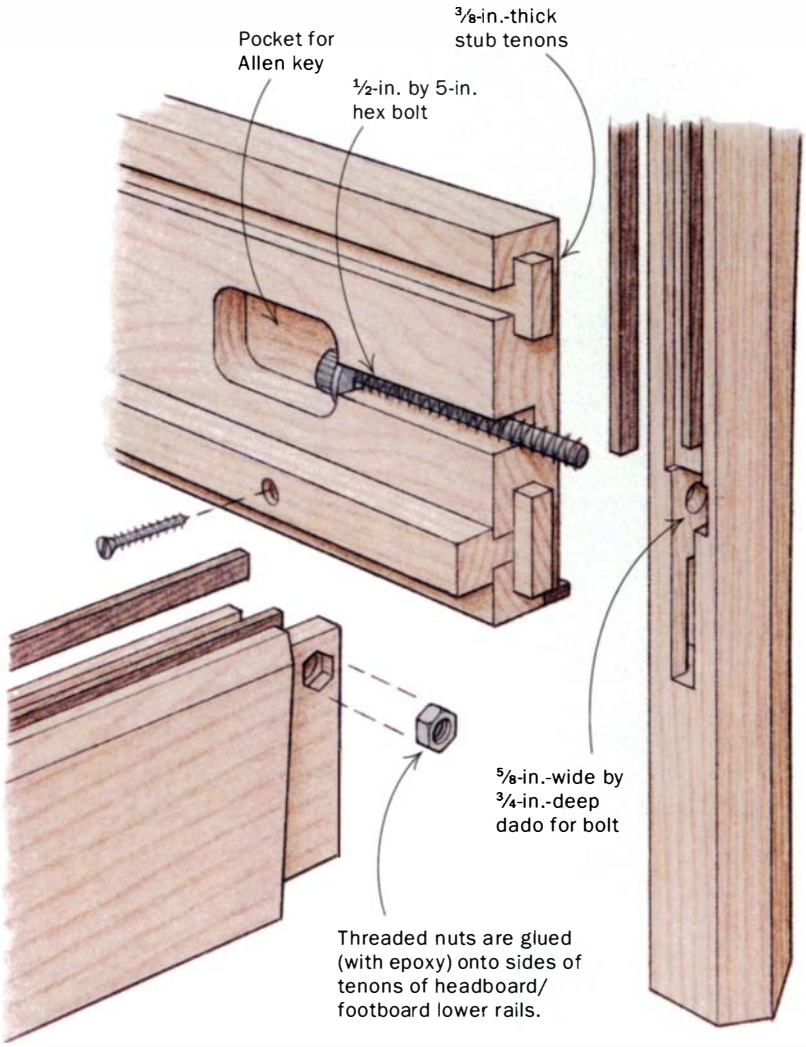


Set the jig down and push it up against the pins. *Turn the router on, plunge in about ⅛ in. and push the jig to the right, keeping it in contact with the pins. Repeat, taking deeper cuts until you cut through the template stock. Don't let the router bit contact the pins. Finish cutting out the template on a bandsaw.*

Hidden bed-rail-to-post connection

Decorative caps made to cover bolt holes in bedposts work fine, especially when used on traditional-looking furniture. But I didn't want a cap to detract from the fluid shape of the posts of this bed. A friend, Mike Laine, showed me how to get a strong joint using mortise and tenons coupled with captured nuts and bolts. The joint is secure and leaves no trace of its mechanics once the bed has been assembled and a mattress or futon installed.

Refer to the drawing on p. 76 for the size and location of the joinery, which is cut while the stock is still square. Clamp and dry-fit the posts to the lower rails of the headboard and footboard, one at a time. Then, on the drill press, align a drill bit with the already drilled bolt hole in the post and drill through the tenon of the rail, being careful not to drill too deeply.



Remove the lower rail and thread the bolt through the hole and into the nut. Scribe the outline of the nut onto the tenon. The mortise for the nut captures only half its thickness; any more would weaken the tenon. To make room for the protruding half of the nut, enlarge the mortise in the bedpost around the nut with a small router and finish up with a chisel.

The bolt is housed in a dado cut into the lower rails, centered between the two tenons. Mortise around the head to give you enough clearance to reach in with a hex wrench and cinch everything down. Check the joints for fit, then epoxy the nuts in place, being careful not to get any glue on the threads.—*D.F.*

small piece of folded 220-grit paper and hand-sand the surface with the grain. Hand-sanding is important because your fingers will sense any high or low spots. Lastly, break all of the edges with a rigid sanding block and 220-grit paper, just enough to make the edges inviting to touch yet still crisp to the eye.

Cut the top of each post on the chopsaw, then sand it smooth with a rigid (no cork) sanding block, which will bring out the figure of the end grain.

Headboard and footboard also have six-sided parts

The upper and lower rails for the headboard and footboard are curved and have six sides to match the posts (see the drawings on p. 76). The procedure for building the headboard and footboard is similar to the posts. First, cut the joints while the stock is still square. (The only exceptions are the center stiles. Take their measurements off the frames of the headboard and footboard after dry-fitting them. Cut the mortises for the center stiles by hand.) Then mark the six-sided profiles on the shoulders of all of the tenons.

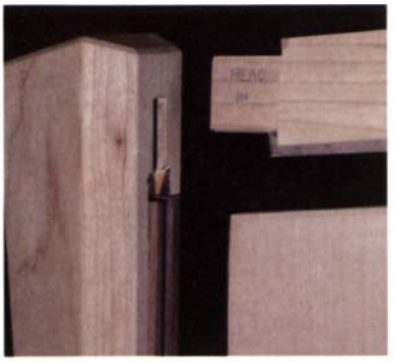
As you did with the posts, make a template to help lay out and cut the curves of the headboard and footboard rails. Mark the curves using the template, then rough-cut the parts on the bandsaw. Finish up by attaching the template to the stock and use a pattern-cutting bit and router. Before shaping the facets of the rails, cut the slots for the accent strips and panels using a router with a slot-cutting bit.

The same methods and tools used on the posts are used to mark, cut and shape the rails. The center divider is cut like the rails; the tenons are cut first on the tablesaw. Then the tapered angles are cut; the bevels are shaped with a grinder.

A granadillo border separates frame from panel—The panels in this bed are made of Swiss pear wood, and the frame, posts and rails are made of cherry. Although in time the cherry will darken more than the pear wood, the contrast in color between them, after milling, is subtle. To separate the two woods visually, the frame is inlaid with strips of granadillo, a deep, rich, purple-brown wood. The strips of granadillo surround each panel. A strip of granadillo is also inlaid along the bottom edge of the bed's rails.

INLAY ADDS CONTRAST

Degree of separation. *Granadillo provides contrast and separation between the similarly toned cherry and pear wood.*



Before the joint is assembled. *The granadillo strips are glued into the grooves for the panels using a battery of small spring clamps.*

Mill the granadillo strips wide and long. (Rip all of the granadillo straight; the strips will bend to conform to the curve of the rails.) Then clamp up the rails and stiles and take your measurements for the granadillo. Cut the strips to size, then glue them in place using lots of spring clamps. Where the strips intersect, use a butt joint.

Take measurements for the panels while the headboard and footboard are clamped together. Then transfer these measurements onto ¼-in.-thick particleboard or plywood and cut these out on the bandsaw. Because of the number of curves, there's usually a bit of tweaking to get everything right. Once you have a good fit, use the ¼-in.-thick panels as templates for the real thing.

Movable inner rail accommodates two types of mattresses. *Placed in the lower groove, the rail is positioned for a box-spring and mattress set. In the upper slot, the rail accepts a futon (using slats for support).*

The pear-wood panels are resawn and slip-matched. Leave about ⅛ in. of extra space for every 12 in. of panel to allow for expansion and contraction of the wood. When gluing up the frame, put a dab of glue in the center of each rail's groove to keep the panel centered.

This bed frame is compatible with a futon or a box-spring and mattress set. To allow for that, cut two dadoes—one high, one low—on each long rail. For the futon, two removable inner rails are screwed to the upper grooves. (You'll also need slats to support the futon.) For use with a traditional mattress set, the inner rails are attached to the lower groove, and the box spring rests on the inner rails.

Finish with hand-rubbed oil

I used a low-gloss tung oil to finish the bed, applying three coats over three days. When applying the first coat, the wood will be thirsty and absorb a lot of finish. Apply a liberal amount of oil to one section at a time, such as one panel. Rub off the excess after a couple of minutes and move on to another section. After a day, go over the entire piece with a green 3M scrub pad, lightly rubbing off raised grain and built-up oil.

On the second day, apply a thin coat of oil, again working in small sections, and wipe with a clean cloth after a few minutes. For a splotch-free finish, remove the excess before it begins to dry and get gummy. On the third day, apply a final coat, the same way as the second, but use even less oil. When using oil, less is better. □

David Fay builds custom furniture in Oakland, Calif.

Beech: A Tough Nut Worth Cracking

One of the most unruly of woods is also among the most useful

BY JON ARNO

The joy of working with beech lies in the game the wood presents—the tantalizing challenge of how to tap its enticing qualities while avoiding its devastating shortcomings.

Beech's assets are many. Close grained, it machines and turns well with minimal tearout, and it takes finish beautifully. Its hardness and ability to absorb shock make it the wood of choice for many workbenches, tool handles and mallets. Perhaps beech's greatest attribute is the ease with which it can be steam-bent. Beech has astonishing plasticity when exposed to heat and moisture. Once steamed, it will conform to jigs that demand surprisingly tight bends without failing, and once dry, it experiences relatively little rebound.

But then there is the evil side of beech: It is extremely unstable. An average plank of beech can shrink 17.2% on its way from green to oven dry, one of the highest rates of shrinkage among domestic hardwoods. Beech's tendency to swell and shrink with changes in humidity is nastily compounded by the enormous differential between the wood's radial and tangential shrinkage. This differential makes beech one of the most difficult woods to season without warping and to keep flat once it is dry. Most other woods with comparable shrinkage factors are rendered useless by their propensity to check and split. Fortunately, beech is spared this fate by its abundant medullary rays, which tend to hold it together. One final frailty of beech is its poor durability when exposed to the elements.

Best uses of beech

Beech is a high-contrast species—one with a great gulf between its outstanding virtues as one of our most workable woods and its horrendous shortcomings in terms of stability and durability.

Beech's deficiencies haven't kept it from attaining a place among the most useful of

Bark parchment. *Because beech is tight grained and good for holding detail, slabs of it were once used as writing tablets; centuries later, the same virtues led early printers to use type cut from beech. But the most prevalent link between writing and the beech tree must be the one that occurs on the bark at the point of a penknife.*

Grand foliage. *Notable for its skin-smooth gray bark and powerful trunk, American beech, Fagus grandifolia, attains a magnificent shape when planted in the open. Its large, spreading branches carry acres of small, lance-shaped leaves.*

Beech bends beautifully. *A Thonet chair made in the 1860s illustrates the pliability and durability of steam-bent beech. By utilizing only small-diameter parts, the chair also minimizes the effects of beech's excessive seasonal movement.*

For planes and benches, beech is best. *Beech is long wearing, dense, shock resistant and abundant, qualities that have made it the enduring wood of choice for the majority of wooden planes and workbenches.*

woods. And we can learn how best to employ beech by studying how it has been used by woodworkers of the past.

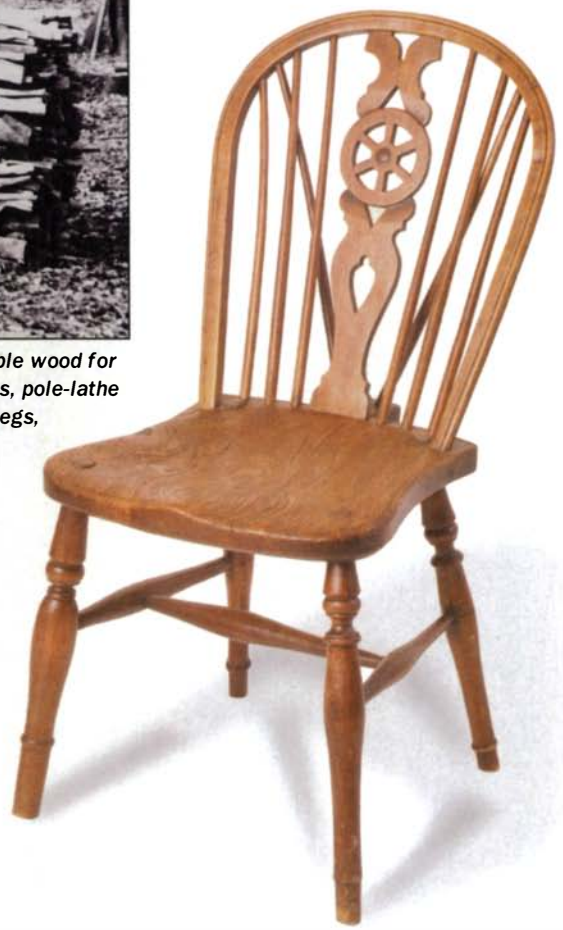
In period furniture, beech is seldom seen as the primary wood in tables or case goods, where its lack of stability would be devastating. And in exterior applications, either it was seldom used or has not survived. However, it is found in abundance as turning stock, as glue blocks in the framing of upholstered furniture and as bentwood parts in chairs, where it is excellent both for steam-bending and bent lamination. Thomas Chippendale, although addicted to mahogany in fashioning the rococo style of furniture for which we know him best, used beech in special applications, for fretwork panels in his Oriental styles and as core stock for primitive "plywood" slats, where resistance to splitting was a key feature.

Fortunes have been made on the bending capacity of beech. The Thonet chair company (see the photos at left) built its factories in the beech forests of Austria and Eastern Europe and then built an international bentwood chair-manufacturing empire on the strength and pliability of the wood the company harvested there.

Beech has been used extensively for turned or shaped objects, especially one-piece items—such as tool handles, wooden knobs and pulls—that are free to deform a bit without causing functional problems. Beech has also played a major role in the production of mundane yet essential things such as clothespins, kitchen utensils and scrub-brush backs. Its use in food containers and tight cooperage peaked in the late 19th century, but even today one major American brewery touts the contribution to flavor made by the beech-wood vats used to age its beer. Beech's low tannin content apparently puts a mellow finish on the brew. That low tannin content is also important to woodworkers: On the positive side, the low tannin content makes beech less likely to corrode iron fasteners and hardware; on the negative side, low tannin content contributes to beech's poor durability in the weather.

Perhaps the most ingenious exploitation of beech can be seen in early examples of Windsor chairs. Thousands of these chairs were

Photos: Jonathan Binzen, except where noted



Wisdom of the Windsor makers. *Windsor chair makers, savvy at selecting the most suitable wood for each part of a chair, chose beech for turned parts. At the height of the popularity of Windsors, pole-lathe turners in Buckinghamshire, England, bivouacked in the beech woods and turned stacks of legs, stretchers and spindles for the many chair makers in High Wycombe (inset). A wheel in the back splat and a fan tail supporting angled spindles at the back of the seat typify the High Wycombe Windsor style (right).*

churned out in the 1800s by bodgers who worked literally out in the forests around High Wycombe, about 25 miles northwest of London, where beech was once plentiful. The fine texture and diffuse-porous anatomy of beech made it easy to turn into spindles on primitive lathes. In this role, even the wood's extreme tendency to shrink and swell proved to be an advantage, because the spindles could be thoroughly seasoned and then tapped into the more moist, steam-bent backs and armrests. The spindles swelled while the backs and armrests shrank, providing extremely tight joints without the need for adhesives. While many of these rugged and inexpensive chairs were sold unfinished and referred to as "white Wycombes," the wood's tight-grained, smooth surface made paint finishes easy to apply and equally popular.

One application that has me somewhat puzzled is the prevalent use of beech in making wooden plane bodies. Before the advent of the modern router, a set of molding planes was a necessity in cabinetmaking and finish carpentry. Possession of such a set was a source of pride to the accomplished 19th-century woodworker, and these pretty, little beech-bodied planes were often themselves works of art. Beech's workability and formidable resistance to wear make it a plausible candidate in this role, but one would think its notorious instability would pose a serious negative.

Using small parts is key to managing the movement in a wood like beech. A good example of this approach is seen in flooring. The machinability and resistance to wear that make beech a superior wood for plane bodies also make it suitable for flooring. But when used as flooring, beech requires a design that minimizes the risks inherent in its high shrinkage and instability. The answer is parquet squares, small pieces where the joinery allows the wood to move in almost unnoticeable increments. To me, examples of ingenuity such as this showcase the essence of beech and its redeeming grace.

It is no coincidence that the words beech and book stem from the same Sanskrit origin. Not only does the utility of beech wind through history, but the wood is also an inseparable part of history's recording. Norse tribes used beech bark as crude writing pa-

Photos (clockwise from top): Wycombe Local History and Chair Museum; University of Reading, Museum of English Rural Life; courtesy of Dr. B.D. Cotton Collection

per, and more indelible records called runes were sometimes carved in slabs of beech. And in the 15th century, Gutenberg's first bible was printed using type carved in beech blocks.

Beech is oak's mellow cousin

Although it boasts only 10 species worldwide, beech (genus *Fagus*) lends its name to the ancient and enormous Fagaceae family, which also includes the mighty oaks (genus *Quercus*), with their more than 450 species. Beech is comparable in density to northern red oak, *Q. rubra*, and, like red oak, beech has heartwood with a warm, pinkish tan color that is especially attractive and seems to darken noticeably when varnish or even crystal-clear lacquer is applied. Beech's close relationship to the oaks is also betrayed by its abundant and clearly visible rays. Although the rays in beech are much smaller than those in white oak and even diminutive in comparison to those in red oak, they are exceptionally plentiful, dark and distinct and provide a sure way to identify the wood. While most of our oaks possess an extremely loud, ring-porous figure, beech is diffuse-porous and so mellow that it would be downright bland in appearance were it not for the rays. (In ring-porous woods, the larger, sap-carrying vessel cells are concentrated in the earlywood; in diffuse-porous woods, vessel cells are evenly distributed throughout the wood.)

Being diffuse-porous conveys to beech a number of benefits in terms of workability. Beech tends to hold details when shaped, and it turns with far less tearout than do the oaks. Also, being substantially finer textured than the oaks, beech requires no fillers to achieve a smooth finish. Although it is certainly not in a class with extremely fine-textured woods such as maple or even cherry in terms of ease of finishing, several coats of a heavy-bodied varnish will inundate its relatively modest porosity and can then be rubbed out with fine-grit abrasives to achieve a glass-smooth surface.

Which way to the beech?

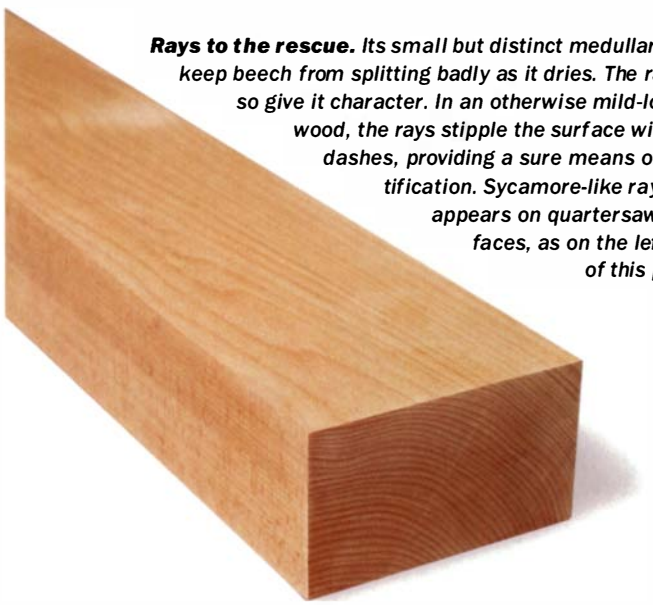
When the first Europeans arrived, America was rich with beech groves. Although there are still plenty of beech trees, most of the old, dark, gloomy groves are gone.

Only one species of beech, *F. grandifolia*, is native to North America, but it is divided into at least four relatively well-defined races—the gray beech that grows from Wisconsin to Nova Scotia; the red beech throughout most of Appalachia and the central Midwest; the white beech along the coastal plain from Louisiana to North Carolina; and the Mexican beech in the mountains northwest of Vera Cruz. Growing conditions have an impact on the working characteristics of these woods. The white beech of the South grows faster and tends to be slightly softer and coarser textured than red or gray beech, while the latter two generally produce more attractive and darker rust-brown heartwood. All North American beech trees make slow progress in converting sapwood to heartwood, and even the best logs contain large quantities of rather drab creamy sapwood. The sapwood is often discolored by fungus, giving it a dirty gray hue. For all of these reasons, the appearance qualities of beech are highly variable, and there is no substitute for firsthand examination of the stock in selecting choice material for special projects.

Drawing: Mark Sant'Angelo

If you buy a Swedish workbench or an Austrian bentwood chair, it will most likely be made of European beech, *F. sylvatica*. The European tree is a different species from our native beech, but there is hardly a lick of difference between the two. European beech also varies based on climate, with wood from Central Europe tending to be softer than that from England and Scandinavia.

Although mature stands of our American beech were virtually wiped out, beech is certainly not scarce today. The current U.S. reserve of beech sawtimber exceeds 21 billion bd. ft., making it about twice as plentiful as cherry. The problem experienced by many woodworkers in sourcing beech is that only a trickle of the overall harvest makes its way to the retail market in the form of lumber. High-grade stock tends to be absorbed by flooring manufacturers and other industrial users while the low-grade material is sponged up by crate and pallet producers. When it is available, however, beech is relatively inexpensive when compared with similar grades of other, more popular cabinetwoods.



Rays to the rescue. *Its small but distinct medullary rays keep beech from splitting badly as it dries. The rays also give it character. In an otherwise mild-looking wood, the rays stipple the surface with tiny dashes, providing a sure means of identification. Sycamore-like ray fleck appears on quartersawn surfaces, as on the left side of this plank.*

Don't dry this at home

Ordinarily, on other species with similar supply patterns, I'm a strong advocate of harvesting your own and air-drying it. Beech, however, is a noteworthy exception. The incredible drying stress this species experiences makes it one of the most difficult of our native woods to air-dry. If you can't find kiln-dried beech at a local hardwood retailer, perhaps the most sensible option is to visit the nearest sawmill with commercial kiln-drying capability and expertise. Although this sometimes means buying relatively large minimum quantities, it offers two important advantages. First, it allows the opportunity to examine the stock firsthand for color and figure. And second, it provides at least some assurance that in the hands of an expert kiln operator, a portion of this species' drying stress has been cooked out of the boards you buy. □

Jon Arno is a frequent contributor to Fine Woodworking. *He lives in Troy, Mich.*

Dovetail Jig Review

Router jigs have their place, but don't expect them to duplicate hand-cut joints

BY GARY ROGOWSKI

To the uninitiated, dovetail joints are intimidating. That's why dovetail jigs are so popular. Seems like every few years someone comes out with a new one. And lots of woodworkers buy them, hoping to become master joiners with the flick of a router switch. I imagine many of these jigs get tossed into a corner after a brief tussle. Most will cut snug-fitting joints. But some are difficult to set up, either because of poor design or sheer complexity. And if you run out of patience with these jigs, your joints will fit poorly.

True, making hand-cut dovetails takes skill, and unlike riding a bicycle, you do forget, or at least lose proficiency, if you don't do it regularly. Router jigs—a few of them, anyway—can simplify the task. But a router jig won't give you the flexibility and look of hand-cut dovetails. There's not a router bit out there capable of cutting the classic skinny pin hewn by a dovetail saw and chisel.

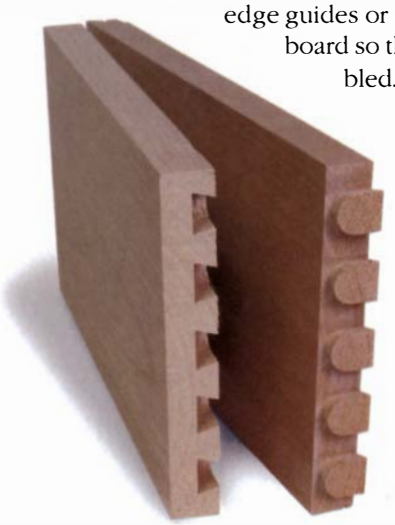
I'm no purist and realize that jigs have their place. Many jigs will allow you to cut dovetails faster than you could using hand tools. I tried eight commonly available jigs to see how they stacked up to

one another. They can be classified into three groups: Jigs that cut only half-blind dovetails; jigs that cut only through-dovetails; and combination jigs that, depending on the model, may cut half-blind, through-, sliding and variably spaced through-dovetails.

Half-blind jigs cut both pins and tails at once

Half-blind dovetails are visible from one side (see the photo below). They're commonly used for drawer joinery when you don't want the end grain of the tails to show in the drawer front. Half-blind dovetail jigs all work in a similar fashion: A matching pair of pin and tail boards is cut simultaneously. Spacing is not variable.

Setup for each jig is the same: Mating pin and tail boards are both clamped in the jig at 90° to each other. The outside faces of the boards are placed down, or facing the jig. Locating pins, edge guides or stop bars offset the edges of each board so that the joint lines up when assembled. The jig's template is placed on the boards and secured. To cut the joint, use a router equipped with a template guide bushing and a dovetail bit. By changing the position of the edge guides, you can also cut dovetails onto drawer fronts with rabbets for overlay construction.



One bit cuts both pins and tails. *Half-blind jigs leave symmetrical rows of dovetails with rounded edges of pins, which won't show once the joint has been assembled. Some combination jigs also cut these joints.*

Getting a good fit with half-blind jigs depends on setting the bit's depth precisely through trial and error, which can be time-consuming. If you set the bit for too shallow a cut, the tails and pins will be too large. If the bit is set too deeply, the joint will be so tight that it won't fit together. To speed the setup, mark your depth settings on a scrap of wood.

Porter-Cable 4112—Assembling this Porter-Cable jig takes some time, but it's a fairly easy job because of the decent instructions. Each edge guide is attached with only a small screw and a lock knob (see the left photo at right). When the knob is loose, the edge guide can pivot, especially if you're prone to banging your boards into place on a jig.

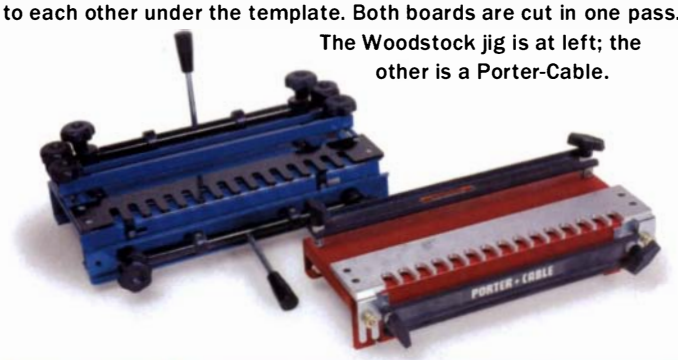
The clamp bars are sheet metal, and while they hold fine when new, I imagine they'll get distorted over time. I own an old Stanley dovetail jig of similar design, and it now requires an extra clamp to hold stock securely. Because the lock knobs screw on, it takes time to lock and unlock boards, but the joints come out fine.

Woodstock—The Woodstock jig is easy to assemble out of the box, but after that, things go downhill. You need to do a ludicrous amount of math to set the finger, or slot, template properly, and adjusting the template is difficult. The placement of a vertical board is also difficult because the finger template isn't easily removed and stays in the way. This template can also deflect, causing the router base to bind on it when cutting, possibly the reason for the poor results I achieved using it. The jig also has too many lock knobs located too close together (see the far right photo), making

HALF-BLIND DOVETAIL JIGS

Half-blind dovetail jigs all work the same way. A pair of adjoining boards, outside faces against the jig, are clamped at right angles to each other under the template. Both boards are cut in one pass.

The Woodstock jig is at left; the other is a Porter-Cable.



MODEL	WOODSTOCK (360-734-3482)	PORTER-CABLE (800-487-8665)
MAXIMUM WIDTH	12 in.	12 in.
EASE OF SETUP	Poor	Fair
MANUAL	Fair; fence-adjustment instructions read like a math lesson	Good; brief but clear
COST	$70 (bit and template guide bushing included)	$100 (bit and template guide bushing not included)
COMMENTS	Overly complicated to set up; awkward to use	Fine for occasional use

Adjusting the Porter-Cable's edge guide. *To align joints, boards are offset to one another using edge guides. These guides are light duty; a board banged against a guide may knock it out of adjustment, requiring you to repeat the initial setup.*

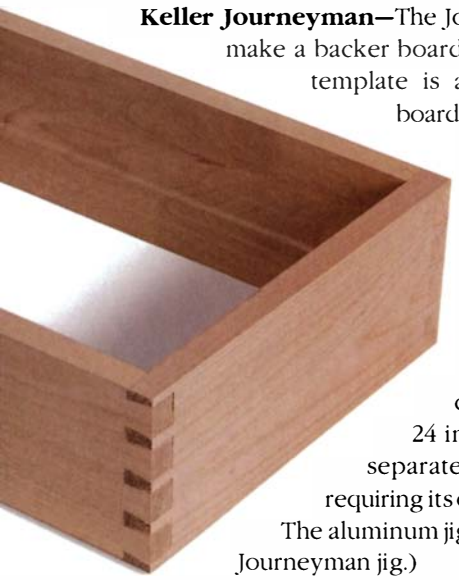
Design makes it difficult to use the Woodstock jig. *Lock knobs spaced too close together make the Woodstock jig awkward to use.*

Photos: Anatole Burkin, except where noted

it difficult to turn one without banging your fingers on another. Plus I have a little trouble trusting a jig whose instructions warn against overtightening plastic parts, lest they crack. The woodshop is not a place for the meek.

Through-dovetail jigs cut pins and tails separately

On through-dovetail jigs, stock is mounted vertically under the template, which has separate fingers and bits for cutting tails and pins. The template mounts onto a backer board whose placement determines the fit of the joint, unlike a half-blind jig whose bit depth determines the fit. On through-dovetail jigs, joints are cut using a bearing-guided bit. Because the pins are cut at an angle (using a straight bit), moving the backer board in or out will produce pins of different sizes. The bit depth determines only whether or not the joint comes out with flush ends.

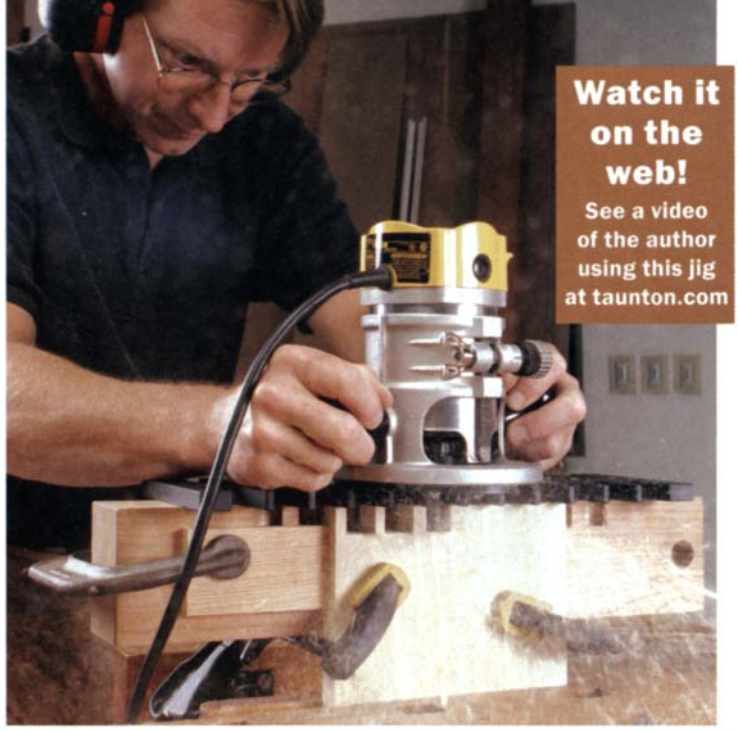


Keller Journeyman—The Journeyman jig requires you to make a backer board, to which the phenolic-resin template is attached. Milling the backer board to the proper size and adjusting it are simple, taking about an hour. The 15-in.-wide Journeyman template has both the tail and pin fingers, so you mount only one backer board. (The large, heavy-duty jigs, made of anodized aluminum, come in three sizes: 16 in., 24 in. and 36 in. These jigs all use separate tail and pin templates, each requiring its own shop-made backer board. The aluminum jigs operate the same way as the Journeyman jig.)

The pin template has angled fingers, which are cut with a flush-trimming bit. If the backer board is set too far forward, the pins will be too small and the joint will be loose. If the board's set too far back, the pins will be too large to fit with the tails. Setting the backer board right is the key to this jig. But once set properly—and as long as you don't drop it on the shop floor—the jig is always ready to go and cuts perfect-fitting dovetails.

The Journeyman jig is easy to use (see the right photo above). First, mark the center on the tail board and center this line on one of the fingers of the tail template. Figuring out the bit depth is easy: Simply add the thickness of the template (½ in.) to the thickness of the stock. It's a good idea to clamp a piece of wood to act as a stop so that the jig automatically indexes subsequent cuts. After routing the tails, place the pin board in a vise, lay the tail board on top and use the tails as a template to mark (use a knife or sharp pencil) the location for the pins. Then mate the pin board with the template, using the layout marks for registration. By using registration marks, you can also move the jig from side to side and handle stock wider than the jig. And you can also cut variably spaced through-dovetails simply by moving the jig over.

Katie Jig—The Katie Jig comes with two backer boards fitted to an aluminum extrusion, which serves as the track for the template's fingers (see the photo at right). The finger spacing can be adjusted.

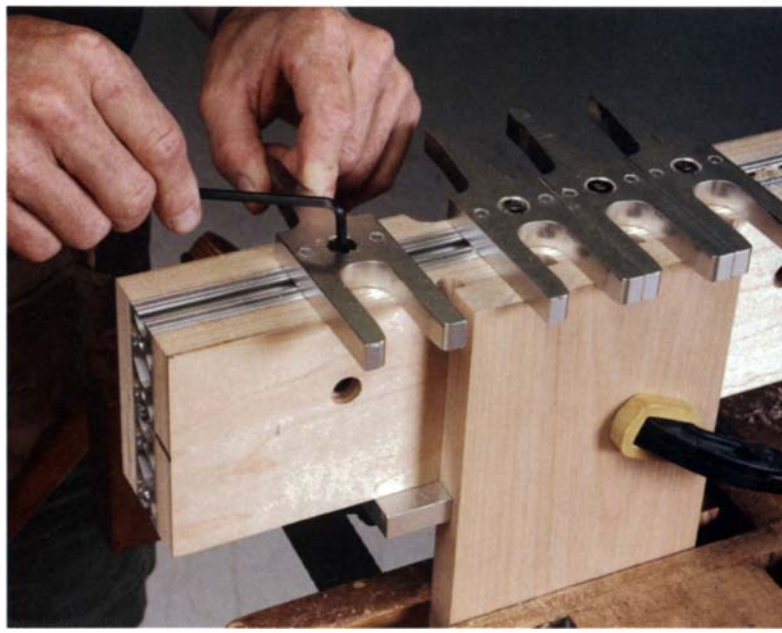


Cutting through-dovetails on the Keller Journeyman. *A stop block (left) is clamped to the backer board of the jig. Stock is clamped vertically under the template and is cut using a bearing-guided router bit.*

Each finger has two sides—one for cutting pins and the other for tails. Stop blocks slide into the bottom of the jig and can be locked in place. It doesn't matter whether you cut the tails or pins first because the stop blocks put you in the right spot for both cuts.

The Katie Jig is remarkably simple to set up and use, and the results are good. There is no fudge time because the jig has been adjusted at the factory. Like the Journeyman, you can slide the jig over when cutting stock wider than the template's 12 in.

One thing about the fingers concerns me. When loosened (via set screws), the fingers have a bit of fore and aft play in the sliding



The Katie Jig has an adjustable template. *The template's fingers are attached to a sliding aluminum extrusion, which allows you to adjust the spacing of dovetails.*

THROUGH-DOVETAIL JIGS

Pins and tails are cut separately with through jigs. Stots Dovetail Template Master (left), is just that: a template used to make a working jig (the MDF template shown); the Katie Jig comes with a backer board and stop blocks; the Keller Journeyman and Keller 1601, both of which operate on the same principle, require you to make your own backer board and stop blocks.

Using the Stots jig is slow work. *The router must come to a complete stop before moving on to the next pin or tail cut.*

MODEL	STOTS DOVETAIL MASTER TEMPLATE (502-329-0737)	KATIE JIG (317-881-8601)	KELLER JOURNEYMAN (800-995-2456)
MAXIMUM WIDTH	6 in.*	12 in.*	15 in.*
EASE OF SETUP	Fair	Good	Fair
MANUAL	Good but diminutive graphics	Good, clear instructions; helpful graphics	Fair; graphics are crude but adequate
COST	$40 (template only)	$250 (two bits and adjustable stops included)	$140 (two bits included)
COMMENTS	Tedious to copy template; slow to use	Simplest to set up and use	Easy to use; stays in adjustment

*Jig can cut wider stock.

rack. How the fingers are positioned can affect the tightness of the joint. I did, however, get good results with the jig.

In use, the router bit cuts into the backer board, which helps prevent tearout of the joint (same as on the Journeyman jig). Over time, repositioning the fingers will result in a worn-out backer board that doesn't offer support against tearout. You can either buy a new backer board from the manufacturer or mill your own.

The dovetail bits that come with the Katie Jig are so tall and wide that when using stock thinner than 1 in. your tails look a bit oversized. Make drawers out of ½-in. stock, and the joints look very oversized. The other problem with using thin stock is that the tails and pins will be proud (up to about ¼ in.) of the joint, and they have to be planed or sanded flush.

Stots Dovetail Template Master—The Stots jig isn't really a jig at all: It's a master template. You use the Stots jig to pattern-rout a working template. Why? The foreword in the manual explains that the problem with through-dovetail jigs is "not if you cut your jig, but rather when." Of course, this applies equally to the Stots jig, which you make out of plywood, medium-density fiberboard (MDF), or another material that's easily cut and also easily marred.

Working templates can be ganged together, and you can make them as long as you want. But pattern-routing each template and making a backer board take a couple of hours. Using the jig is time-consuming, too, because for each pin or tail, you have to insert the router bit into a slot, cut it, then turn it off before lifting the router up and out of the slot. Yes, it works, but I would recommend buying any other jig and spending your time more wisely.

Combination jigs give you versatility

Combination jigs are remarkable in that they all try to do so much in such a small package. Their designers should be given awards for cleverness, and the writers of some manuals should be given a caning behind the woodshed. The KISS (keep it simple, stupid) principle should always be the guide when designing dovetail jigs.

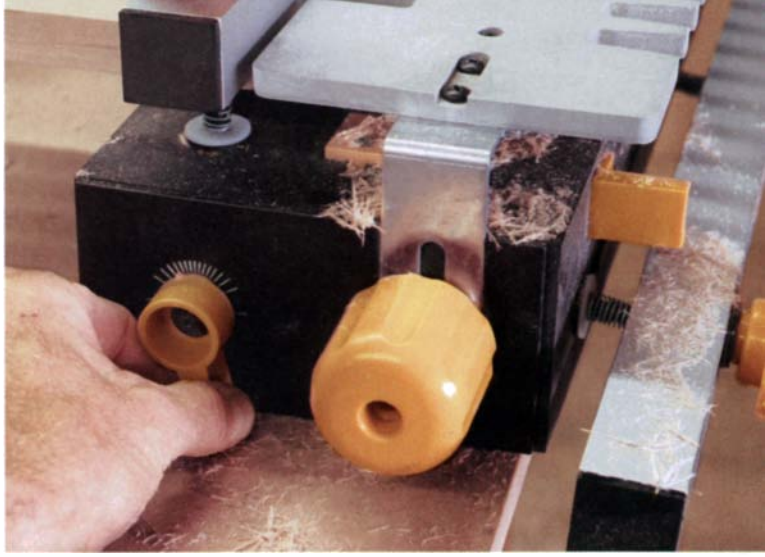
Essentially, if you want to cut adjustable through-dovetails, you should learn to cut them by hand. You'll save lots of money and get a sense of satisfaction that none of these jigs can give you. On the other hand, if you have to produce a lot of joints, with practice you can learn to use these jigs efficiently and perhaps save some time.

Combination jigs can cut half-blind and through-dovetails, and some do even more, including variably spaced through-dovetails, box joints and sliding dovetails. For half-blind joints, the setup usually requires only one template, a template guide and a dovetail bit. The exception is the adjustable half-blind Leigh jig, which uses both sides of its two-sided template, two setups and one bit. Through- or variably spaced dovetail joints require two templates (or a two-sided template) and two bits.

Porter-Cable Omnijig—The manual for the Omnijig was not written by a former Microsoft engineer. It's short and readable, and it makes sense. The Omnijig, made of thick cast aluminum and steel, is by far the heaviest of the jigs and is fit for industrial use. It's the best combination machine for cutting half-blind dovetails. The sturdy, eccentrically mounted clamping bar is a huge improvement over the flimsy clamps found on most half-blind jigs. The finger template is made of cast aluminum. Sturdy fasteners keep jig settings from being knocked out of whack (see the left photo on the facing page).

The Omnijig can also cut adjustable through-dovetails. As with the other through-dovetail jigs, the tails and pins are cut with the stock clamped vertically. A backer board of scrap wood is clamped into the jig to prevent tearout and damage to the jig's base.

The Omnijig's adjustable through-dovetail template is unusual in that the fingers for both pins and tails are on the same side. All you have to do is move the template spacers in or out to reposition the template for cutting either tails or pins. The fingers can also be moved left or right to make variably spaced dovetails. Once set for a tail cut, the fingers will automatically make the pin cut to match. Make sure you don't space the fingers too far apart; otherwise, you may lose support for your router base.



Some clever engineering went into the Craftsman jig. *A dial on the side of the jig allows you to fine-tune the template position, which affects the fit of the joint. Many of the components are made of plastic.*

I got good results with the Omnijig. The only thing troublesome about the through jig is the large ¾-in. dovetail bit that comes with it. The bit narrows to about 3/16 in. at its neck right before the shaft. It looks awfully thin, although I had no problems with it.

Sears Craftsman—The Craftsman 16-in. jig is designed for people who love to assemble jigs. Just getting all of the pieces together is an accomplishment in itself. And the design is clever. Unfortunately, it's designed within a budget that included only plastics and pot metal (see the photo above).

To prevent deflection of the templates, each needs to be fitted with a metal stiffener. This is hardly a symbol of strength. The

For variably spaced joints, the Leigh jig gives you the most flexibility. *But there's a steep learning curve, requiring you to do lots of reading and to have lots of patience.*

Porter-Cable's Omnijig has an optional variable-spacing template available. *Adjustable fingers, which cut both pins and tails, slide along a pair of clamping bars.*

COMBINATION DOVETAIL JIGS

Some of the most clever design innovations can be found on combination machines. The Leigh D4 (left) gives the user the most options for types of joints; the Porter-Cable Omnijig (middle) is also a versatile machine; the Craftsman combination jig (right) will not allow for variably spaced dovetails.

MODEL	LEIGH D4 (800-663-8932)	PORTER-CABLE OMNIJIG (800-487-8665)	SEARS CRAFTSMAN (800-377-7414)
MAXIMUM WIDTH	24 in.	16 in. (24-in. model available)	16 in.
EASE OF SETUP	Poor	Good	Fair
MANUAL	Fair; good graphics but time-consuming to decipher	Good; brief but clear	Good; easy to follow with good graphics
COST	$350 (two bits included)	$275 (dovetail bit and template guide bushing included)	$135 (template guide bushing included)
COMMENTS	For variable spacing, this jig can't be beat; accessories are available to make finger joints, mortise-and-tenon joints and Isoloc joints	Best jig for half-blind dovetails; extra templates are available for finger joints, variably spaced dovetails, fixed through-dovetails and sliding dovetails	Entry-level jig; works fine but spacing of joints is fixed

clamping system, however, is surprisingly strong and well designed.

The half-blind template works the same way as the Porter-Cable and Woodstock templates. The one difference is that a dial moves the template in or out to adjust the fit of the joint.

Through-dovetails are made using a single template mounted with two sets of fingers on each side, one for the tails and one for the pins—like the Journeyman jig. My router base didn't slide smoothly over the template. But the results were okay.

Leigh D4—I know it's heresy to complain about the very popular Leigh jig, but it's just too darn busy for my taste (see the bottom photo on the facing page). The Leigh can do so many things, but it takes so many pages of instructions to get there: 168 pages, in fact. I think you could be fairly accomplished at handwork by the time you tried all of the Leigh's permutations. But, hey, that's just my opinion.

For half-blind work, I needed at least two hours of setup time to get the fit right. It cuts boards like any half-blind jig: one board placed horizontally and one vertically and both cut with one dovetail bit. But unlike the other half-blind jigs, each board is cut in a separate operation by flipping the finger template over and realigning it. There are no clues as to the depth of cut you need, either. So it's a cut, fit, dial in, trial-and-error kind of operation. And if you set the adjustable fingers too far apart, you need to add a spacer block to prevent accidental cuts in the wrong places.

The Leigh D4 jig cut through-dovetails with great ease. And once you understand the sign language of the jig, it's pretty simple to use. You lay out the joints with the pin side of the finger template. That's the side the lock screws are on. Then you flip the template over to make the tail cuts using a template guide and dovetail bit.

To cut the pins, you must flip the template over and dial it into position. So it's a trial-and-error fit again. In fact, the manual for the Leigh jig says to keep testing until you get it right, then note the settings for future reference. The results I got were good, eventually. I just felt that the setup time was too long. □

Gary Rogowski is a contributing editor to Fine Woodworking.

Fine WoodWorking®

Index to issues 128 through 133

This alphabetical index covers all the issues of *Fine Woodworking* published during 1998 (*FWW* #128 through #133). Starting in 1988, *Fine Woodworking* has published annual indexes in the January/February issues, starting with *FWW* #74. The Taunton Press also sells a cumulative index covering issues #1 through #120 for $12.95. The format of each index reference is issue number:page numbers. A hyphen between page numbers means the discussion is continuous; commas between page numbers indicate an intermittent discussion. This index, like all previous indexes to *Fine Woodworking*, was prepared by Harriet Hodges, chair maker.

T

U

V

W

Rules of Thumb

BY MIKE DUNBAR

Sharpness is next to godliness ... at least for a woodworker

Working wood is a process of making smaller pieces from larger ones. Smoothing and shaping, peeling away thin shavings, trimming very fine amounts, fitting pieces together—every stage of the process requires cutting wood. To make the cutting job easy and to achieve the best results, you need to use sharp tools.

Few woodworkers would think of running their tablesaw with a dull blade or firing up their router with a bit they knew was as dull as a hoe. As a matter of fact, if their bits and blades weren't sharp, they probably wouldn't even use the tool. They'd put it down because it didn't work right. And this is what happens with a lot of woodworkers, beginners and advanced alike, concerning hand tools. If they don't know how to sharpen the iron of a dull plane, they set the plane back on a shelf, convinced that hand tools just don't work.

Sharpening is a skill that's hard to teach yourself. It is best acquired by working with and learning from someone else, for until you have used a truly sharp tool, you do not know what standard you need to achieve.

Sharpening is a gateway skill. Once you pass through the gateway, unlimited avenues open up to you. But until you pass through the gateway, you are fated to frequently perform some of woodworking's varied tasks in ways that are awkward, difficult and inefficient. Woodworking requires a great deal of precision and control of tools. And without truly sharp tools, precision and control are difficult.

In my chair-making school's literature, students are advised to come to class with their tools tuned and sharpened, as this saves time for their woodworking. One of two things is said to me by almost every one of these students as they begin their work. The first is, "I didn't sharpen my tools because I don't know how and hoped you would be able to show me." Or they say, "I always thought I knew how to sharpen until I used one of your shop tools."

I hear these comments so frequently that I think the vast majority of woodworkers are struggling with tools that are not sharp, and for that reason they are not taking advantage of tools that would be better suited for the job than the ones they are forced to use. As a result, they sacrifice much of the precision they should have while working wood as well as much of the pleasure they should obtain from it.

Sharpening is a skill that's hard to teach yourself. It is best acquired by working with and learning from someone else, for until you have used a truly sharp tool, you do not know what standard you need to achieve. I can tell you that your tools should cut effortlessly, slicing through end grain as a hot knife would cut through butter. The finished surface should glisten and appear waxy, like a bar of soap shaved with a pocketknife. However, it is all meaningless until you hold and use a sharp tool. Only then do you understand your objective.

A sharp edge actually slices wood, leaving the wood's microscopic structure mostly intact, which is why the freshly cut surface glistens. A dull edge—either on a new tool that has only been surface-ground or on an old tool that is nicked and pitted—tears and crushes wood rather than slicing it. Much more effort is required to push (or pull) the tool. The chip breaks into pieces, and these pieces choke the tool. The resulting surface is scarred and rough.

Sharpening is not hard. Avoid anyone who says that it is. You will discover that the process is also rather fast. When

There are as many ways to sharpen as there are to skin a cat. *Sharpening devices are made of many different materials, from man-made ceramic stones to diamond-impregnated steel bars to finely machined natural stones.*

Photos: Jefferson Kolle, except where noted

There are many sharpening systems. Which system you use is not important. What is critical is creating a truly keen cutting edge: one that has two polished surfaces.

The author uses sandpaper and a piece of glass to sharpen his tools. *It's imperative that both sides of a cutting edge get sharpened. Here, the author sharpens the back of a chisel.*

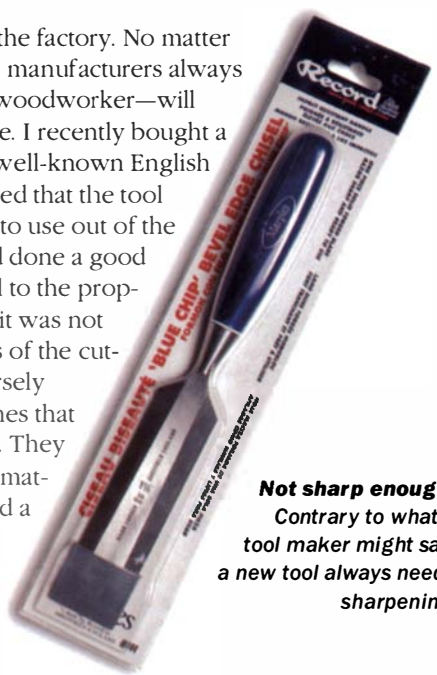
someone claims to have spent a half hour honing a tool, I know that the person does not know how to sharpen.

There are many manual sharpening systems: water stones, oil stones, diamond plates, ceramics, sandpaper on glass. (The latter is used in my shop.) And there are almost an equal number of motorized sharpening systems: electrically powered stones that rotate through a water bath and slow-speed sanding belts. There are almost as many ways to sharpen as there are to skin a cat.

Which system you use is not important. What is critical is creating a truly keen cutting edge: one that has two polished surfaces. You can work one side of a tool for days, and you will not have sharpened it until you also work the intersecting surface. Think of an ax; no one would sharpen only one edge. Polishing replaces scratches in the metal with increasingly finer scratches until the steel has a mirror finish. The scratches on a polished surface are so small they can be seen only through magnification. And the resulting cutting edge is invisible. You can see a dull edge, but a sharp one disappears. While sharpening, look at the cutting edge. If it is visible, more work is required.

Students frequently expect brand-new tools to be sharp and ready to use. They are not. New tools have never been made truly sharp at the factory. No matter what they may claim, manufacturers always expect that you—the woodworker—will prepare the tool for use. I recently bought a 2-in. chisel made by a well-known English firm. The package stated that the tool was sharp and ready to use out of the box. The factory had done a good job grinding the tool to the proper shape. However, it was not sharp. Both surfaces of the cutting edge were coarsely ground with scratches that were clearly visible. They did not even have a matte surface, never mind a mirror polish.

Most of my students who are sur-

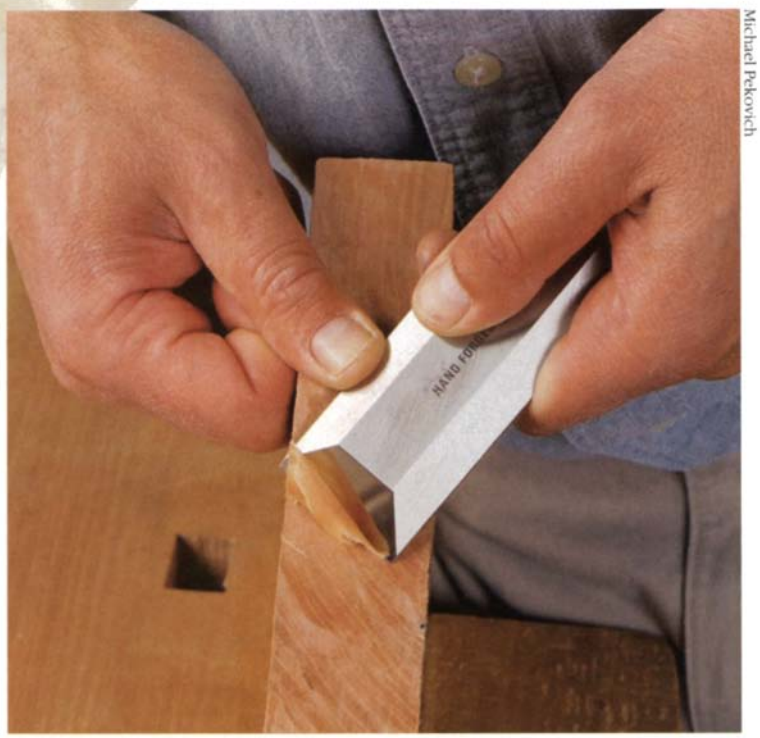


Not sharp enough. *Contrary to what a tool maker might say, a new tool always needs sharpening.*

prised to discover that their tools are not really sharp own nothing finer than an India stone or a 1,000-grit water stone. These types of stones will produce only a matte finish. They are incapable of polishing steel and creating a truly keen edge. In other words, you have to own the equipment necessary to create the required level of polish, be it an 8,000-grit water stone, a black Arkansas, a fine diamond plate or 2,000-grit wet-and-dry paper (paper uses a different measure of grit than water stones).

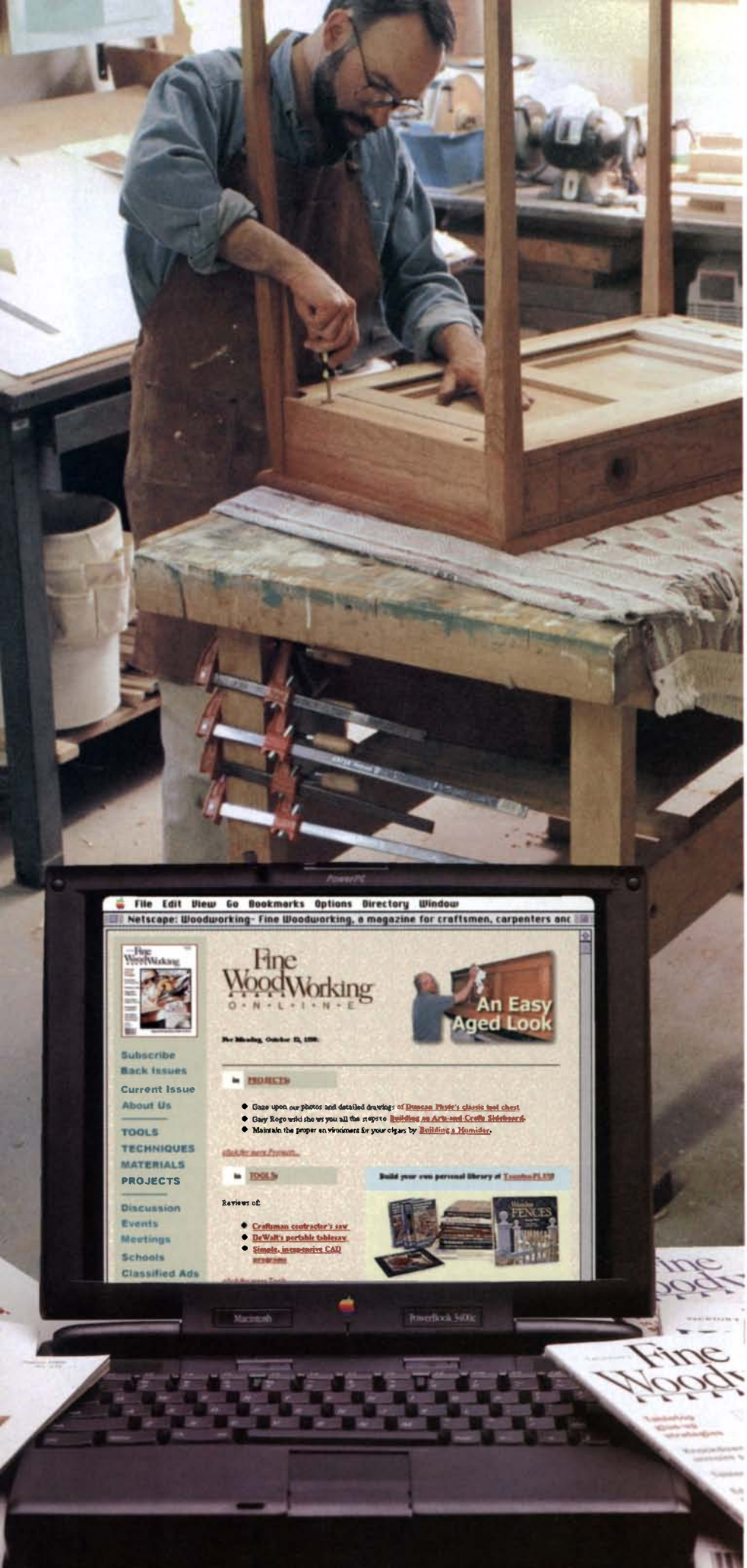
A lot of equipment is sold to aid sharpening, but you will be surprised at how little other equipment is needed to produce the necessary polished edge. Be slow to buy such sharpening aids and devices. Wait until you have learned to sharpen, and you will be better able to distinguish what you really need from the widgets and gewgaws.

You'll know when you have a truly keen edge on your tools. You'll feel it in the control you'll have: A chisel will feel like an extension of your hand, and it won't jump across the wood, digging in when you don't want it to. Your spokeshave will slice wisps of wood. And your planes will glide almost without effort, as thin curls slide out of the plane's throat, thin and translucent.



Michael Pekovich

Polished to a mirror surface. *Polishing both surfaces of a cutting edge eliminates minute scratches that will impair the edge's ability to sever wood fibers. Cutting end grain on old, dry cherry is a test for any edge.*



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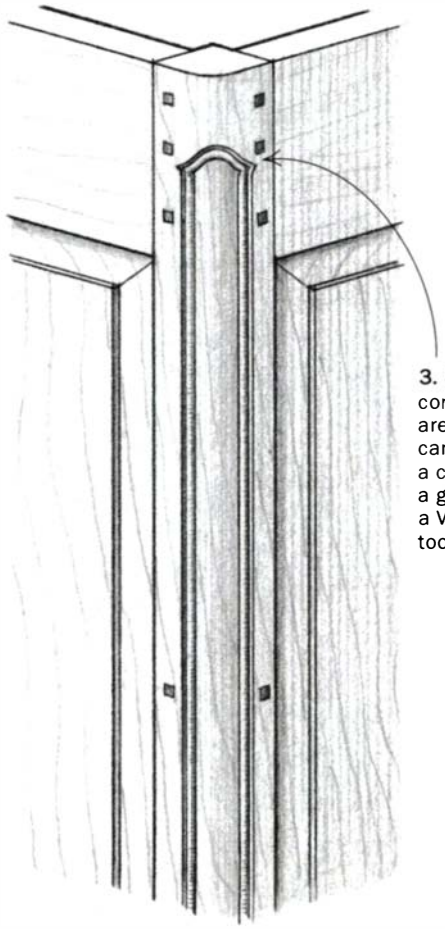
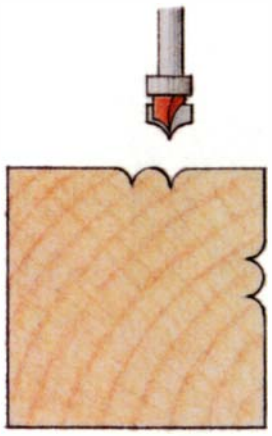
ROUNDED EDGE DETAIL ON POST LIGHTENS ARMOIRE'S APPEARANCE

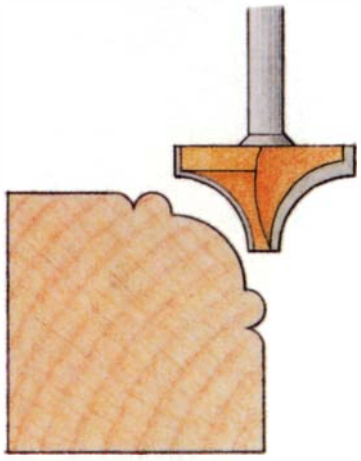
Stopped router cuts form the beads and the rounded corner. The smaller end section is cut by hand.





1. Four passes with beading bit establish straight portion of bead.

3. Rounded corner beads are hand-carved with a chisel, a gouge and a V-cutting tool.



2. An ovolo bit eases corner between the two beads.

Edge detail on a French armoire

How does Chris Gochnour cut the edge detail on the corner of his French post-and-beam armoire (FWW #132, pp.70-75)? —John Testerman, Menifee, Calif.

Chris Gochnour replies: The post on my French armoire was designed with a rounded corner lined on each side with a small bead. This detail keeps the case from appearing too boxy and lends a light look to the hefty armoire. I used a series of stopped router cuts, then carved out the top and bottom details by hand.

I first drew out the design with a pencil, making sure to mark the top and bottom portions where the design starts to curve and where the router cuts stop and the handwork begins.

For each of the two small beads, I loaded the router with a beading bit (Eagle #1390602) and used a fence to guide two parallel cuts on each face of the posts. I stopped the bit just short of the rounded sections on the top and bottom.

I used a ⅞-in. ovolo bit to relieve the sharp corner between the two beads. Again, I guided my cut with a fence and watched my marks to make sure I stopped short of the top and bottom.

For the curved details on the top and bottom, I used a V-cutting tool to define the bead. A straight chisel and a slightly contoured gouge were used to finish the rounding on the corner

This detail took some patience to get just right, but after the piece went together, it proved to be a small touch that made all the difference.

[Chris Gochnour designs and builds furniture in Salt Lake City.]

Bringing out maple's depth with Danish oil

I read your article on finishing cherry (FWW #130, pp. 46-49). I am finishing maple and want to bring out the depth of the wood before adding gel stain. Do you recommend using Danish oil on maple prior to staining, as you do with cherry?
—Derek Sedillo, Torrance, Calif.

Jeff Jewitt replies: Your approach will certainly work better than going straight to a gel stain, which will not bring out the depth or accentuate any curl figure in the maple. But the best approach is to use a water-soluble dye stain first, which will even out tonal disparities and establish the undertone of color that you want. Sealing the wood afterward with a Danish oil will "kick out" any figure and enhance surface luster and shimmer. You can then use the topcoat of your choice, though I'd advise a barrier coat of shellac if you're using a water-based finish.

For more color, you can add a gel stain any time after the wood has been sealed with Danish oil—this is technically called glazing. You can manipulate the amount and the way you wipe the excess off to achieve specific effects. For example, by leaving more in crevices and corners, you can simulate age and patina.

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

Breadboard ends on a folding table leaf?

I am designing a large three-quarter leaf cherry gateleg table for my dining room. For the continuity of design, I'm planning to use breadboard ends on the top as well as on the leaves. Will there be any problem with seasonal expansion of the wood, and do you feel a rule joint would be best for this application?
—Watson Lohmann, Pitman, N.J.

Garrett Hack replies: Using breadboard ends is a good way to keep a tabletop flat. They work equally well for unsupported flat parts like desk fall fronts, writing slides and cutting boards. But I've never seen them on a drop-leaf table as you describe, for the simple reason that they can bind up the movement of the leaves.

The binding is caused by wood movement and the changing alignment of the

Drawings: Vince Babak

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1295DH	5" random orbit sander	82
1584AVSK	clic barrel handle jig saw, vs w/case	149
1587AVSK-50	50th anniv. jig saw kit	156
1587AVSK	top handle jig saw, var sp w/case	149
1608	laminate trimmer	99
1613EVS	2 hp var sp plunge router	199
1615EVS	3 1/4 hp plunge router	298
1617	1 3/4 hp router	158
1617EVS	2 hp electronic var. speed router	179
1618	1 3/4 hp D-handle router	169
3107DVSK	5" random orbit sander with case	114
3294EVS	in line grip jig saw	122
3315K	12v crdls t handle w/2 bat, cs & chrg	158
3615K	14.4v cdls drill kit w/2 batteries	174
3725DVS	5" dustless vs random orbit sander	144
3727DVS	6" dustless vs random orbit sander	148
3915	10" slide compound miter saw	498

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66	3 hp, 1 ph 10" t.a. saw w/50" fence	1995
66	5 h p, 1 ph 10" t.a. saw w/50" fence	2095
73	1 1/2 hp dust collector	389
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84	combo belt & disc sander	445
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EZ2	18 gauge nail/staple kit	109
0249NK	18 gauge brad nailer 3/4"-2" w/case & 5000 nails	108
0232NK	18 ga brad kit 3/8"-1 1/4" with case	68
0566T	angle finish nailer 1"-2 1/2"	202
0626NK	18 gauge narrow crown stapler 3/8"-1 " with case	103
0638S	narrow cr stapler 3/4"-1 1/2"w/cs	179
ITM/ART	0241 & 0626 in one case	119

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99-55-13	Fein turbo vac II	248
MSFE636-1	Random orbit sander	489

RYOBI

AP12	12" port. planer	345
DBJ50	detail biscuit jointer	68
DC500K	detail carver kit	62
HT20VSK	multi rotary tool w/cs & accys	48
ML618	18" wood mini lathe	199
OSS450	oscillating spindle sander	149
RE185	2 1/4 hp fixed base vs router	109
SC165VS	16" vs scroll saw	164

HITACHI

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C8FB2	8 1/2" slide compound miter saw	438
C10FC	10" compound miter saw	198
C10FS	10" slide compound miter saw	558
DN10DYK	9.6V cdls right angle kit	168
DS14DV-G	14.4v kit w/2 bat & free Gerber tool	209
M12V	3 hp var speed plunge router	189
NR83A	full head strip nailer, 2 - 3 1/2 cap	369
NV83A	coil nailer, 2" to 3 1/4" capacity	369
P20SB	3 1/4" planer	89

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JS100	biscuit joiner	94
JS102	biscuit joiner w/var. angle fence	118
FT2000E	3 hp plunge router	184
F410	10" x 40t quiet blade	48
F810	10" x 80t quiet blade	73
LM72M010	10" x 24t flat top rip blade	36
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LU84R010	10" x 50T red combo blade	42
LU85R010	10" x 80T red crosscut blade	58
LU92M010	10" x 60 teeth TCH laminate	59
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SD308	8" safety dado with case	116
SD508	new 8" super dado set	167
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6095DWLE2	same as above w/flashlght	139
6213DWAE	12v cordless kit w/ 2 batteries	169
6233DWAE	14.4v cordless kit w/2 batteries	199
6333DWAE	14.4v 1/2" cordless kit	209
B05001	5" random orbit sander	67
LS1013	10" slide dual comp miter saw	558
LS1211	12" slide dual comp miter saw	756
N1900B	3 1/4" planer	146

Milwaukee

6490-6	10" miter saw	274
6496-6	*new* 10" slide compound miter saw	545
6497-6	10" slide compound saw w/accs	619
6537-22	10 amp recip saw w/case	178

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SKS	narrow crown stapler	247
SLP20	brad nailer w/cse 5/8"-1 5/8" cap	198
SFN40	finish nailer 1 1/4"-2 1/2" cap	338

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28-185	bench top band saw	167
28-270	14" bandsaw, 1 hp white, enc stand	849
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DW420	5" random orbit sander, psa	62
DW421	5" dstls mdm orb sander, velcro,	67
DW423	5" vs dustls random orbit sander	79
DW431	3" x 21" dstls belt sander var sp	185
DW610	1 1/2 hp router, 9 amp	144
DW621	2 hp vs dstls plunge router	198
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DW682K	biscuit joiner kit	159
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DW972KS2	12v combo drill & saw kit	274
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DW991KC2	14.4v drill & recip saw combo kit	372
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breadboard ends and table edges where the leaves are hinged. When the top swells, the breadboard ends don't extend all the way to the table's edges. When the top shrinks, the ends project beyond the table's edges. In this position it is likely that the breadboard ends will constrict the movement of the leaves. With breadboards on the drop leaves too, at some point in the year it is likely that both breadboard ends will bind against each other and could split the hinges out of the top or leaves. With only one leaf, you could restrict the wood movement away from the hinged side on the leaf and top and not cause any problems.

A rule joint is the neatest and strongest joint between a leaf and top. But when cutting it in a table edge with a breadboard end, wood movement is going to be a problem. Because the tolerance in a rule joint is small, any variation between the top and breadboard ends will surely bind the joint. For your table, I would keep the meeting edges square and plane down the ends of the breadboards when they are proud of the table edge.

[Garrett Hack is a writer and woodworker living in Thetford Center, Vt.]

Sanding tight spots

I'm working on a piecrust table, and getting a smooth surface in the top's tight recesses seems impossible. Is there an easy way to sand these areas?
—Thomas M. Wheeler, Montgomery, Ala.

David Lamb replies: The tight areas on ornate pieces like the piecrust tabletop you describe can be a challenge, even in experienced hands. After doing any mechanical shaping with a router, the edges still have to be cleaned up. If the project is large, I often make custom scrapers or use a gooseneck scraper refiled to fit the profile of the trouble spot.

Another easy option is to make sanding sticks from scraps around the shop. With the sticks cut to fit the particular sanding area, you can move from one grit to another easily. But to make sure the area doesn't lose its shape, don't start sanding with anything coarser than 180 grit.

The easiest route is to use rifler files, which come in a variety of sizes and shapes. With some hunting and a little luck, you might find one that seems ready-made for your work.

[David Lamb designs and builds furniture in Canterbury, N.H.]

Mending a broken Windsor

I have a Windsor chair with a seat that is split down the middle. When I align the seat halves together, there is a gap in the middle approximately ⅛ in. wide. If I were to plane each side to eliminate the gap, it obviously would make the seat narrower and interfere with one of the back spindles. What is the best way to repair the seat?
—Warren Maas, Missouri City, Texas

Michael Dunbar replies: You first need to determine whether your chair is an antique, made between 1730 and 1830, when chair makers still worked by hand. If the chair is an antique, I strongly advise against trying to repair it yourself.

It is possible that the chair is very valuable, and your efforts could make it nearly worthless. While many Windsors from this period sell for around $2,000, depending on condition, style and maker, it could be worth much more. The record price for an individual antique Windsor is in excess of $50,000! If you have an antique Windsor, let only a trained conservator work on it.

If your chair is factory made (post 1830), repairing the problem you describe is straightforward. Take the chair apart to the extent possible. The two surfaces no longer pull together because the wood on each side of the split has moved independently and changed the shape given it at the time of manufacture. First joint both surfaces and determine what species of wood was used in the original seat. Using the same species of wood, prepare a strip thick enough to replace the wood removed during jointing and to return the seat to its original width. The piece of wood should also be wider than the seat's thickness and longer than the seat's length so that it will overhang the original surface everywhere.

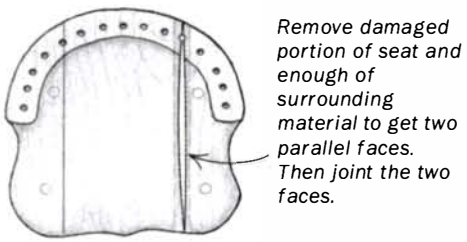
Glue the new piece of wood between the jointed surfaces of the two seat halves. Make sure both sides of the seat are in the same plane and clamp them under even pressure. When the glue has dried, shave the new piece of wood flush with the seat's original surfaces. The strip is thin and should be easy to trim.

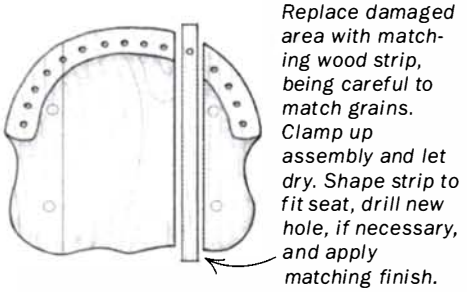
If the split occurred in line with a hole, you will have to run a drill bit of the same size into the hole to clean out the new wood. Stain the new wood to match the original and apply the same type of finish used on the rest of the chair. Finally, reassemble the chair.

[Michael Dunbar teaches Windsor chair making and is a contributing editor to *Fine Woodworking*.]

REPAIRING A CRACKED SEAT

With this Windsor disassembled, the cracked seat is easily repaired.





Is tree curl and figure genetic or environmental?

Every year I plant a few trees so those who follow me will have materials to

work with. Could you please tell me whether curl and figure in wood is genetic or environmental? If genetic, could material from a figured tree be grafted to a compatible rootstock to produce another figured tree?

—Howard Parks, Hughesville, Pa.

Jon Arno replies: Unfortunately, there doesn't appear to be a single answer for what causes figure in wood. It's a good bet, though, that genetics play a major role. It is suspected that some forms of figure such as burl and bird's eye may be triggered by pathogens or some sort of stress in the form of nutrient deprivation and/or climatic conditions. But how certain species react to these stresses to produce unique figures must involve their genetic programming. Otherwise, burl, bird's eye, fiddleback and other figures would be equally common regardless of species, and they are not.

To the extent that genetic programming contributes to a given type of figure, a scion grafted onto a compatible rootstock should continue to produce the desired figure. But there are some practical limitations in carrying out your strategy. Often, unusual figure does not become apparent in a sapling until it attains considerable size, and by then, it becomes very difficult to perform a successful graft. Also, if the figure requires a pathogen or stress trigger, nutrients and/or immunities provided by the rootstock could turn it off. Personally, I think it's worth a try, and on behalf of woodworkers yet to be born, I certainly applaud your social conscience.

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

Resawing on a bandsaw

For resawing, I use a 14-in. bandsaw with a ½-in. blade that has 4 tpi. Recently, I was resawing a cherry board that is ¾ in. thick and 4 in. wide into ¼-in.-thick boards. While doing this, I heard a dull screeching sound. Also, the blade wandered back and forth in a wavy pattern about ⅛ in. wide. And when feeding the board into the saw, it lurched forward about ⅛ in. or so, then stopped and then lurched forward again. Can any of these conditions be corrected? If they are normal, I'll get used to it.

—Don Fast, Houston

Gary Rogowski replies: Don't get used to poor performance from your tools. This kind of behavior from a bandsaw is not normal. I take that back. It's a normal cut for a bandsaw that's cutting poorly. You should expect a great deal more from a properly made resaw cut.

Ask yourself how you're cutting here. You're ripping when you resaw. It just happens to be through much thicker material. Ripping is hard enough, as you know if you've ever tried ripping by hand. But resawing through 4 in. of hardwood like cherry takes some force. Although I believe most of your problem is blade related, check your saw to see that it's running properly. The drive belt should be transmitting power smoothly with no belt slippage and with the motor

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and wheel pulleys properly aligned. With the blade off the wheels, spin them to check their balance and listen for any crunchy sounds, which would indicate a bad wheel bearing.

Next, throw away your blade or use it only for cutting firewood. Part of your problem stems from the fact that there are simply too many teeth in the cut you're trying to make. The teeth are pulling so much sawdust with their ripping cut that the blade can't clear it away fast enough. The blade screeches as it heats up and starts to track badly as sawdust fills the teeth and the kerf they're making. Then it lurches forward as the teeth finally clear a path again, only to have sawdust fill up everything once more, and you do this dance all over again. This is not normal for a good resaw cut.

A good resaw cut is a slow, controlled, *straight* cut. I use a ½-in. blade as you do, but I always run a 3-tpi hook-tooth blade to minimize the number of teeth in the cut at any one time. The hook-tooth form also has deeper gullets than the skip tooth and a rake angle of about 10° for a more aggressive, shearing type of cut. Recently, I have also started using a blade from Highland Hardware called the Wood Slicer, which cuts very aggressively but with little feed pressure and good results.

Make sure your blade is tensioned properly with no flutter in it as it's running, and check your blade guides and thrust bearings to see they're set within a few thousandths of an inch. Use a new blade for important resawing, and figure that after a few dozen feet of resawing your blade is going to get tired. Slow down your feed rate, make sure that the blade is still tensioned and tracking properly and that it keeps cutting straight. If you really start to bog down again in the cut, replace the blade or have it resharpened.

[Gary Rogowski is a contributing editor to *Fine Woodworking*.]

Shaker box supplies

I would like to learn how to make Shaker boxes. Are there any plans on how to make the mold you use to bend the box bands? Also, is there a good book or video on making them?

—Bertin LeBlanc, Dieppe, N.B., Canada

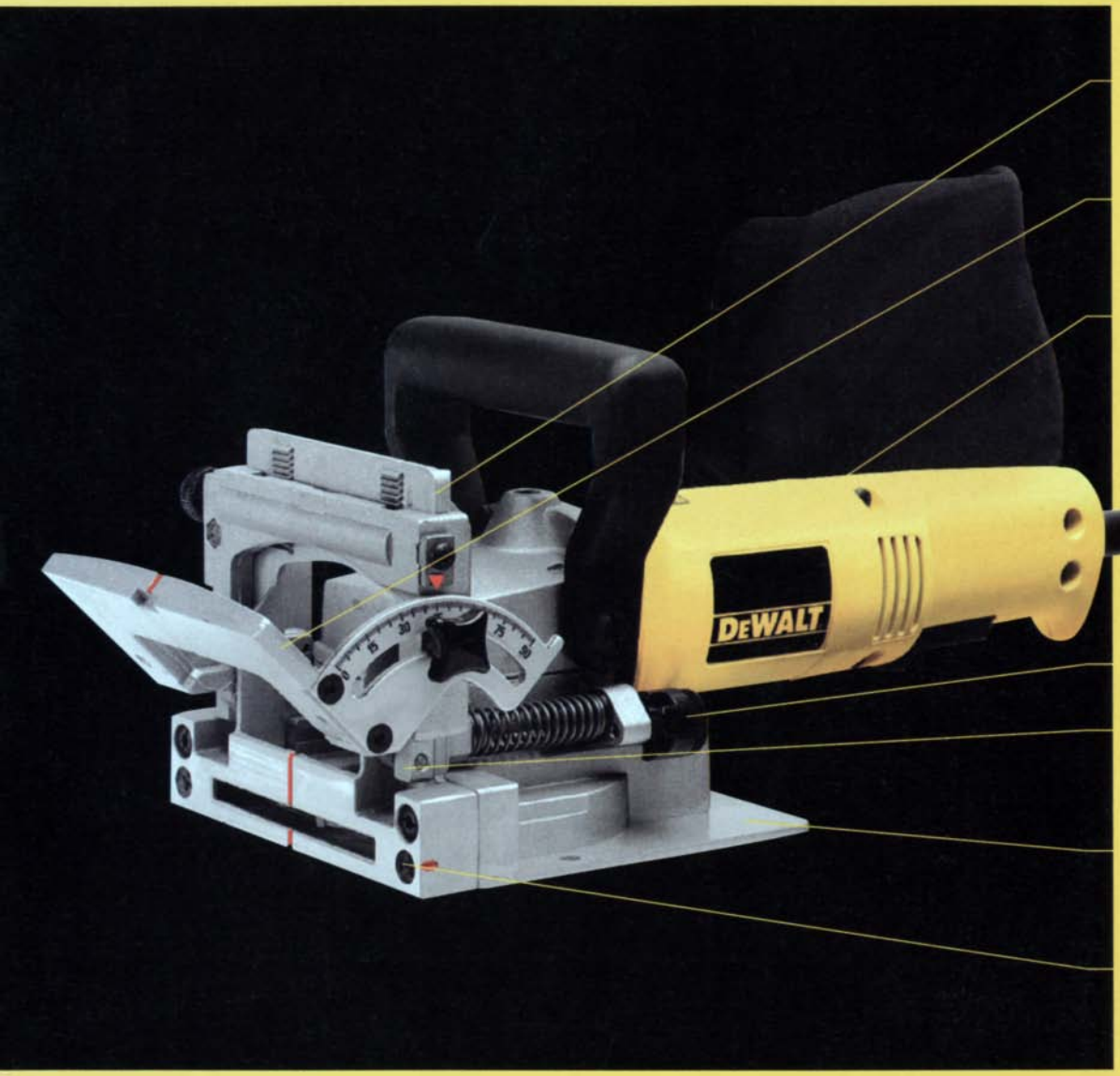
Matthew Teague replies: From his shop in Charlotte, Mich., John Wilson has been making beautiful Shaker boxes for 18 years. You can look up his article on the craft in *FWW* #102 (pp. 54-57), or try to catch one of his many seminars across the country.

Wilson's own catalog offers an abundance of information—be it books or videos—and supplies. For a copy of his latest supply list, give him a call at (513) 535-5325. As a primer, you might try one of his Shaker box kits, available from Woodcraft (800-225-1153).

[Matthew Teague is an assistant editor at *Fine Woodworking*.]

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

THE BEST TOOL IN THE JOINT.



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31-695	6" Belt/9" Disc Sander	441	299
23-710	Sharpening Center	217	145
31-460	4" Belt/Disc Sander	198	119
40-560	16" 2 speed Scroll Saw	230	129
40-540	16" var/spd Scroll Saw	249	165
11-990	12" Bench Drill Press	255	184
11-090	32" Radial Bench Drill Press	405	279
43-505	1/2" Bench Router/Shaper	398	269
22-540	12" Bench Top Planer		Sale 259
28-195	10" Band Saw	390	309
22-560	12-1/2" Planer w/ extra knives	329	249
36-865	Versa Feeder Stock Feeder	329	249
36-220	10" Compound Mitre Saw	294	199
28-185	Bench Band Saw	213	168
36-240	10" Sliding Mitre Saw	589	439
37-070	6" v/spd Bench Jointer	351	265
14-650	Hollow Chisel Mortiser	380	249
17-900	16-1/2" Floor Drill Press	490	329
17-920	NEW Mortise Chisel Kit		Sale 59
36-285	8-1/4" Builders Saw w/ stand		Sale 268
34-555	Sliding Table	487	289
36-250	10" Slide Compound Saw	825	449
31-780	Oscillating Spindle Sander	253	194
31-780K	31-780 w/ 31-781 spindle set		209
46-700	12" Wood Lathe	575	465
40-650	Q3 18" Scroll Saw		Sale 389
36-905	30" Unifence	346	255
36-906	50" Unifence	444	299
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28-270	14" Band Saw 1 HP w/ 50-274 mobile base, 28-855 rip fence, & 28-266 cool blocks		Sale 839
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6537-22	6527 w/quick lok blade change	224	175
0407-22	12V Drill w/kyls chuck&2 batt	380	175
0224-1	3/8" Drill 4.5 amp magnum	236	132
0234-6	1/2" Drill 4.5A mag 0-850 rpm	255	134
0235-1	1/2" Drill w/keyless chuck	255	139
0244-1	1/2" Drill 4.5A mag 0-600 rpm	255	134
0222-1	3/8" Drill 3.5 amp 0-1000 rpm	213	119
0228-6	3/8" Drill 3.5 amp 0-1000 rpm	207	109
0375-1	3/8" close quarter Drill	255	148
0379-1	1/2" close quarter Drill	288	165
6546-6	Screwdriver 200 & 400 rpm.	150	89
6547-6	6546-6 w/bits, 1/4" chuck & cs	185	108
5399	1/2" D-hdle Hammer Drill Kit	356	219
5397-1	3.8" v/ spd Hammer Drill Kit	275	145
5371-6	1/2" v/ spd Hammer Drill Kit	360	194
3107-6	1/2" v/spd right angle Drill Kit	411	234
6142	4-1/2" Grinder w/cse & acc.	224	129
6490-6	10" Mitre Saw	496	265
6491	6490 w/ carbide blade & bag	594	345
6494-6	10" Compound Mitre Saw	585	319
6266-6	Top Handle Jig Saw	315	159
6496-6	10" Slide Compound Saw	1050	569

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LU85R010	Super Cut-off	10" 80	115	64
LM72M010	Ripping	10" 24	69	38
LU73M010	Cut off	10" 60	84	49
LU87M010	Thin Kerf	10" 24	72	45
LU88M010	Thin Kerf	10" 60	88	49
LU98M010	Ultimate	10" 80	128	68
LU91M010	Compnd Mitre	10" 60	88	54
F410	Quiet Blade	10" 40	95	49
SD308	8" Dado - Carbide		230	119
SD508	8" carbide w/case & shims		344	172
FB100	16 piece Forstner Bit Set		338	194
94-100	5 pc. Router Bit Door System		320	169
FT2000E	Plunge Router		Sale	189

HITACHI TOOLS

C8FB2	8-1/2" Slide Compound Saw	1169	449
C10FS	10" Slide Compound Saw	1627	579
C15FB	15" Mitre Saw	1346	645
NV45AB	Coil Roofing Nailer	935	379
NT32AE	NEW Pinner 5/8" - 1-1/4"		Sale 85
NT50AE	NEW Pinner 3/4" - 2"		Sale 129
C10RA	NEW 10" Table Saw	632	319

MAKITA TOOLS

Model	Description	List	Sale
5090DW	3-3/8" Saw Kit 9.6 volt	280	155
DA391D	3/8 angle Drill 9.6V	166	114
DA391DW	3/8" angle Drill Kit 9.6V	341	175
ML902	Incandescent Flashlight 9.6V		14.95
6095DWE	9.6 volt Drill Kit w/2 batt		Sale 125
6095DWLE2	6095DWE w/flashlight		Sale 139
632007-4	9.6 volt Battery	47	30
632002-4	7.2 volt Battery	39	28

NEW 18 VOLT MAKITA TOOLS

6343DWAE	1/2" Drill Kit		Sale 249
5620DWA	6-1/2" Circular Saw Kit		Sale 259

CORDLESS DRILLS
WITH 2.0 AMP HIGH CAPACITY BATTERIES

6213DWAE	12V 3/8" Drill Kit	325	169
6233DWAE	14.4V 3/8" Drill Kit	358	205

9900B	3"x21" Belt Sander w/bag	347	165
9924DB	3"x24" Belt Sander w/bag	360	169
N1900B	3-1/4" Planer with case	263	142
1912B	4-3/8" Planer	352	205
N9514B	4" Disc Grinder 4.6 amp	118	65
DA3000R	3/8" Angle Drill	355	185
2708W	8-1/4" Table Saw	637	295
6405	3/8" Drill Rev. 0-2100 rpm.	115	65
6013BR	1/2" Drill Rev. 6 amp	270	159
9401	4" x 24" Belt Sander w/bag	458	219
5007NBK	7-1/4" Circ Saw w/ case	250	125
LS1011	10" Slide Compound Saw	995	429
LS1211	12" Slide Compound Saw	1620	695
3901	Plate Joiner Kit	376	159
3612C	3 HP Plunge Router	492	249
LS1040	10" Compound Miter Saw	460	259
LS1013	10" Dual Compound Slide Miter Saw	1088	599
BO5010	5" Random Orbit Sander	142	72
LS1220	NEW 12" Compound Miter Saw		379
9227C	NEW 7/9" Polisher	350	195
SJ401	NEW 16" Bench Scroll Saw	300	175
2702	NEW 8-1/4" Table Saw		Sale 299
2703	NEW 10" Table Saw		Sale 319

SENCO AIR NAILERS

SFN1+	Finishing Nailer 1 - 2" w/ cs	448	225
SN325	Nailer 1-7/8 - 3-1/4"	665	365
SLP20	Pinner w/cs 5/8 -1-5/8"	422	185
SKS	Stapler 5/8 - 1-1/2"	390	245
SN70	Framing -Clip Hd 2 - 3-1/2"	725	449
SN65	Framing -Full Hd 2 - 3-1/2"	709	379
SN600	NEW Framing 2 - 3-1/2"	699	369
SFN40	Finish Nailer 1-1/4 - 2-1/2"	569	319

NEW Accuset Nailers by SENCO

A100LS	Finish Stapler 1/2" - 1"	180	119
A150LS	Finish Stapler 1/2" - 1-1/2"	220	149
A125BN	Brad Nailer 5/8" - 1-1/4"	160	99
A200BN	Brad Nailer 5/8" - 2"	215	139

BOSTITCH AIR NAILERS

Model	Description	List	Sale
N80S-1	Stick Nailer	Super Sale	325
RN45	Coil Roof Nailer 3/4 - 1-3/4	845	359
N60FN-2K	Finishing Nailer w/ case	557	269
BT35-2K	Brad Tacker 5/8" - 1-3/8" with case, oil, & brads	279	125
MIIIFS	Flooring Stapler 15 gauge	902	529
S32SX-1K	Finish Stapler-1/2" - 1-3/8" with case & oil	269	145

JORGENSEN ADJUSTABLE HANDSCREWS

Item#	Jaw Length	Opening Capacity	List	Sale	Box of 6
#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

PONY CLAMP FIXTURES

Model	Description	List	Sale	Lots of 12
50	3/4" Black Pipe	15.45	8.50	92.50
52	1/2" Black Pipe	12.65	6.95	74.95

PANASONIC CORDLESS

EY6100FQKW	12V 3/8" Drill kit w/ 2 Ironman batteries, 15 min. charger, & case	379	179
EY6230FQKW	NEW 15.6V Drill Kit with 2 Ironman batteries, 30 minute charger & case	425	209
EY3503FQWKW	5-3/8" 12V Wood Cutting Circular Saw Kit	500	259
EYC001	EY6100FQKW drill, EY3503FQW saw, 2 batteries, 15 minute charger, and case		Sale 315

BIESEMEYER FENCES

B-50	50" Commer. Saw	443	325
T-SQUARE 52	52" Homeshop	360	275
T-SQUARE 40	40" Homeshop	335	255
T-SQUARE 28	28" Homeshop	325	245

AIRY AIR NAILERS

Model	Description	List	Sale
0241SK	Brad Nailer 3/8" - 1-9/16"	180	98
0626SK	1/4" Crown Stapler 3/8" - 1"	194	98

Above nailers come w/case, fasteners, oil & wrenches

0241/0626
0241 Brad Nailer, 0626 Stapler, case, fasteners, oil, & wrenches
Super Sale 129.95

STABILA LEVELS

25010	10" die cast Torpedo Level	43	19
24640	24" Level w/ hand holes	62.20	43
24670	48" Level w/ hand holes	79.70	58

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DEWALT TOOLS

Model	Description	List	Sale
DW309K	Recipro Saw 10 amp	318	175
DW378G	7-1/4" Framer's Saw	210	169
DW222	3/8" Drill, 0-1200 rpm	184	99
DW231	1/2" Drill, 0-850 rpm, 7.0 amp	240	129
DW236	1/2" Drill, 0-850 rpm, 7.8 amp with keyless chuck	264	149
DW124K	1/2" right angle Drill	590	329
DW321K	Top Handle Jigsaw Kit	300	164
DW364	7-1/4" Circ. Saw w/brake	294	162
DW610	1-1/2 HP 2 handle Router	266	149
DW411K	1/4 sheet Palm Sander w/ cse	88	58
DW682K	Biscuit Joiner with case	448	169
DW705	12" Compound Mitre Saw	734	359
DW621	2 HP Plunge Router	400	218

DW621 comes with Free DW6956 fine height adjuster !

DW675K	3-1/8" Planer with case	292	164
DW677K	3-1/4" Planer w/ case	268	155
DW431	3 x 21 v/spd Belt Sander	338	188
DW421	5" Palm Ran. Orb Sander	144	74
DW423	Palmgrip Random Orbit Sander - variable speed	170	94

DW421 & DW423 come with Free DW4317 case !

DW673KL	Laminate Trimmer Kit	364	188
DW272	Drywall Gun. 0-4000, 6.3 amp	160	95
DW276	Drywall Gun. 0-2500, 6.5 amp	160	95
DW935K	14.4V 5-3/8" Trim Saw Kit	444	237

DEWALT CORDLESS DRILLS

DW952K-2	3/8" v/spd w/ two 9.6V XR batteries	284	129
DW972K-2	3/8" variable speed w/ two 12V XR batteries	362	184
DW972KQ-2	Above drill kit with 15 minute charger		Sale 229
DW991K-2	3/8" variable speed w/ two 14.4V XR batteries	415	209
DW991KQ-2	Above drill kit with 15 minute charger		Sale 245
DW994KQ	1/2" variable speed w/ one 14.4V XR batteries	458	239

Above drill kits come w/ charger & steel case !

DW991KS-2	DW991K drill, DW935 trim saw, 2 XR batteries & case		Sale 345

DEWALT 18 VOLT CORDLESS TOOLS

DW938K	Recipro Saw Kit	520	269
DW995K	1/2" Drill Kit w/ 1 battery	428	229
DW995K-2	1/2" Drill Kit w/ 2 batt.		Sale 249
DW997K	1/2" Drill/Hammer Drill Kit	454	249
DW936K	5-3/8" Saw Kit	458	249
DW995KS-2	DW995K Drill, DW936 Saw and case		Sale 385
DW991KC-2	DW991K 14.4V drill kit, DW937 14.4V recipro saw,& case	375	
DW995KC-2	DW995K 18V drill kit, DW938 18V recipro saw, & case	395	
DW997KC-2	DW997K 18V drill kit, DW938 18V recipro saw, & case	419	

DEWALT BENCH TOP TOOLS

DW708	12" Dual Compound Slide Mitre Saw		Sale 649
DW788	20" Scroll Saw		Sale 469
DW733	12" Planer w/ extra blades		Sale 435
DW744	10" Portable Table Saw		Sale 499
DW756	NEW 6" Bench Grinder	164	75
DW758	NEW 8" Bench Grinder	184	115

BOSCH

Model	Description	List	Sale
1587VS	Top Handle "CLIC" Jig Saw	292	139
1587AVSC	1587VS Saw Kit with case and *New* Progressor blades		Sale 149
1584VS	Barrel "CLIC" Jig Saw	288	149

Bosch Metal Case for above Jig Saws ... 24
Bosch 30 blade assortment for Jig Saws 29.99

1584VS or 1587VS
with steel case and 30 Bosch blades **Sale 175**

1295DH	5" Random Orb Palm Sndr.	145	89
1274DVS	3"x21" v/spd Belt Sander.	301	175
1278VSK	1-1/2"x12" Belt Sander	218	129
1275DVS	3"x24" v/s Belt Sndr	379	214
1276DVS	4"x24" v/s Belt Sndr	408	229
1194VSR	1/2" v/ spd Hammer Drill	272	155
1194VSRK	above Drill w/ case	303	169
1613EVS	2HP v/s Plunge Router	369	199
1615EVS	3 HP v/s Plunge Router	536	305
1634VSK	Recip Saw 10.5 amp	335	185
3315K	12V T-handle Drill Kit	345	159
3615K	14.4V Drill Kit	354	174
3107DVS	5" Random Orbit Sander.	165	98
3107DVSK	3107DVS with case	195	115
3725DVS	5" Random Orbit Sander	256	145
3727DVS	6" Random Orbit Sander	266	149
3915	10" Slide Compound Saw	1050	499
3912	NEW 12" Compound Mitre Saw	638	359
11224VSR	7/8" SDS Rotary Drill	404	229
1703AEVS	5" Grinder - 8.5 amp	245	139

Introducing the NEW Bosch Routers

1617	1-3/4 HP Router - 2 handle		Sale 169
1617EVS	2 HP Router w/ variable speed - 2 handle		Sale 189
1618	1-3/4 HP Router - "D" handle		Sale 179

JDS AIRTECH AIR CLEANERS

Model	Description	List	Sale
750	12"x24"x28" 1/4 hp 200 CFM - 750 CFM		Sale 249
8-12	20"x24"x44" 1/3 hp 800 & 1200 CFM		Sale 479

RYOBI SPECIALS

RE600	3 HP Plunge Router v/spd	500	235
BE321	3" x 21" v/spd Belt Sander	310	139

Above sander comes with sanding frame

WDS1600	16" x 32" Drum Sander	980	569

Above sander comes with stand

JM80K	Plate Jointer with case	218	99

JET TOOLS

JJ60S	6" Jointer - open stand		Sale 429
JJ6CSX	6" Anniversary Jointer - closed stand w/ extra knives		Sale 499
JJ8CS	8" Jointer - closed stand		Sale 1189
JWP124P	12" Benchtop Planer		Sale 299
JWBS14OS	14" Band Saw 3/4 HP - open stand		Sale 499
JWBS14CSW	14" Anniversary Band Saw - 1 HP - closed stand, rip fence and mitre gauge		Sale 569
JWTS10JF	10" Contractor Table Saw with 30" Jet fence 1-1/2 HP		Sale 549
JWTS10CWPF	10" Contractor Table Saw with 30" Exacta fence 1-1/2 HP		Sale 749
JTAS10X50W1	10" Anniversary Tilting Arbor 3 HP Table Saw with 50" Exacta fence, table, & legs		Sale 1399
JDP17MFW	16-1/2" Anniversary Drill Press 3/4 HP - 16 speed with mortise attachment & bit set		Sale 439
DC-650	Dust Collector, 1 HP, 650 CFM	319	219
JWP-15HO	15" Planer with stand	1699	1229

PORTER CABLE

9444	Profile Sander Kit	220	99
9444VS	Var/spd Profile Sander Kit	207	119
690	1-1/2 HP Router 8 amp	278	149
6931	Plunge Router Base	139	82
693PK	690 and 6931 plus case		Sale 199
9690	690 Router with case		Sale 159
691	1-1/2 HP Router D-handle	303	164
693	1-1/2 HP Plunge Router Base	338	184
697	1-1/2 HP Router/Shaper	418	235
698	Heavy Duty Shaper Table	238	135
352VS	3x21 v/s Belt Sander w/bag	321	175
9352VS	Above sander with case		Sale 189
360	3"x24" Belt Sander w/ bag	397	214
360VS	360 Sander w/ variable speed	429	229
362	4"x24" Belt Sander w/ bag	412	225
362VS	362 Sander w/ variable speed	446	239
9125	3-1/4" Planer Kit w/ case	250	145
505	1/2 sheet Pad Sander	249	139
330	Speed Block Sander 1/4 sheet	120	68
556	Biscuit joiner w/5556 fence		Sale 135
557	Plate Jointer with tilt fence. Includes 2" & 4" blades for use with standard & face frame plates	400	199
5563	Face frame plates for 557		7.99
7519	3-1/4 HP Router 2 Handle	469	258
7518	3-1/4 HP 5 speed Router	534	289
7539	3-1/4HP v/spd Plunge Router	534	289
7310	5.6 amp Laminate Trimmer	176	104
97310	Laminate Trimmer Kit comp	336	194
7335	5" Random Orbit Sander	254	139
97355	7335 w/ case & dust pick-up	274	149
7336	6" Random Orbit Sander	259	145
97366	7336 w/ case & dust pick-up	284	159
332	Palm Grip Rndm Orb Sander	133	59
333	above sander with dust bag	148	65
333VS	NEW Random Orbit Sander - variable speed	150	85
334	333 Sander with PSA pad	148	65
335	Palmgrip Random Orbit Sander with dual flip pad		Sale 85
310	Production Lam. Trimmer	270	154
347K	7-1/4" "Framers" Circ Saw with plastic case	250	129
743K	7-1/4" "Framers" Circ Saw with case - left hand version	250	129
9737	Tiger Recipro Saw	307	159
9543VS	NEW Top Handle Jig Saw	300	169

New Porter Cable Cordless Nailers !

CDA250	Angle Finish Nailer 1-1/4" to 2-1/2"	500	279
CFN250	Finish Nailer 1" to 2-1/2"	500	279
CMS200	Medium Crown Stapler 1" to 2"	500	279

Porter Cable Pneumatic Nailers

BN125	Brad Nailer -18 ga. 5/8"- 1-1/4"	144	89
BN200	Brad Nailer -18 ga. 3/4"-2"	238	125
FN250A	Finish Nailer -16 ga. 1"-2-1/2"	362	185
DA250A	Nailer -15 ga. 1-1/4"-1-1/2"	412	215
FC350	Framing Nailer - clipped head	558	289
FR350	Framing Nailer - round head	558	289
RN175	Roofing Coil Nailer	504	289

CFBN125 BN125 nailer, CF1400 compressor and 25' air hose
Sale 269.00

Porter Cable Compressors

CF1400	1 HP, 4 gal. Pancake		Sale 195
CF1540	1-1/2 HP, 4 gallon Side Stack		Sale 299
CF2400	2 HP, 4 gal. Side Stack		Sale 325

Porter Cable Cordless Drills

9862	12V Drill Kit w/ 2 batteries	382	159
9862F	9862 Drill Kit with flashlight		Sale 169
9872	14.4V Drill Kit w/ 2 batteries	424	185

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With Electronic Variable Speed

DW431
Heavy-Duty 3" X 21" Electronic
Variable Speed Belt Sander

DW421
Heavy-Duty 5" Random Orbit Sander

Dust-sealed switch provides increased durability

2.0 amp motor operates at 12,000 opm, providing maximum sanding speed for smooth finishes

Sealed, 100% ball-bearing construction delivers longer life

Dual-plane, counter-balanced fan reduces vibration and user fatigue

3/32 orbit diameter provides a tight orbital pattern for smooth finishes

The Controlled Finishing System™ maintains a controllable pad speed and minimizes gouging during startup

The family of **DEWALT HEAVY-DUTY SANDERS** was designed to produce the fastest, finest finishes possible, on all kinds of materials. Take the DW421 Heavy-Duty 5" Random Orbit Sander, which features the DEWALT-exclusive Controlled Finishing System™ to maintain pad speed and virtually eliminate gouging. Its 2 amp motor provides maximum sanding speed while being extremely comfortable to use. And, features like the dust-sealed switch contribute to longer tool life. If greater control is needed, there's the DW423 electronic, variable-speed sander. It has many of the same features, along with speeds that can be varied from 7,000 to 12,000 opm. For fine finishes, the DW411 orbital sander has a 2 amp motor and moves at 13,500 opm. And, for fast material removal, there's the DW431 belt sander. Its compact, light-weight design permits use in tight spaces or on vertical surfaces. So choose the best sander for the job. Choose DEWALT. Guaranteed Tough.™

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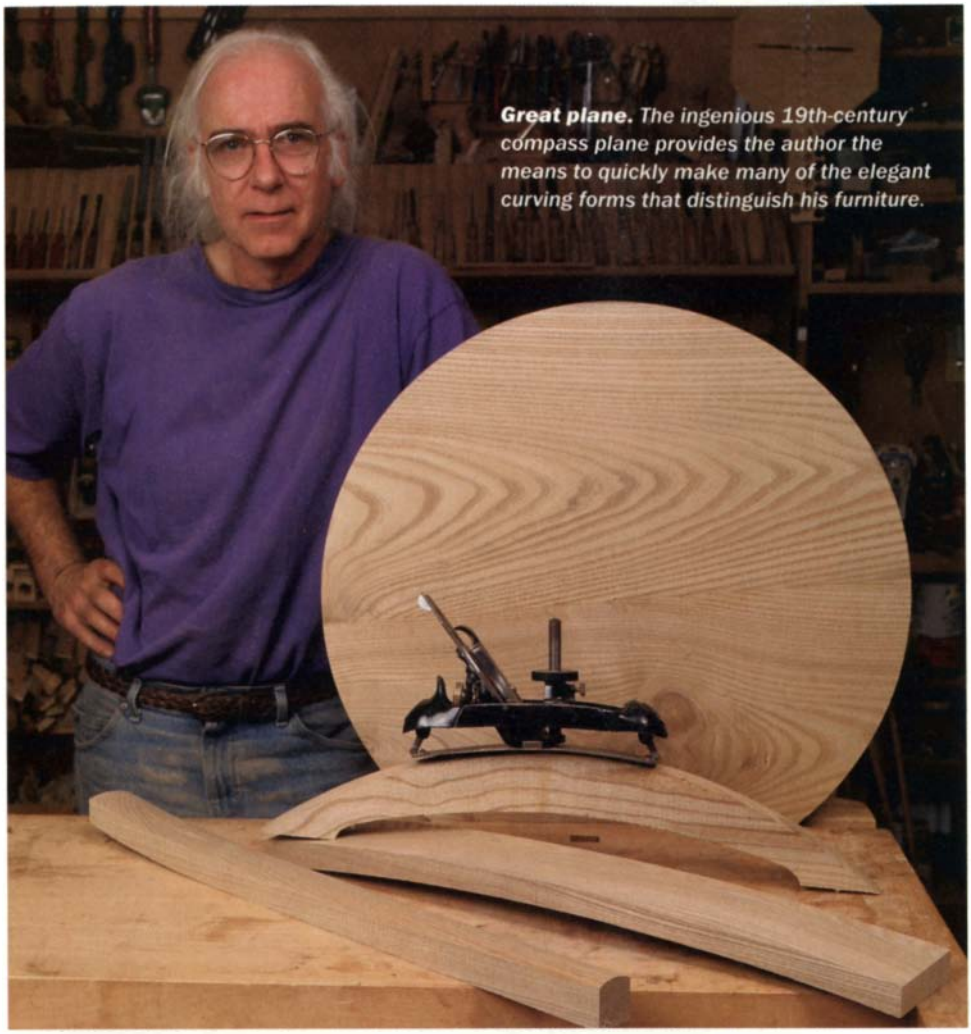
Great shapes—without a shaper

BY HANK GILPIN

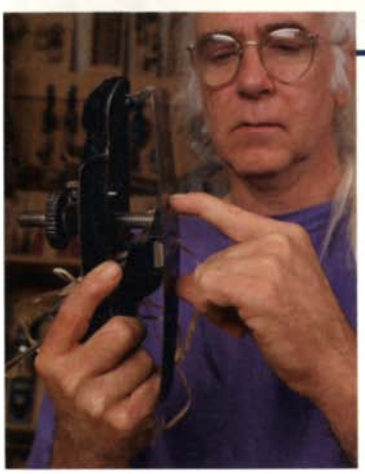


Great plane. The ingenious 19th-century compass plane provides the author the means to quickly make many of the elegant curving forms that distinguish his furniture.

As our sawdusty world races inexorably toward a future filled with computerized machines, let me reintroduce a rather interesting old hand tool—the compass plane. Designed more than a century ago and originally intended to replace the myriad planes required in the wheelwright's trade, the compass plane is not used much anymore. You can still find new ones in tool catalogs and old ones through tool dealers and flea markets, but my guess is that after they change hands they mostly sit on a shelf again. That's a pity, because using a compass plane is a wonderfully engaging experience, one that rewards a certain degree of skill with access to an astonishing array of beautiful curving forms.

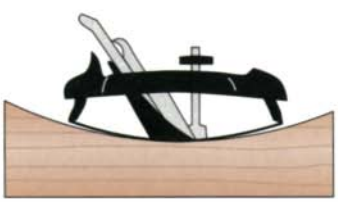
To me, the attraction of the compass plane is practical. It gives me the freedom to create shapes quickly that could be produced on a machine only with elaborate jigging and setups. But it is also plain fun. I love whaling away on a curved piece of wood with the plane, watching the shavings curl off the tool and piling up like ribbon candy.

The shaping can be simple—like a concave drawer front—or quite complex—like a tapered,



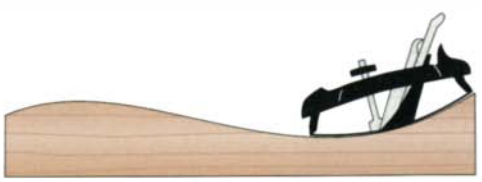
It rides on this much. *More of a shaping tool than a finishing tool, the compass plane is like a spokeshave—in use, the blade and only the center section of the sole contact the work.*

SETTING THE SOLE



TRUE-RADIUS CURVE
Whether the curve is concave or convex, set the sole so that both ends are just off the surface.

CHANGING-RADIUS CURVE
Set the sole to the tightest point in the curve.



CABRIOLE CURVE
Set the sole to the tightest concave curve.

Photos: Jonathan Binzen; drawings: Michael Pekovich

A little more sole. *For cutting a true radius like this round tabletop, the compass plane is set very close to the radius of the circle and rides on more of the sole.*

Cut from flat grain toward end grain.

Crowning moment. *To achieve a crowned cross section on the top of the foot, the author starts by fairing the curve and then cuts a series of facets along it that he blends smoothly into an arc.*

curving leg of changing oval section. I can work slowly with precision or attack with wild abandon. The pleasure of using this tool and the beauty of what it can produce is enough to make me sneak shapes that require it into nearly every piece I design.

The compass plane (also known as a circular plane) is essentially a bench plane with a veneer-thin flexible sole. A screw mechanism allows you to adjust the sole inward or outward to cut convex or concave shapes. The compass plane's blade is held in place with the same type of frog and cap iron assembly found on a bench plane, and blade adjustment and blade sharpening are also the same as with a bench plane. In use, however, the compass plane operates more like a spokeshave, with only its blade and a narrow band of the sole contacting the work. And like the spokeshave, the compass plane is more properly a shaping tool than a finishing tool. In certain woods and situations, you can get the compass plane to produce a fine finished surface, but its real strength lies in producing and fairing the curved shapes, not in finishing them.

Whatever I am making—chairs, tables, chests or just some free-form shape—I begin by laying out the curves. Then I cut quite carefully on the bandsaw, leaving the pencil line. Accurate bandsawing is critical. The compass plane does not do well trying to compensate for a poorly sawn line. It will tend to follow whatever wavers you make with the bandsaw. The better you bandsaw, the easier you'll find it to use the compass plane and to achieve the clean line you drew. Once I'm through with the bandsaw, however, I don't use the pencil line; I plane by eye, fairing and smoothing the curves by look and feel. Any joinery near or along the curved part is generally cut before the curves are bandsawn.

If I am cutting a true arc—a round tabletop, for instance—I set the sole of the plane a shade flatter than the curve I'm after and begin cutting. I'll shape a round top in quadrants, beginning on flat grain and planing downhill to end grain. When one section is done, I reclamp the piece and shape an adjacent quadrant. I generally start shaping a workpiece with a moderate cut and then pull

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FORREST WOODWORKER II: 6"–14" dia. avail.

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10" x 30 T (1/8" or 3/32" K)	~~$99~~	$89	$79
10" x 40 T (1/8" or 3/32" K)	~~$119~~	$107	$95
12" x 40 T	~~$129~~	$116	$103
8" or 8 1/4" x 40 T	~~$99~~	$89	$79
7 1/4" x 30 T	~~$69~~	$62	$55

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6" set	~~$269~~	$242	$229
8" set	~~$269~~	$260	$245
10" set	~~$349~~	$314	$297

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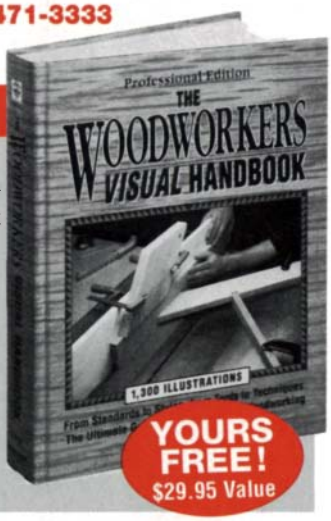

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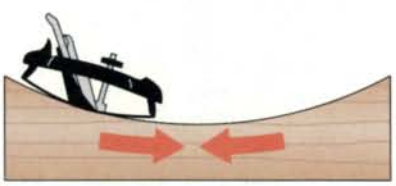
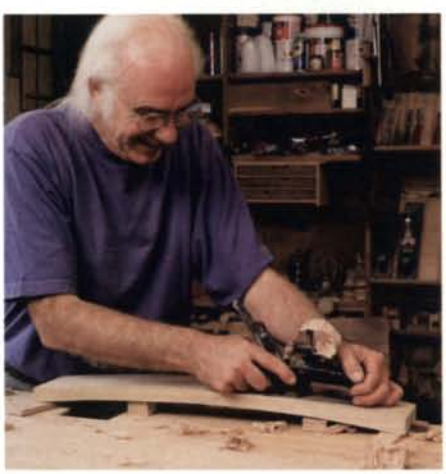


Start final passes at the high points and end in the middle.



He does it for fun. *Once you have the hang of it, the compass plane is a pure pleasure to use.*

back to a fine cut with a lot of hard, downward pressure for the finish. I often leave the fine facets as the finished surface, but if necessary, I'll go back over the shape with scrapers or sandpaper to smooth it out.

Most of the forms or shapes I work, however, are not true arcs. Instead, the radius of the curve changes over the length of the piece. For such curves I obviously can't match the curve of the plane's sole to the curve of the piece. Instead, I set the sole to a radius that will permit it to negotiate any part of the curve. So, if I am planing a convex shape, I set the sole to a slightly flatter arc than the least curved section of the workpiece; for a concave shape, I set the sole to a slightly tighter arc than the most tightly curved section of the workpiece.

Even a workpiece with a reverse or cabriole curve, where one section curves inward and another outward, can often be shaped with the compass plane without changing the sole setting. I set it a bit tighter than the tightest concave curve on the piece and then cut the whole thing at that setting. It works surprisingly well that way, but the cabriole should be fairly gentle, and you should develop your skill on other shapes before trying this one.

Counterintuitively, a curved piece that is crowned in section (the shape of a handrail, for instance, or the foot shown on p. 116) is easier to make with a compass plane than a curved piece that is flat in section. That's because the crowned piece is made by cutting narrow facets and blending them into a crown. On the workpiece that is flat in section, you use the full width of the blade, which makes the cutting more difficult.

Although the compass plane works like a spokeshave, you have eminently more control. But it takes a bit of practice. You must get into a rhythm with arms and body, so your hands feel the wood through the cutting of the plane. It is the balance you achieve with the plane that makes it cut cleanly—keeping the tool in a constant relationship to the wood even though the curve changes. You can gauge this balance by watching the shaving. An even, continuous curling is your goal.

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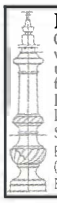
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BY CHRIS MINICK

Shellac: a marvelously versatile finish

My fondest childhood memories are of the times I spent with my grandfather learning the tricks of the finishing trade. Gramp's favorite clear finish was shellac—by any standard, a marvelously versatile finish. It dries quickly, is easy to apply and repair, is compatible with other finishing materials, has good water resistance, and it's edible. Yes, edible. Shellac has been used as an FDA-approved coating on candy, fruit and pharmaceuticals for years. And because it is nontoxic, shellac is absolutely safe to use on children's furniture and toys.

Bugs supply the raw material

Shellac holds the distinction of being the only common finish derived from animals—or more precisely—insects. Shellac resin is produced by a small, red sap-sucking insect (*Laccifer lacca*) indigenous to India and surrounding tropical areas. During a large part of its life cycle, the female of the species exudes a mixture of resin and wax, forming a shell-like casing around herself and her freshly laid eggs. This shell protects the maturing larvae from the elements. (It also kills the mother in the process.)

Once the young have matured and freed themselves from the crust, workers gather the crude lac from the trees, then refine it into what we know as shellac. Dry shellac flakes are available in several different grades, depending on the degree of refinement (see the photo below). Seed lac—the least refined—is a dark reddish brown, while dewaxed super blond—the most refined grade—is a light pale yellow. From darkest to lightest, the furniture-finishing grades of shellac are seed lac, button lac, garnet, orange and dewaxed super blond. Dewaxed versions of garnet and orange are also available.

Water resistance can be very good

Shellac has the reputation (only partly deserved) of being water sensitive. However, unadulterated shellac is totally water resistant. Think about it—this little bug lives in a climate of subtropical monsoons. If shellac were water sensitive, it would not make a very good shelter for the developing larvae.

So why is all shellac not water resistant? Shellac flakes must be dissolved in alcohol to be useful as a finish. Once dissolved, a process called *esterification* begins to chemically alter the shellac molecule. The longer the shellac resin remains in an alcohol solution, the more *shellac ester* is produced. Shellac ester is not only water sensitive, but it also prevents the resin from drying hard, acting as a substance that finish manufacturers call a *plasticizer*.

Therefore, a freshly prepared shellac solution (with a low ester content) will produce a hard, water-resistant finish on wood; but the finish film produced from old shellac (with a high ester content) will be soft and prone to water marks. That's why I always mix my own shellac solutions from dry flakes and use them or toss them within six months.

As a sealer, watch the wax content

Because shellac is compatible with most other finishes, forms an almost impermeable film, adheres well to a wide variety of surfaces and simply looks great on the surface of wood, it has been a popular finish for the last 3,000 years.

Shellac's extraordinary barrier and adhesion properties make it an ideal sealer for use under other finishes. However, only the dewaxed variety should be used for sealing purposes. Normal shel-

Different grades, different shades. *Treatments used to refine various grades of shellac affect the color of the end product. Also, the density of the dried shellac varies considerably. Shown here are the amounts needed to mix a 2-lb. cut of each grade of shellac.*

Photos: William Duckworth

lac contains from 3% to 5% natural wax, which will cause adhesion problems if the wax-laced shellac is used as a sealer. If your shellac solution looks cloudy in the jar, or if two layers have formed after the solution is left undisturbed for a couple of days, the shellac contains wax (see the photo below). The cloudy stuff is the wax.

I have found that dewaxed shellac works exceptionally well as a sealer, even—contrary to common opinion—under polyurethane varnish. Also, I routinely use dewaxed shellac as a sealer for oily woods such as cocobolo, teak and rosewood. The shellac traps the natural oils in the wood, preventing any drying and delamination problems with the finish coat. And I can topcoat with any film finish I choose: lacquer, varnish or water-based varieties.

A thin coat of shellac over a water-based dye stain prevents the stain from bleeding into the topcoat. Similarly, a small amount of shellac added to an alcohol-based dye stain locks the stain into the wood, preventing any subsequent bleeding. And a washcoat of thin shellac applied prior to staining seals the wood pores to give controlled penetration to the stain. This step will minimize blotching with woods such as cherry and pine and prevent highly porous woods such as willow or butternut from absorbing too much stain.

Wax can cause problems. *As a sealer under other topcoats, such as oil-based varnish or polyurethane, use only dewaxed shellac. Unsure whether your shellac contains wax? Leave it undisturbed for a day or two. The cloudy wax will settle to the bottom.*

As a topcoat, shellac looks as good as it feels

Used as a topcoat, shellac imparts a silky, smooth feel and an aged glow to wood that is impossible to achieve with any other finish. My favorite finish for walnut is a coat of linseed oil followed by two or three coats of garnet shellac. Once the finish is rubbed out and waxed, it will pass for one looking a hundred years old. Button lac has the same aging effect on cherry.

A great "no-finish" finish for Craftsman- or Shaker-style furniture is to apply one or two thin coats of shellac to the raw wood, followed by a few coats of dark furniture wax. The piece will have a warm, aged look without showing any detectable surface film.

Shellac is also an ideal coating for the insides of drawers or cabinets. It provides good protection from daily abuse and won't leave that lingering varnish (or lacquer) smell in the cabinet. Incidentally, a coat of shellac on the inside of a musty smelling cabinet will trap the offending odors inside the wood, eliminating a problem common in antiques.

Mix your own for better quality

Mixing a batch of shellac is simple to do. I like my shellac solutions on the thin side, so I weigh enough flakes and denatured alcohol to make a 20% to 25% solids shellac solution (I'm a chemist, remember). The rest of the world, however, talks about shellac solutions in terms of "pound cut"—an old finisher's term that refers to the number of pounds of shellac flakes dissolved in 1 gal. of denatured alcohol. A 20% solution—100 grams of flakes dissolved into 400 grams of alcohol—is about the same as a 2-lb. cut.

To make a smaller amount by eye, mix a batch as follows: Fill a quart jar half full with dry shellac flakes. Add denatured alcohol until the flakes are just covered with liquid. Soak the mixture and shake it occasionally until all of the flakes are dissolved—overnight is usually sufficient. If the solution is too thick, add alcohol; if it's too thin, add flakes. The precise cut is not important, anyway. Experience will soon teach you the right ratio.

Apply by brush, rag or spray gun

Shellac can be applied by any method you prefer. I brush small projects, spray large ones and use a rag for my sealer coats. Sounds easy, and it is, but shellac has some peculiarities that set it apart from other finishes.

Because shellac dries rapidly, it tends to blush when applied on warm, humid days, when moisture in the air gets trapped within the finish. Usually this whitish, cottonlike blush will disappear as the film dries. But if it doesn't, a thin coat of alcohol applied to the dry surface will correct the problem. During the summer, I apply my shellac finishes during the cool early morning hours, and I rarely have blushing problems. You should always work with a full brush and flow the shellac onto the wood rather than brushing it back and forth as you do with paint.

If you discover a missed spot, wait for the coat to dry thoroughly before attempting a touch-up. Brushing after the shellac has set but before it is dry will certainly wrinkle the finish film. Although shellac will dry to the touch in 10 to 15 minutes, resist the temptation to apply another coat too quickly. The terrific barrier properties that make shellac a great sealer also trap a small amount of the alcohol solvent in the drying finish film. If sufficient drying time is not allowed between coats, the trapped alcohol will cause the whole finish to remain soft for weeks. I've learned the hard way to adhere to a strict drying schedule. I apply no more than three thin coats per day, scuff-sanding lightly between coats. The first coat dries for two hours, the second for four hours and the third overnight.

Cleanup is a snap. A half cup of sudsy household ammonia in 1 qt. of water makes a good cleaning solution for brushes and spray equipment. Be sure to rinse your spray gun with plenty of water after the ammonia wash, to keep the ammonia from pitting the surface of aluminum parts.

Preserve shellac finishes with a little wax

Shellac finishes are easy to maintain. A good paste wax will minimize surface dings and provide some added water resistance. Occasional rewaxing restores that protection. The original shellac finish should dry at least 48 hours before you wax it for the first time. Should the surface become damaged with water spots (unlikely if fresh shellac was used), the offending white ring will usually disappear when swiped with an alcohol-damp rag. For more severe damage, lightly sand the damaged area, then recoat the entire piece with fresh shellac. New shellac will bond to old shellac without witness lines or adhesion problems.

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What if a wall could speak, but instead of having an ear for gossip, it had an eye for things beautifully made? So instead of revealing indiscretions, it celebrated creativity. It might speak of millwork and filigree, carving and architecture, painting and sculpture and carpentry. And if it said all this in a mysterious tongue that sounded like the language of woodworking, it might look like this entryway designed and built for the Ontario Crafts Council by Gord Peteran, a sculptor, painter and furniture maker in Toronto.

Photos: main and top detail: Jeremy Jones, portrait: Elaine Bro