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June 1994, No. 106
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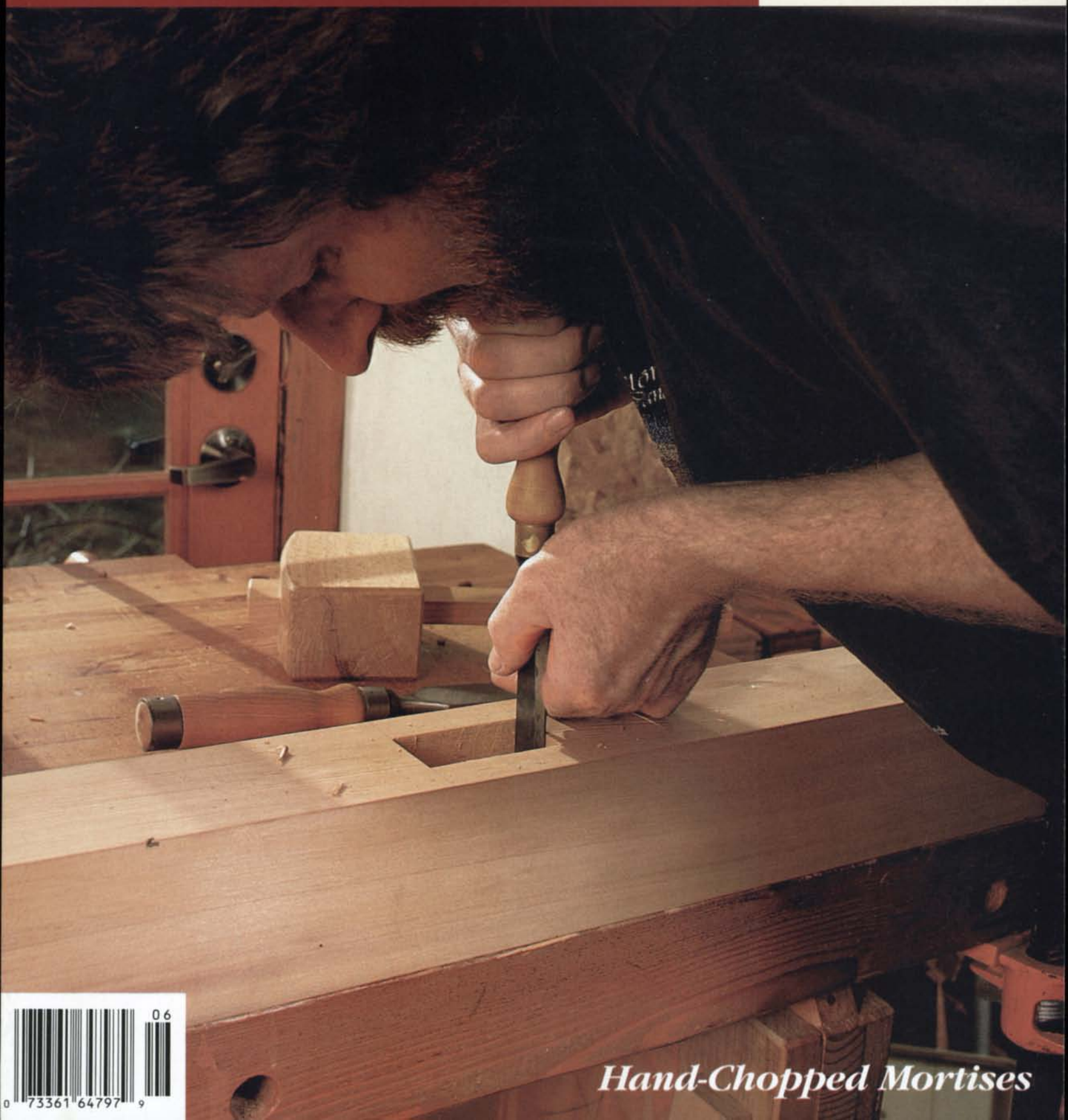

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Fine WoodWorking®

May/June 1994 No. 106

DEPARTMENTS

ARTICLES

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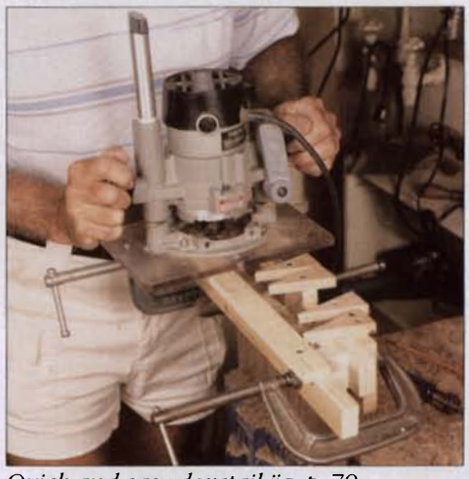

Quick and easy dovetail jig, p. 79

On the Cover: *Washington-state woodworker Tony Konovaloff hand-cuts the mortises for his trestle table. For more on the table and Konovaloff's techniques, see p. 60. Photo: Vincent Laurence*

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Hitting home—When we published a call for entries in *FWW* #103 for *Fine Woodworking's Home Furniture*, we had no idea how many people would be attracted to the concept of this new book. What we were looking for were fine examples of practical furniture pieces, not artwork meant for a gallery, but solid craftsmanship in pieces meant to be used. The response was beyond our expectations.

It started as a trickle; then, sometime just after the holidays, the trickle turned into a small, steady stream. But just as the deadline door was closing, the stream turned into a deluge big enough to rival some of the record storms we had here in New England this winter. It took us weeks just to get the entries sorted and logged into a computer data base to keep track of them. It wasn't until that was done that we really knew what we had: nearly 800 entries, most of them of high caliber. Considering that we asked for not only photos but written explanations and even drawings, those entries represent a serious effort by some dedicated woodworkers.

But there was more astonishment to come. We got a hint of it when we started opening the packages and finding multiple entries, as many as nine from one woodworker. The nearly 800 entries came from fewer than 500 woodworkers.

Just for openers—Speaking of opening packages, we were as impressed by the variety of pieces submitted as we were by the variety of packaging used. Entrants found a myriad of solutions to the problems of protecting their entries and making sure they arrived safely.

Oh, sure, there were lots of standard envelopes, ranging from letter size to the ubiquitous manila envelopes and a rainbow of special courier packs, as entrants worked to beat the deadline. But then there were tubes and cartons, too.

The real fun began with what was inside those containers. There were envelopes inside envelopes inside more envelopes. Photos were tucked into everything from photo-finishing envelopes to plastic sandwich bags to professional clear sleeves. Some of the entries were presented in fancy binders with typeset covers; others were handwritten on loose-leaf notebook paper.

But topping them all was one big box. It arrived rather unceremoniously on our secretary's countertop. The box was about 2 ft. on each side, and we couldn't imagine what kind of an entry was inside. On opening, we all ducked for cover as the Styrofoam peanuts began cascading out. In the center of the Styrofoam was a package wrapped tightly in that plastic bubble wrap my kids so delight in popping. Inside that were five glossy black cardboard presentation folders, each with an entry.

Whether your entry was one of the handwritten ones or professionally packaged, be assured we'll look hard at all of them. What we've seen so far assures us it won't be difficult to fill up the new book with some finely crafted and truly practical work in wood. Thanks to everyone who took the time to enter. Watch this space for updates on the progress of the book.

Closing in on clamps—Often the simplest tools in our shops play crucial roles in the success of our projects. And just as often, it seems those simple things are overlooked when it comes to articles about selecting and using tools. Bernie Maas helps to fill that gap with his article on clamps (see p. 54). Bernie's extensive experience in his own shop and as a university woodworking instructor shows in his thoughtful comments and handy tips.

But the article is just the beginning. Bernie has also helped us make another Video Take (see p. 59), offering readers a video tour of clamps and clamping procedures. Between both the video and the article, even the most experienced woodworker is likely to learn something new about these basic and essential woodworking tools.

Then, once you have a good grip on the world of clamps, you can turn to Jim Tolpin's article on p. 74 to put those tools to use making smaller stock into bigger boards. With today's premium prices for wide boards—if you can find such boards at all—more and more woodworkers are edge-gluing and face-gluing stock to get material of the dimensions they need. Jim describes his practical approach, even offering insights into such mysteries as how much glue to use.

Left is left and right is...oops—A number of sharp-eyed readers were quick to spot that we flopped a photo of Cameron Russell's captain's desk on p. 44 in *FWW* #104. The drawers really belong on the right side of the desk and the door on the left, as was correctly shown in the drawing.

—William Sampson, editor

Fine WoodWorking

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Writing an article

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A router without good table manners—In your February issue (*FWW* #104), Pat Warner recommends the Porter-Cable 7518 router as the "best choice by far for a router table." I've been using a 7518 in this capacity for over a year and have come to the conclusion that although the 7518 is a powerful and well-built router, it is definitely not suited for use in an inverted position.

The principal problem is with the height-adjusting mechanism. When inverted and mounted in a router table, chips fall into the spiral grooves machined into the base and can gouge and scar both the base and the body. In extreme cases, these chips can even jam the base and body together.

I would also caution anyone mounting a router as powerful as the 7518 into a table to make doubly sure that the pinch bolt that locks the base to the body is tightly fastened before the router is turned on. I once switched on the router with the bolt loosened, and the start-up torque was sufficient to cause the body to unscrew from the base. A 10-lb. router motor bouncing around the bottom of your router table at 21,000 rpm can really liven up your day.

I would also advise devising a means of positively locking the mounting plate to the table. The 7518 exerts so much torque that in spite of its heavy weight, it is possible, in the case of a severe catch, for it to lift the entire plate out of its recess. For these reasons, I feel that no router should ever be mounted in a table without a separate on/off switch mounted where it can easily be reached if the router gets loose. It's quite difficult to hit the switch on a router that's flying around the shop on its own.

I recently experienced an incident that strongly reinforces my feelings on this subject. I was routing a piece of ½-in. acrylic (for a router jig) with a ½-in. flush-trimming bit when the bit grabbed the piece, tearing it from my grip and jamming it between the bit and the mounting plate. Before I could switch the router off, it had pulled itself on top of the table. The bit was ruined and pieces of carbide had fallen into the height-adjusting mechanism. I managed to free the body from the base and smooth the gouges out of both, but the mechanism is still rough and grabs.

I left the shop muttering under my breath that none of the router reviews that I had read prior to purchasing the 7518 had mentioned any of these drawbacks. Ironically, this happened the same day that my February *Fine Woodworking* arrived, and within a few hours, I read Mr. Warner's article.

—Elwyn "Woody" Collins, San Jose, Calif.

Take a plunge router for use in tables—The question asked in the "Q & A" section (*FWW* #104) was "What type of router is better suited for router tables, plunge routers or standard routers, and why?" The question was what type, not what brand. The answer sounded like an ad for Porter-Cable, and there are plenty of other routers that would work just as well if not better.

Also, I disagree with Pat Warner's recommendation on a fixed-base router. Pat says that a router table is primarily a single-depth machine. This is far from the truth. Many times it is necessary to make small incremental passes on a joint or a decorative edge. Try adjusting a fixed-base router under a table up 1/16 in.; it's not too easy. In fact, many router manufacturers sell height-adjustment extensions whose purpose is to allow you easily to change the height of your plunge router mounted under the table. *—John Ardizzoni, Saugus, Mass.*

Strength of rabbet joints—I'd like to call your attention to an error made in "A Dozen Ways to Build a Box" (*FWW* #104). Gary Rogowski does an excellent job of discussing various joints, but his statement that a double rabbet joint is stronger than a simple rabbet due to its increased surface area is incorrect. Assuming that each rabbet is cut to the same depth, the area of the joined surfaces will be identical. In fact, even if one were to make a triple or quadruple rabbet joint, surface area would not increase. This is easily demonstrated by simply drawing and measuring.

I would agree that a double rabbet is stronger, but I would attribute this to mechanical factors rather than surface area.

—Vern L. Orth, Canoga Park, Calif.

Orienting wedges in tenons—In "A Dozen Ways to Build a Box" (*FWW* #104), the illustration of the mortise-and-tenon joint on p. 78 makes me think that the artist did not carry out the intention of the author. Wouldn't that joint be far better with the wedge rotated 90° from the orientation shown? I'm sure Gary Rogowski would not actually do a joint that way.

—R.S. Lee, Calgary, Alta., Canada

EDITOR'S NOTE: Mr. Lee is correct. The wedges in the mortise-and-tenon illustration were inadvertently rotated 90°. The correct orientation for these wedges is perpendicular to the grain of the mortised board.

Finishing is an art—Chris Minick's article "Choosing a Finish" (*FWW* #104) was very nice. Finishing furniture is so controversial, though, that you can get a person to argue with himself on the topic. In one place, Minick writes, "on-the-wood finishes lay on the surface and do little to accentuate the grain or color of wood" and then lists shellac as an on-the-wood finish. Next page he writes, "I brushed on fresh, super-blond shellac to enhance the grain...." I don't think this indicates confusion; it's just that furniture finishing is as much an art as a science.

There are many good hints on finishing practice and a lot of good information in that excellent article, but experienced finishers are bound to disagree with some of what Minick writes. Rather than explaining where Minick is "wrong," I hope they will continue the *Fine Woodworking* tradition by writing articles describing their methods, so we can all benefit from their experiences and viewpoints. *—David Dunthorn, Oak Ridge, Tenn.*

Hand-rubbed varnish for tabletops—I have received a great deal of help from numerous articles on finishing by Chris

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Minick. "Choosing a Finish" (*Fine Woodworking* #104) was no exception. Chris Minick will not lose his load of walnut to me: Compared to other woodworking operations, I do enjoy finishing the least.

I do agree that for protection, such as required for a tabletop, varnish is my only choice. I do not have a spray booth for lacquer. A brushed-on semigloss varnish is in itself not a quality finish. After 40 years of trying everything else, I have returned to hand rubbing the varnish with fine pumice and water or oil. It really is not that difficult if one limits this finish to the top only. (I use a Danish oil or gel varnish on the vertical surfaces.) I have used an alkyd varnish in preference to polyurethane because I am under the impression that the latter would be more difficult to rub due to its hardness. I am curious that Chris did not mention this and will be interested in his comments.

—Marshall G. Baldwin, Westport, Conn.

CHRIS MINICK REPLIES: You hit the nail on the head. The hardness of a finish dictates how well it rubs out. But I'm afraid you have it backward: Harder more brittle finishes like nitrocellulose lacquer or shellac rub out easier than soft, more flexible finishes like polyurethane varnish.

Rubbing out a finish involves scratching the surface with a succession of finer and finer abrasives. Because hard finishes scratch easily, rubbing out is easier. But soft, flexible finishes deform when abraded instead of scratching, which makes rubbing out more difficult. Polyurethane varnishes come in varying degrees of flexibility. Spar varnish, exterior polyurethane varnish and floor varnish are designed to accommodate a great deal of wood movement, hence they are more flexible and difficult to rub out. Conversely, interior polyurethane or alkyd varnishes are harder and rub out easier. Try a few varnish brands in your shop; you will be surprised at the differences.

Shellac shelf life—I enjoyed reading Chris Minick's article "Choosing a Finish" (FWW #104) and found it very informative. However, I wanted to clear up a common misconception in the article regarding shellac. Chris states that shellac has a short shelf life, so it's best to prepare your own solution from dry flakes. While this may be true for some pre-mixed shellac on the market, it is not true of Bullseye shellac from Wm. Zinsser Co. Inc.

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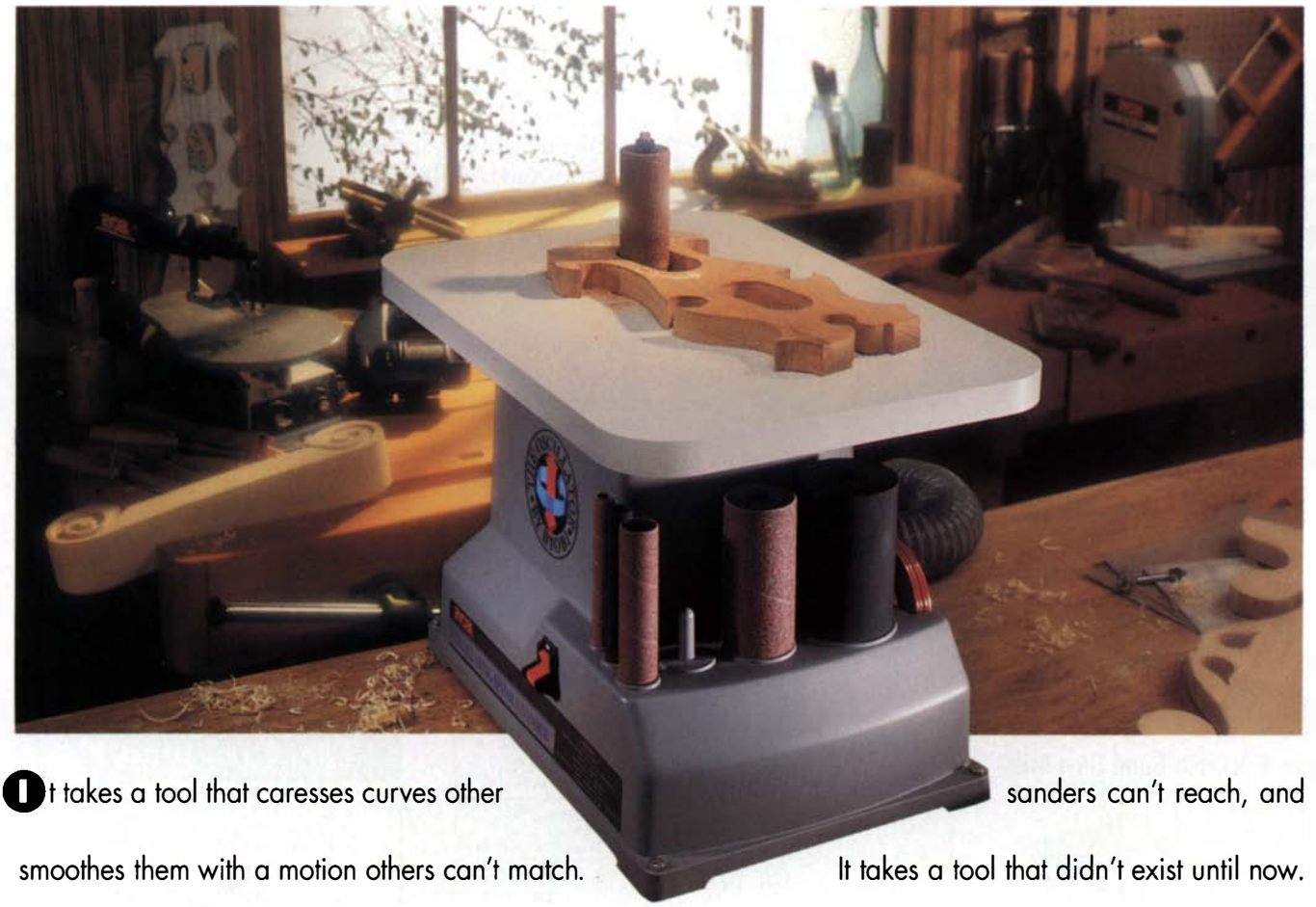
—Diane Wood, product manager, Wm. Zinsser Co. Inc., Somerset, N.J.

Saving diseased elms—I am catching up on my reading—elm trees (FWW #103). Yes, I have a dandy that I nursed through the Dutch elm disease. I read about a cure in our local newspaper. It used lime, Epsom salts and plenty of water. The girth of the trunk was twenty-some inches when it got cured. Today it has a 93-in. girth.

—Donald W. Assel, Canton, Ohio

Sharpening stone dangers on the jointer—Reading Peter Tischler's suggestions on honing jointer knives in your recent article "Jointer Savvy" (*FWW* #102) set off warning bells in my mind. Many years ago, after installing a new set of knives in a 4-in. jointer, I decided to hone a secondary bevel using a natural sharpening stone in much the same way as the author de-

Man has always been attracted to curves. But until now, no one quite knew how to sand them.



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scribed. Placing the stone on a carefully adjusted outfeed table and just grazing each knife edge, I quickly flicked the power switch on and off to (I thought) barely spin the cutterhead. I did not, as Tischler suggests, let the cutterhead get up to speed. My experience was horrendous and still brings back nightmares.

The stone immediately broke into pieces, apparently jamming between the cutters and the infeed table. Two high-speed knives shattered like glass, sending a shower of extremely sharp steel shrapnel flying in every direction. Several pieces penetrated a shop wall some 12 ft. away. By the grace of God, or sheer dumb luck, I was not injured. The jointer was not so lucky. Huge chunks were missing from the infeed table, a set of knives was ruined and one gib plate was scarred beyond repair. Tischler's procedure may work for him and others, but even after 15 years and a lot of professional experience under my belt, I'm still not brave enough to try it. *—Skip Taylor, Highlands, N.C.*

Starting a guild is worth the effort—Your editorial "Going for the guild" in the February 1994 "Editor's Notebook" (*FWW* #104) was excellent. I started the South Florida Woodworkers Guild about five years ago. I'm a hobbyist, but my work is now of gallery quality thanks to all I've learned through the guild. Aside from the learning experience, it has been a lot of fun. Many of the members are professionals, and the skill level of the guild has improved over time.

I would like to suggest that anyone interested in starting a guild should find a place to meet on a regular basis, and put flyers in places where woodworkers normally go. Also, local newspapers that have columns on what is going on in the community should be contacted. Above all, do not get discouraged if the growth is slow; it takes time. We started with seven members of which only three are still active. Our guild now has about 50 members. Each year our guild is attracting good talent and is now fun and very educational. *—Burt Halpern, Hollywood, Fla.*

Recipe for flattening veneer—In the "Q & A" section of *FWW* #104, a fellow was asking how to flatten some Carpathian elm burl veneer. John Kriegshauser's reply was good; here's some additional methods that my wife, Lora Hunt, and I use successfully in our professional marquetry art business.

We use a glycerin, alcohol and water mixture to wet the veneers that need flattening (the ratio is 3:1:6). We keep this mixture in a spray bottle and lightly spray each side of the veneer piece with the finest spray-adjustment setting, barely darkening the entire surfaces. Let them sit for three to four minutes to allow the moisture to soak in.

Our quickest and most successful flattening method is to use an old dry-mount press turned to its hottest setting. We place 10 pages of newspaper on the bottom of the press (to absorb moisture), insert the veneer between two sheets of kraft paper and clamp inside the dry-mount press, leaving it for about 30 seconds. After removing the veneer, which is perfectly flat, we place it under some plywood until ready to use, preferably the same day, because, as Kriegshauser correctly stated, the burl will gradually wrinkle up. Our dry-mount press is 16 in. by 24 in., so if the veneer piece is longer than that, the flattening can be done in overlapping sections with equal success.

Other methods that also work include using a vacuum-bag veneer press, preparing as above, or the veneer simply can be ironed using a hot hand iron after preparing as before. Because we work with a lot of veneers every day, including burls, the investment in the second-hand dry-mount press was well worth

the $35. If readers don't want to buy one, a school or photography studio just might let them use one at no charge.

—Spider Johnson, Mason, Texas

Complacency might cut you short—Recently, there has been a great deal of interest in jointer safety. I've read the articles and letters with some personal interest. On Nov. 27, 1993, I stuck my right index finger into my jointer. For the rest of my life, I'll have a constant reminder of the day I did something really stupid because of complacency.

I use guards, push sticks, hearing protection, respiratory protection and safety glasses religiously, but on that day, I became complacent. I usually run stock on my jointer large enough to hold safely without a push stick. It never even crossed my mind that I should not hold a 1⅛-in.-sq. stock without a stick until it rolled. And *zap!*, I lost a half an inch of my finger. All the safety equipment in the world won't help if you get so caught up in what you are doing that you don't think to use it.

—Thomas Usher, McLoud, Okla.

Machine small parts from larger stock—In the August 1993 "Methods of Work" (*Fine Woodworking* #101), you showed Abijah Reed's custom push stick for advancing long, thin pieces through the saw. Then, in your correction in "Methods" (*Fine Woodworking* #104), you explain the blade should not extend above the work. You and the originator of this technique, Mr. Reed, are missing the point.

Under no circumstances should a woodworker attempt to machine a piece of wood that small. This should never be a problem. I have always been taught to machine such small parts on thick stock, and then I rip the intended piece from that. It is extremely dangerous to attempt to rip, to rout, to shape or to mold such a thin piece.

—R. Adam Blake, Cincinnati, Ohio

Not a seaworthy captain's desk—The more I looked at the plans for the captain's desk (*FWW* #104) the more I realized that this desk violates one of the strongest rules I have developed in project building: the fewer directions of access the better. This desk requires access and clearance from three directions. It would be improved by putting the door for access to the chart storage under the desk, cutting the access directions to two, front and right. If kneeling to get under the desk seems awkward, getting in next to the wall will be nearly as bad, as one cannot step back to look in the opening.

As now built, if used in "cramped ship's quarters," either the desk must be moved to get at the drawers and door (but on a ship, it should be fastened down), or whatever is beside the desk must be moved. The desk cannot be put in a corner. At best, a wastebasket must be placed before the door and removed for access, and space must be left for the drawers to pull out.

—Mike Firth, Dallas, Texas

Belt sander requires experience—I'd like to commend Mr. Christian Becksvoort for not only producing a beautiful chest of drawers (*FWW* #104), but also showing a couple of interesting tricks in the alignment and surface preparation of such a piece.

There is one point I must bring to the attention of those readers who don't build furniture on a daily basis, though. The only way a flat surface will be achieved using a belt sander is with experience. If you are a weekend woodworker or if furnituremaking is a once-in-a-while thing, do not use this process unless you're sure everything is aligned and true, or the end result will

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be far from the one you had hoped for.

You can and will gouge the sides due to uneven pressure, or if one drawer should be lower than the rest, you'll try to catch up with that one lower drawer face. Something is going to give somewhere. A belt sander is a useful and important tool in any shop, but nothing takes the place of experience but more of it.

—L. Neal, Colchester, Conn.

Planing tips—In a recent letter (*Fine Woodworking* #104), Eugene Hise says that because the plastic rollers on portable planers won't press out a cupped board, it is unnecessary to joint one face before thickness-planing if taking light passes. However, planing out cup isn't sufficient to produce a flat face; one also needs to plane out any twist or bow (see "Stock Preparation" by Mark Duginske, *FWW* #92). Unfortunately, the beds on all thickness planers are too short to plane a board flat with any kind of lengthwise warp. Comparatively, the tables on jointers are much longer than the beds of any portable thickness planer. A sled jig can be constructed to assist in supporting and guiding short boards straight through a thickness planer (*FWW* #97, p. 16), but this doesn't work well with medium-length or longer boards.

Also, I feel the chastising Mr. Hise gives *Fine Woodworking* for not presenting methods of work that are appropriate to home shop budgets is completely uncalled for. True, Peter Korn did recommend a $1,500 jointer, but he also had a sidebar to the "Flat, Straight and Square" article, which Mr. Hise does refers to, called "Flattening the face of a board with a handplane" (*FWW* #102). Yet another example of an alternate, low-cost means to flatten a board's face was presented in *FWW* #77: "Surfacing Stock with a Router."

—Bennett Leeds, Los Gatos, Calif.

A lesson in wood identification—A friend of mine invited me to his newly occupied residence, an older, well-built home in the Coos Bay area of Oregon (once noted as the world's largest lumber port, but no longer). During the visit, I was requested to inspect the home closely. The floor was of particular interest.

Mike and his wife, Pat, were from out of the area and were bewildered by this strange looking "oak" floor. I was a bit more familiar with this fine-grained, clear, old-growth Douglas fir (*Pseudotsuga taxifolia*) as it was. As Mike and I politely bantered between ourselves about the distinguishing qualities of oak and Douglas fir, a girl in our midst spoke out.

His daughter, not yet 3, said, "You are both wrong."

At which point, I felt totally defeated with the child's response. Full of expression, patient but wide-eyed, Mike stayed still. I replied, "It's not fir?"

"No, it's not."

"Then, Katey, what is it," I asked.

Looking up, elated to give us the answer, she responded, "It's wood."

—Thomas G. Smith, Coos Bay, Ore.

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—James P. Chiavelli, associate publisher

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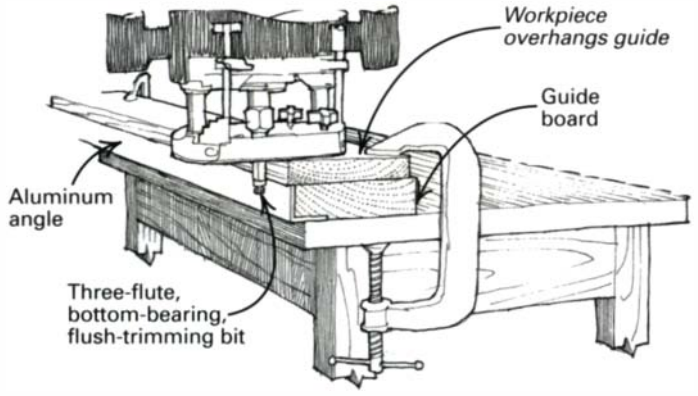
Jointing boards with the router

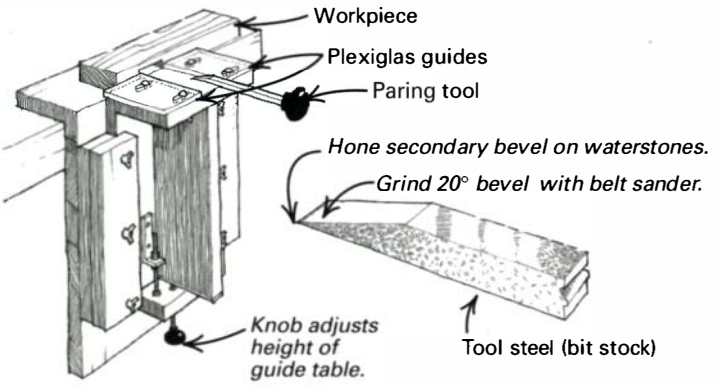


If you don't have a jointer, this easy-to-use jig lets you joint boards with a router. The method depends on a simple aluminum-angle-edged guide board and a commercial-grade flush-trimming bit. I use the Bosch #85602M bottom bearing, flush-trimming bit, which features three cutting flutes, a replaceable bearing and a 1½-in. cutting length.

To construct the jig, rabbet the guide board to receive the aluminum angle. Attach the angle to the guide board with countersunk screws every 6 in. or so. Now clamp the workpiece over the guide board so that it overhangs the aluminum bearing surface by ⅛ in. or less. I like to use deep-throat Vise-Grip clamps to clamp the workpiece to the guide board, but C-clamps will work fine. If the workpiece is badly bowed, take two cuts, or rip the board on the tablesaw first. This concept has worked so well I made a smaller version for jointing the ends of crosscut boards. For this operation, it's important to double-check your depth setting to make sure the bit clears the angle. Also, take light cuts (less than 1/16 in.) to avoid burning the workpiece.

—Andrew A. Westerhaus, Burnsville, Minn.

Mortise shaving fixture



With this fixture, you can produce perfectly sized mortises with glass-smooth walls and ends. The process is much slower than using a hollow-chisel mortiser, but the results are superior. Use it whenever a joint will be highly visible.

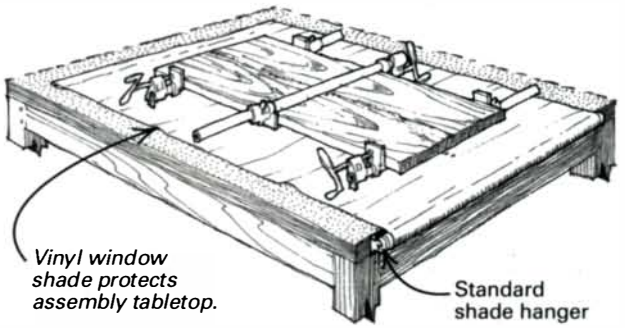
The fixture consists of two parallel tables, one that holds the workpiece and another that guides the paring tool. An adjustment mechanism at the bottom of the fixture raises or lowers the guide table into position where it then locks in place with wing-nut tightened blocks.

The secret to making perfect mortises is in the paring tool. It must have a long primary bevel, be sharp and perfectly flat, perhaps even slightly concave, on the back. I make my tools from square-profiled tool-steel bit stock, which is available from MSC Industrial Supply Co. (151 Sunnyside Blvd., Plainview, N.Y. 11803; 800-645-7270) or any well-stocked industrial supply house. The steel comes in several sizes, but I use the 5/16-in.-sq. size the most. Attach a handle to an 8-in. piece of steel, and then grind the steel at a steep bevel, somewhere between 15° and 20°, on the belt sander. This works better than a high-speed abrasive wheel because the belt cuts fast but doesn't overheat the edge. Now hone a secondary bevel using a honing guide and a progression of Japanese waterstones. Don't flatten the back of the steel as you do when sharpening a regular chisel. The paring and corner cleanup go better if you just leave the back of the tool alone.

To use the fixture, lay out the mortise with a sharp awl. Hog out most of the waste with a Forstner bit in the drill press. Leave the mortise layout line. If needed, trim out large waste areas of wood with a regular chisel. Now place the workpiece in the fixture, and clamp it in place. Adjust the height of the guide table to the mortise line, and lock the Plexiglas end guides at the ends of the mortise. Keeping the paring tool flat on the guide table, pare the sides of the mortise. Finally, turn the tool 90° to trim the end of the mortise.

—Bill Webster, Chillicothe, Ill.

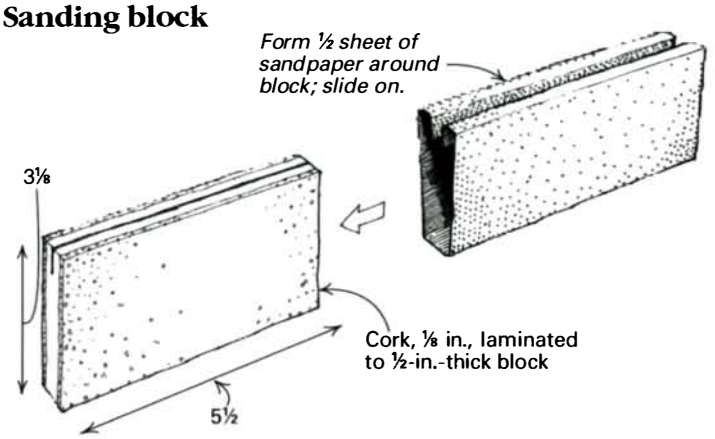
Window-shade assembly-table protector



Here's a simple solution to the problem of glue squeeze-out dripping onto your assembly table when clamping. Attach a common vinyl window shade to the end of the table with standard hanger brackets. Before glue-up, pull the shade over the bench. Any glue squeeze-out will fall on the shade where it will harden. When you roll up the shade, most of the glue will fall off where it can be swept up. The shade stores out of the way ready for the next project. Vinyl shades are available in a variety of widths to fit your bench and are quite durable, especially the heavier shades made for darkening rooms.

—Fran Luta, Brownstown, Pa.

Sanding block



These sanding blocks are sized to take a half sheet of paper. The slot in the block will hold the paper in place without glue or wedges. Cut the block to the dimensions shown in the drawing above, and add a ⅝-in.-deep sawkerf along one edge. A ½-in.-thick block with ⅛-in. cork laminated to each side makes a good sanding block.

To install the sandpaper, slide one end of the paper into the kerf; bend the paper tightly around the block to form the corners. Remove and insert the other end of the paper into the kerf,

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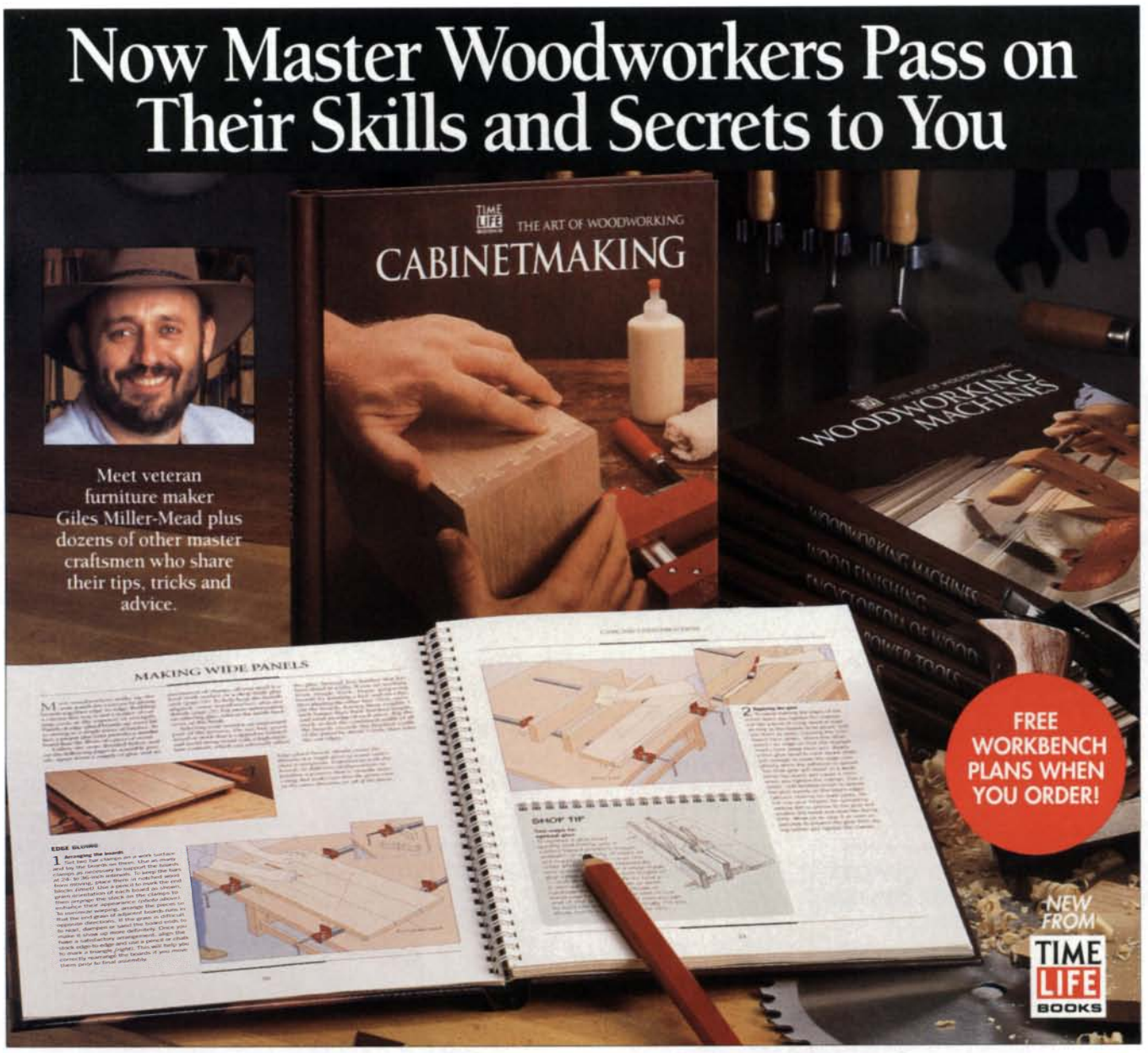

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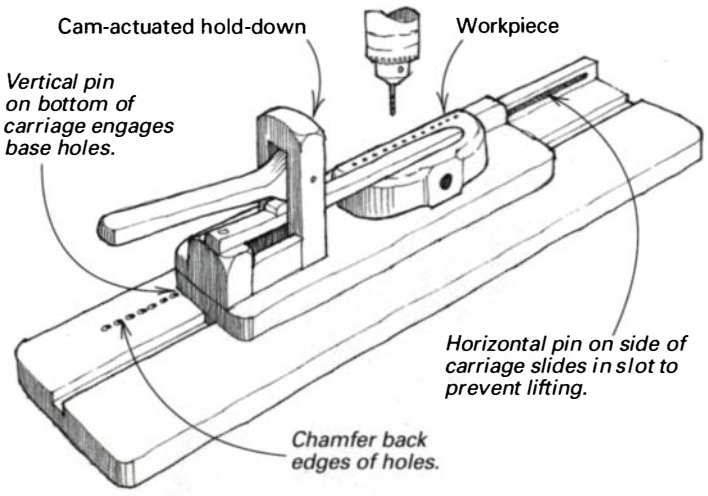
and bend it the other direction around the first couple of corners. Hold the two ends of the paper together, and slide it onto the block as shown. Friction will then hold the paper in the slot.

—Martin Harrison, San Francisco, Calif.

Boring jig with cam-lever hold-down

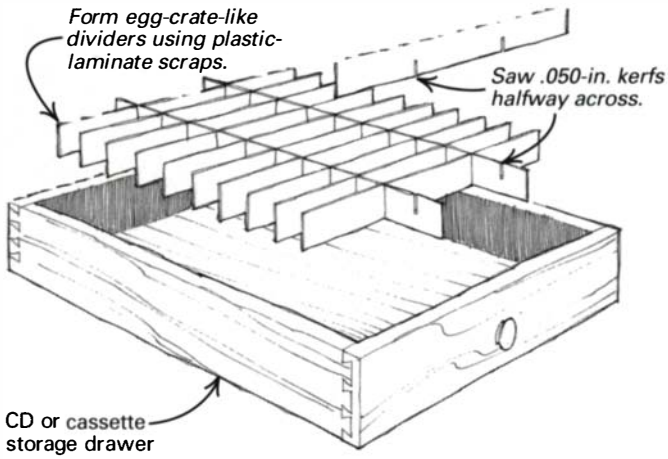


When I began making production runs requiring 12 evenly spaced holes in 50 blocks, I designed this jig, which incorporates several features, including a cam-activated hold-down and a sliding pin to prevent the fixture from lifting up. The jig consists of two main parts: the carriage and the bed. The carriage carries the block to be drilled and the cam-activated hold-down. Embedded in the bottom of the carriage is a ⅛-in. pin that engages carefully drilled holes in the bed. Each hole is slightly filed on the back edge to provide a ramp that the pin can ride down into the hole.

Because the drill press tends to lift the carriage when the bit is backed out of the hole, I added a pin to the back edge of the carriage and routed a slot in the side of the bed for the pin. This keeps the carriage snug to the bed while allowing the other end of the jig to be lifted slightly to advance to the next hole.

—Daniel R. Maxon, Essex Junction, Vt.

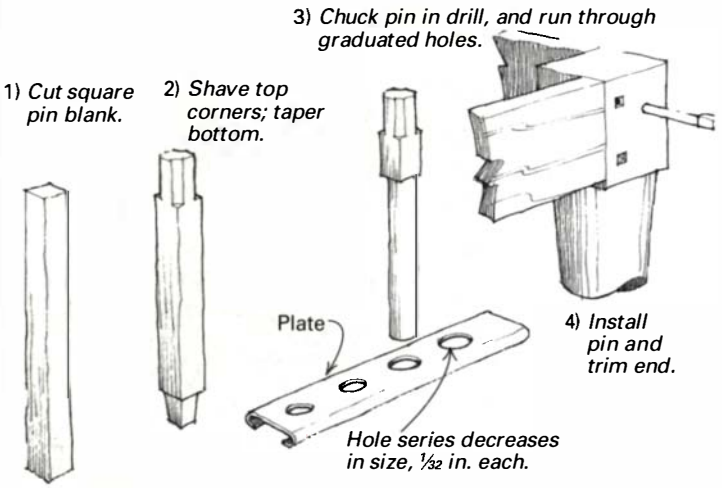
Drawer dividers from plastic laminate



My one-man shop generates a lot of plastic-laminate scraps, which I use to make egg-crate drawer dividers for CDs and audio and video cassettes. To make the dividers, rip the laminate

scrap into 2-in. strips. Then stack the strips, and cut narrow slots halfway through. You'll need a tablesaw blade with a .050-in. kerf for cutting these egg-crate slots. I bought the blade I use from Blaisdell Saw (4040 S.E. Division, Portland, Ore. 97202; 503-235-2260) for about $31. Use a pair of blade stabilizers when running the thin blade. —*Tom Marks, Portland, Ore.*

Square-headed tenon pins



A customer's design called for mortise-and-tenon construction with the tenons pinned through the mortise cheeks. Rather than flush-cut dowels, I decided to use round pins with square heads. Here's how I did it.

After drilling ¼-in. holes through the cheeks, four chops with a chisel gave a ¼-in.-sq. recess on the surface. Making the pins is a little more work. First cut pin blanks slightly larger than ¼ in. sq. Trim the corners of the top ½ in. of the blank to make a short octagonal section, and put a stub on the other end. Chuck the octagonal section of the pin in your drill, and put the pin through a series of holes drilled in a piece of sheet metal to round the lower portion. I used an old discarded drawer slide. The series of holes diminish in diameter; in my case, I used 5/16 in., 9/32 in., ¼ in. and 7/32 in. You can keep the length of the square head consistent by performing the operation through a wooden washer, which acts as a stop between the metal and the drill chuck.

Glue the pin into the furniture in the regular way. The 1/32 in. difference between the pin and the hole allows the glue to swell while the pin's head is rotated to align with the square socket. You can saw the square head flush with the surface, but I opted to carve a little hip roof on the pin head and left it proud.

–Joseph M. Wilson, Pictou, N.S., Canada

Quick tip: To prevent chipout on expensive veneered plywood, first set the sawblade just proud of the table. With the saw turned off, slide the workpiece against the rip fence, pushing down so that it rolls the blade beneath it. Then flip the piece over, clamp on a straightedge, and score the veneer with a knife along the dotted line marked by the tips of the rolling blade.

–Larry Preuss, M.D., Ann Arbor, Mich.

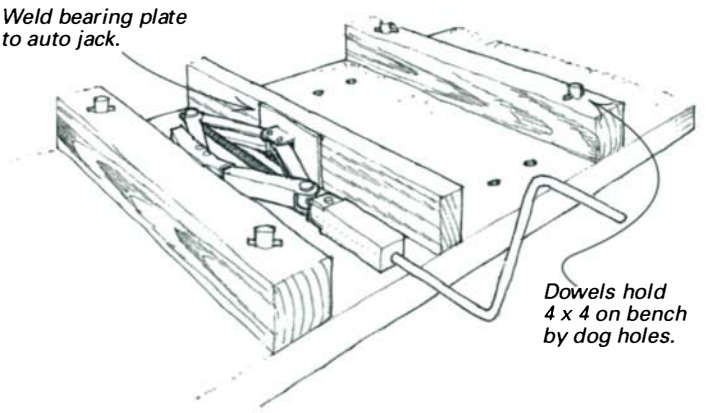
Disassembling epoxied joints

For some time, I have been involved in the restoration of antique furniture where I often encounter a piece that has been "repaired" using epoxy. To disassemble these epoxied joints, I heat the joint with a hot-air gun, the kind used for paint strip-

ping. By carefully directing the hot air evenly to the joint so that the wood gets hot all the way through, the glue will eventually break down. Don't get the gun too close, or you will burn the surface of the piece. By applying steady tension to the joint during the heating process, the joint will slowly move and eventually come apart. Good ventilation and appropriate breathing precautions are required, as well as considerable patience.

—Richard Goodall, Salmon Arm, B.C., Canada

Auto-jack bench vise

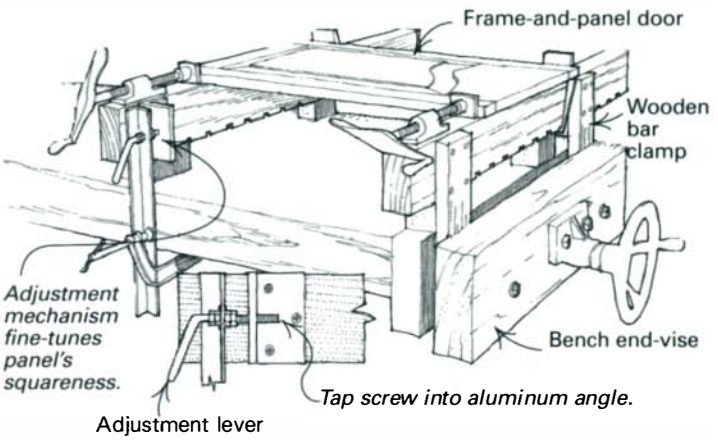


I removed the permanently mounted vise from my workbench to free the entire perimeter of the bench of clamping obstructions. I then added back the removable vise shown in the sketch, which is based on a salvaged auto jack. I sawed off the swiveling saddle on the top of the jack and welded in its place a chunk of ¼-in.-thick steel plate. A 2x4 screwed to the steel plate makes the movable jaw of the vise. At the other end, the fixed jaw is simply a 4x4 held in place by 1-in. dowels that drop into dog holes in the bench. I also attached a crank handle to make tightening the vise a one-handed operation.

Although the arrangement isn't perfect, it clamps with a force beyond anything normally required in woodworking, removes from the bench easily and cost less than $10.

—Tim Anderson, Chippewa Falls, Wis.

Clamping jig for door frames



I designed this jig specifically to glue up small paneled doors. With it, you can adjust away any tendencies of the door to go out of square as it is being clamped up. The jig consists of two clamping bars. The first is fixed in the vise at the end of the workbench. The second is attached to a length of angle iron that

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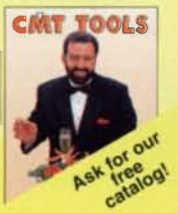

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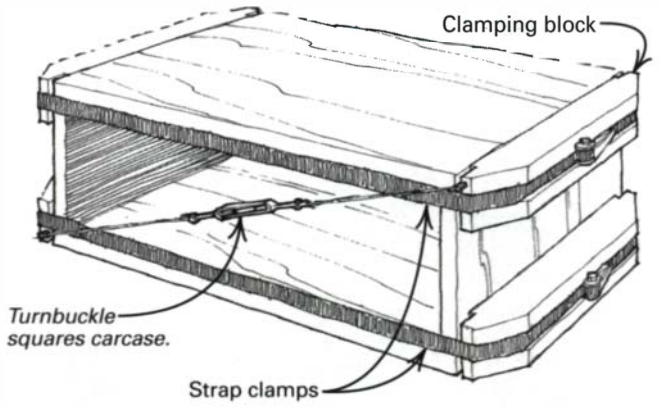
READER SERVICE NO. 173

is clamped to the bench. The second clamp incorporates a threaded adjustment mechanism, which moves the clamping bar in or out slightly. This allows you to change the position of the second clamp until the diagonals across the door measure exactly the same. *—Leo Moisan, Laurier Station, Que., Canada*

Strap-clamp blocks

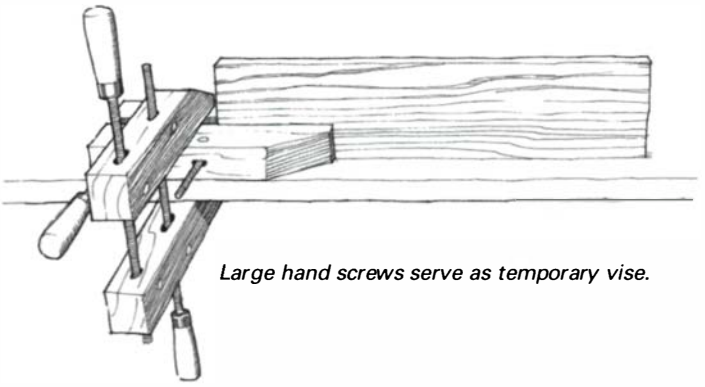


Over the years, I had struggled to assemble case work with pipe clamps, assuming there was no better way. The clamps were heavy, awkward, in the way, wood-marring and hard to adjust for even pressure. Sometimes my lightly tightened clamps would fall off while I was making final adjustments.

So I started playing with strap clamps with better results. I ended up making clamping blocks, like those shown in the sketch above, to use with them. Then it dawned on me to put screw eyes in the ends of the clamping blocks and tie the opposing corners together with a turnbuckle. This addition made pulling the piece into square incredibly easy.

—George Viveiros, North Kingstown, R.I.

Bench clamping with hand screws



Large hand screws serve as temporary vise.

The workbench I am building doesn't have a vise yet. As an interim solution, I use two large hand screws. I lay the first clamp horizontally on the bench to hold the work. Then I clamp the first clamp to the bench lip with the second clamp, as shown in the sketch above. This arrangement has the advantage of being cheap, moveable, strong and versatile.

—Thomas Grace, Binghamton, N.Y.

Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods, Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506. We'll return only those contributions that include an SASE.*

READER SERVICE NO. 49

3-D finishes

I intend to build a tabletop with an uneven inlay for a 3-D effect and would like to cover it with clear finish that will fill in and provide a glass-smooth surface. What is the stuff I've seen on some restaurants' tables, where can I get it and how thick can this finish be built up?

—Steve Petrosino, San Antonio, Texas

Chris Minick replies: Most often that heavy plastic coating on restaurant tables is a non-air-inhibited polyester finish or a catalyzed epoxy coating. Both finish types are toxic in the uncured state and require specialized finishing equipment not available to the do-it-yourselfer.

However, a relatively safe (and relatively expensive at about $60 a gallon) two-part, pour-on epoxy finish is available from Woodworkers Supply, Inc. (1108 North Glenn Road, Casper, Wyo. 82601; 800-645-9292). Maximum coating thicknesses of about 3/32 in. can be expected with this finish.

[Chris Minick is a product development chemist and amateur woodworker in Stillwater, Minn.]

Threading wooden bench screws

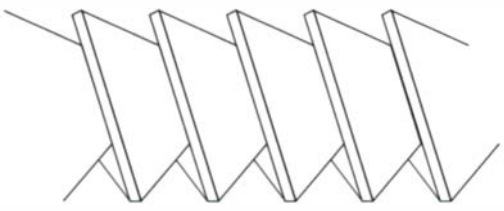
I've been considering building a reproduction 19th-century workbench, but I'm concerned about making the wooden screws and threaded blocks for the vises. Can you suggest a source for these ready-made? Or do you know of a source for appropriate wood taps and dies of 1½ in. to 2 in. dia.?

—Greg Furness, Mineville, N.Y.

Steven Bunn replies: I also have been looking for a source of ready-made, large-diameter wooden screws. The Woodcraft catalog for 1993 (210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, W.V. 26102-1686; 800-225-1153) listed a pair of 2-in.-dia. wooden vise screws with threaded blocks; the 18-in.-long screw (15J01) is $59.95, and the 24 in. (15J02) is $67.95. (Although not in the current catalog, these vise screws are still available.) They also offer tap-and-die sets for 1¼-in.- and 1½-in.-dia. threads.

The kicker to your request for a source of appropriate screws, taps or dies is the word *appropriate*. To my knowledge, all available wooden screws and tap sets use a conventional tapered thread. This is the pyramid-shaped thread commonly used in machine and wooden screws. The conventional threading does not hold up and strips out with use on a wooden bench screw. Mr. J. R. Beall of The Beall Tool Company (541 Swans Road, N.E., Newark, Ohio 43505; 800-331-4718), which manufactures wooden threader attachments for routers, explained that the best thread to use on a wooden screw is a buttress thread, as shown in figure 1 below. This is the thread used on the Record bench vises. The problem, as it was explained to me, is that the buttress thread, while cut relatively easily on the screw, is extremely difficult to tap.

Fig. 1: Buttress threads

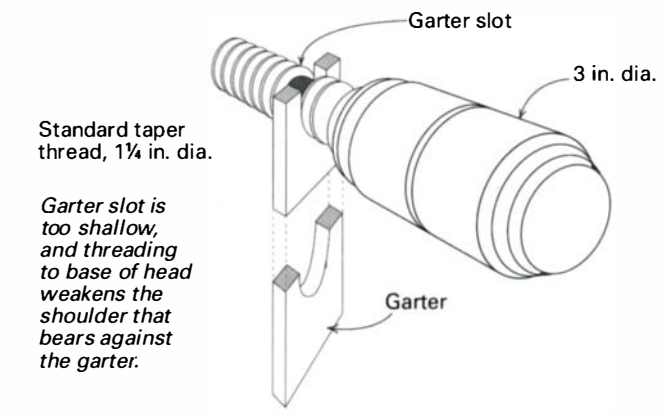


In frustration, I purchased the largest tap-and-die set I could find at the time, and damn the experts. I bought a 1¼-in. set made in England and sold by Wood Butcher Tools (38 Center St., Bath, Maine 04530; 207-442-7939) and turned my own screw, as shown in figure 2. As I found out, threading the screw all the way to the base was a mistake, as I'll explain later.

Feeding the blank through the thread box is a little easier if the blank is slightly undersized. Also, I got cleaner cuts without chatter by wiping the blank with a rag soaked in turpentine rather than cutting dry stock.

After building the tail vise, I cut a slot in the screw (see figure 2) to hold the garter that locks the vise assembly to the screw. The massive head of the screw will drive the vise forward when closing the vise. However, without a garter, the screw will simply back out by itself, leaving the vise jaw behind when you attempt to open the vise.

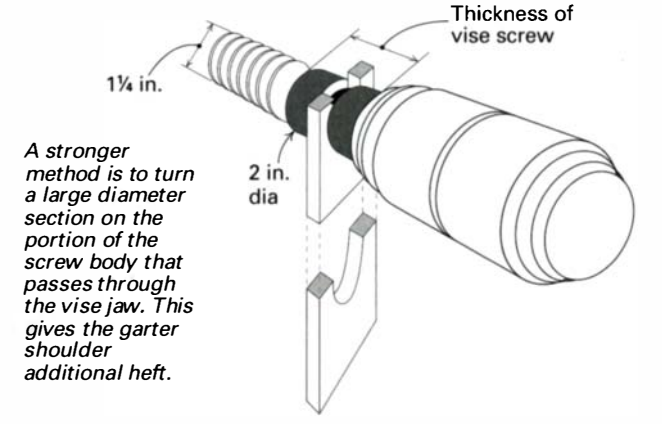
Fig. 2: Taper-threaded bench screw



As I had mentioned, cutting the threads all the way to the base is a mistake because it reduces the shoulder area of the garter. I found that over time, the garter ate into the threads, stripping them from the body of the screw. I disassembled the screw, filed the thread off the 2 in. nearest the base and glued a repair block around the damaged area that I then rounded with a file. I recut the garter slot, making it deeper than before. The deeper slot provides more bearing surface for the garter and is better able to resist the thrust of the screw when backing off the vise.

I threaded the screw through the 1¾-in.-thick bench end cap, which spreads the load on the threads. After a couple of years of use, the threads have held up fine with no appreciable wear.

Fig. 3: Improved bench screw



If I were to make another screw, the only change I would make is to leave the garter section, which I think is the weak link, a little thicker, as shown in figure 3 above. The increased size of the garter shoulder would help the screw survive the thrust and wear of opening the vise.

[Steven Bunn is a woodworker in Bowdoinham, Maine.]

Cultivating walnuts

I have about 50 black walnut seedlings that grew from nuts I planted last fall. I intend to transplant them this year elsewhere on my 30-acre woodlot. Could you tell me whether it

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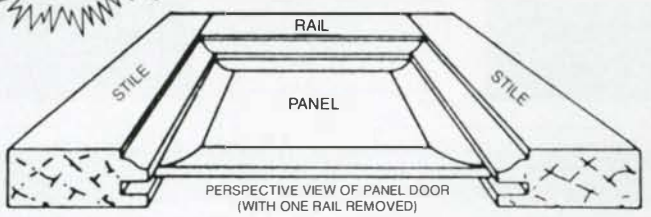

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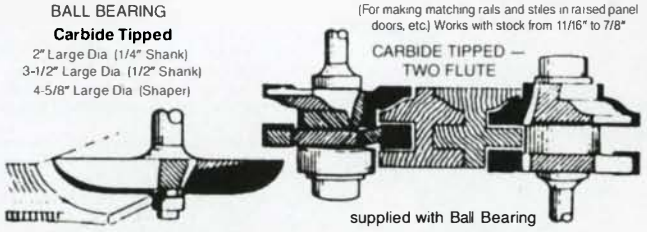

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would be better to set them out here and there in the woods or to plant them evenly spaced in an open area, and if so, what spacing would be optimum? My goal is to produce tall, straight trunks to be made into lumber. Of course, I realize that I won't be the one who makes use of it, but wouldn't it have been nice if someone had planted a few walnuts for me, say, 75 years ago? —Alfred M. Thornton, Hogansville, Ga.

Jon Arno replies: On the surface, your question would appear to be a simple matter of silviculture, but it is actually very complicated. There are pros and cons to both approaches, which might suggest a more careful honing of your objectives. To coax walnut trees to grow tall and produce straight, clear trunks, they should be crowded by competing vegetation. However, to maximize their rate of growth, the competition should be removed in stages as the walnut trees mature. Planting them in an existing woodlot will provide intense, if not overpowering competition. Their rate of growth will be stunted, and many of them will fall victim to rodents and other wildlife. But it will be possible to spread your 50 seedlings over a greater area, and looking centuries into the future, this strategy should provide a higher potential for self-propagation, generation after generation.

The alternative approach offers more opportunity to control the process and greater certainty that you or your immediate descendants will realize some economic return. To maximize the rate of growth while stimulating the trees to produce straight trunks, they should be planted on thoroughly plowed land in rows 4 ft. to 6 ft. apart and at 4-ft. to 6-ft. intervals. It is important to keep the planting area cultivated and free of weeds for the first few years to give the seedlings a good start. Also, the application of fertilizer and a temporary, small meshed fence will help stimulate growth and keep wildlife out. Walnut trees grow rapidly for the first 10 to 15 years but slow down once they begin to produce nuts. As the trees mature to the point that the original spacing is too confining, the stand should be thinned by removing every other tree or by selectively culling out the least promising specimens. There is no finite timetable for this process in that it depends upon growing conditions and climate. Faster culling will result in greater nut production, but allowing the competition to intensify until the growth rate is noticeably impaired will ultimately yield higher-quality timber. With walnut, the desire to see rapid growth must be tempered by the realization that it takes this species a great deal of time to convert its white sapwood to rich, dark brown heartwood.

Given the choice, I would favor the controlled planting approach. Even if lumber is the ultimate objective, the nut crop is a definite plus, and several decades down the road, some of the nuts can be used to plant a few walnut trees in an established woodlot. Chances are, though, the squirrels will do that for you. [Jon Arno is a wood technologist and consultant in Troy, Mich.]

Nontoxic finishes

We are considering entering the area of children's wooden toys. Could you please advise us on the types of finishes that would be suitable for children to chew or lick.

—Marvin Esser, Willowdale, Ont. Canada

Nancy Lindquist replies: There is no legal definition of nontoxic, although the phrase appears on many children's products. Toxicity is a relative term, and as the old grizzlies say, "Even water's toxic if you keep your head under long enough." The concern with finishing children's wooden toys is metallic driers (for example, lead, mercury) in the finishing material. When I finish toys for the kids in our family, I avoid any film formers that have

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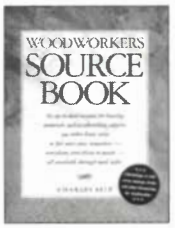

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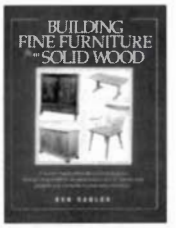

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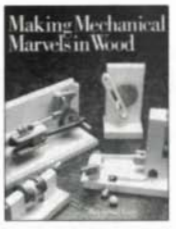

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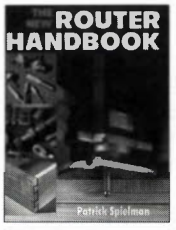

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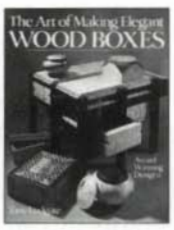

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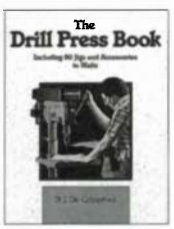

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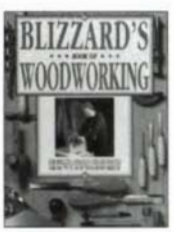

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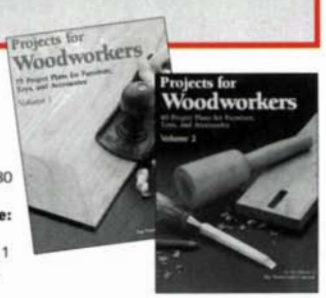

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driers listed on the label. A thin film of air-drying lacquers (water or solvent), shellac and wax are possibilities.

Lacquer is fine, but if the wood is an oily species like teak or pine, a thin coat of brushed-on shellac will adhere better. Once dry, rub the finish smooth with some steel wool, and polish with paste wax. Shellac is also used as a candy coating to keep food coloring off your hands, so it's a good choice.

Another finish I use on toys is soybean oil from the grocer. It's a semidrying oil that is wiped on with a paper towel and ready to use in a few hours. It doesn't build up a film like shellac or lacquer, so it may not give the wet look some people desire. But it's easy to reapply. I use it on my maple and mahogany bowls, walnut and teak cutting boards and walnut toys. Unlike animal fats, vegetable oils will not become rancid, so there's no worry about a foul smell over time.

[Nancy Lindquist is a woodworker, designer and finishing specialist in Chicago, Ill.]

Selling through catalogs

I'd like to explore the possibility of marketing my period reproductions through retail catalogs. Are there appropriate catalogs for this market, and if so, how do I find them? Also, are there any organizations or associations dedicated to helping small, independent shops. —Robert H. Kuiper, Rock Hall, Md.

Jim Tolpin responds: While I'm not aware of any catalog that specifically carries reproduction furniture, I wouldn't be surprised to see one surface in the advertising pages of such magazines as *Yankee*, *Country House* or *Old House Journal*, especially around the Christmas buying season. Take a close look at a potential outlet by ordering its catalog to see what company you'd be keeping if it should carry your product line. To research other catalogs, order a copy of the *Catalog of Catalogs* (Woodbine House, 5615 Fishers Lane, Rockville, Md. 20852; 800-843-7323). Now in its third edition, this annually updated catalog lists a good number of catalog outlets for furniture (as well as nearly anything else you can imagine).

Donna Loyle, assistant editor of *The Crafts Report* (300 Water St., Wilmington, Del. 19801; 302-656-2209), suggests another way to get your products into a catalog: Enter your furniture into a major wholesale gift or furniture fair, and meet the catalog buyers face to face. (In your area, the International Gift and the International Furniture Fairs are held in New York City. Contact George Little Co., 10 Bank St., Suite 1200, White Plains, N.Y. 10606-1933; 914-421-3200 for entry information.) While you may not sell the pieces you bring to the show, which means you shouldn't count on immediately recouping the considerable expenses involved, you will make valuable contacts and possibly score a place in the potentially lucrative catalog market.

Loyle offers this word of caution, however: If you present yourself to buyers as a production furnituremaker, be sure you are capable of filling their orders. Some catalog companies place drop shipment orders with you as they take in customer's orders, while others buy wholesale and warehouse all the goods they catalog. In either case, these companies expect strict adherence to notoriously short notice deadlines and an ability to produce the goods in large volume. Unless you are ready to take the step up to production furnituremaking (even in fine reproduction work), be cautious about entering the catalog marketplace—a failure in fulfillment could burn a lot of bridges in this tight-knit marketplace.

To find other independent woodworkers to commiserate with, try calling your state's art or craft council for the address of local

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Attention: Customer Relations
Re: Woodworker I & II Blades

Gentlemen:

I recently ordered and received Woodworker I & II saw blades for my radial and table saw. I used the blades received.

Woodworking is a hobby of mine. I have a large shop in back of my house. I have primarily industrial grade equipment. I work in the shop during every spare moment. Time for the credits.

I originally avoided your blades because of the cost in comparison with other models on the market. I saw some chips missing in my old blades, and it was time to toss and replace with new blades. I sighed and ate the additional cost and purchased your blades and stiffeners.

I find your blades of the highest quality. They produce a velvet cut with a polished finish which is not surpassed by any other manufacturer on the market. The wood passes through the saw like a hot knife through butter: smooth and with little effort. I see a similar glide whether it is maple, oak, pine, or whether it is thick or thin. Really fine stuff.

Your production staff can be proud of their work. The production quality is not just good, or to specification, it is exceptional.

In retrospect, the minor difference in cost is well worth the final result. Besides it is the blade that produces the cut for a piece to outlast the maker.

Glad to make acquaintance with your staff and their work.

Respectfully yours
DAVID I HARES, ESQ
St. Louis, Mo

Jim Forrest
President and designer
microscoping cutting edge.

Dear Mr. Forrest

Recently, I attended a woodworking show held in my area. One of the displays was a demonstration of your company's saw blade--"Woodworker II". The individual conducting the demonstration guaranteed the woodworker series blade would:

- allow rip/crosscut without changing blades
- provide a smooth cut without burn or blade marks
- provide accurate cuts for all types of joinery

In general, the assertion was your blade would outlast and outperform my current table saw blade.

I've got to tell you, I was skeptical of the claims; but, I bought the blade and stiffener anyway. That purchase was one of the smartest investments I have ever made--the blade performs exactly as advertised!

Over the past few years, I have purchased several table saw blades so I'd have the correct blade for every type cut and material. Although I didn't buy the top of the line in each category, my collection represents a sizable amount of money. Much of this money could have been used to purchase another tool, instead of spending it on saw blades that didn't live up to the manufacturers' claims.

Mine is the story of many others who have failed to heed the old adage "You get what you pay for". In the case of your saw blade, it is truly a quality product. With the smooth, glass-like results I've achieved, I will reconsider the need for a jointer. Although I will pay a little more for your blades, I will more than make up for the cost because I'll need only one blade to do the work of three.

In today's environment, it is nice to find an American company such as yours, who delivers a quality product and doesn't just preach the "total quality" rhetoric.

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Herbert Needlman
Herbert Needlman
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12" x 30T x 1" "	162	119	8" x 40T 3/32	136	99
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Delta	9"	x	80T	x 5/8"	204	119
Ryobi-Makita & all	10"	x	80T	x 5/8"	207	129
Hitachi & B&D & DeWalt	12"	x	80T	x 1"	229	139
Ryobi-Makita	14"	x	100T	x 1"	266	179
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READER SERVICE NO. 50

or regional craftspersons' organizations. Some states (New Hampshire and Kentucky immediately come to mind) have very active craft leagues that sponsor fairs, run stores and even produce catalogs. If you can't find a group presently active within your state, consider starting one (see "Starting a Guild: Tips from Albuquerque," *FWW* #60, p. 84. This article includes a listing of woodworking guilds viable as of October 1986.) Having helped establish a guild here on the Olympic Peninsula of Washington state, I can assure you that the rewards more than outweigh the effort involved.

[Jim Tolpin is a woodworker and technical journalist in Port Townsend, Wash.]

EDITOR'S NOTE—You might also try some of the government organizations established to help the small businessman, such as the Small Business Administration (SBA) or the Service Corp Of Retired Executives (SCORE). Local branches are usually listed in the yellow pages under U.S. Government. Local universities, the University of Maryland for example, may also be able to offer some assistance through their graduate-school programs.

Restoring a chest-on-chest

I am in need of some advice on restoring an English chest-on-chest, which we inherited in poor condition. There are a few places on the front of the piece where veneer has chipped off. I am assuming it is mahogany.

Most importantly, I am concerned about the finish. We were told not to strip it because it could be the original surface. I am wondering if the piece could be restored without refinishing? The finish has cloudy, whitish areas near the base of the feet and on one end; the upper cornice has a spot that is scraped to raw wood; and there is a layer of grime hardened on to the finish in places. How can I make the piece look decent?

—David Hanning, Lodi, Calif.

Bruce Schuettinger replies: Based on the photographs supplied to me, you have an early English George III period mahogany chest-on-chest, or tall boy, circa 1755. The piece has figured veneered drawer fronts, cross-banded drawer rails and front side edges, possible cross-banded moldings, fluted canted corners ending in lambs tongues, pierced brass bat-wing back plates on the drawer pulls and applied bracket feet. The chest-on-chest seems to be of fine quality and is certainly worthy of restoring and keeping in your family.

The feet have suffered a 2-in. to 4-in. loss to their original height. The finish does not appear to be original, but could be as old as one hundred years and is most likely a spirit varnish. To determine the type of finish on the surfaces, you could try testing the finish by applying solvent alcohol on a cotton swab and rubbing the surfaces of the chest in an inconspicuous area. If the finish is easily removed, it is a spirit varnish, consisting primarily of shellac.

It is critical to obtain the right material to replace the missing veneer on the front of the piece. If it is mahogany, it will be of a botanical species, *Swietenia mahagoni*, from the West Indies or Caribbean, which is where the English were trading at the time this object was made. The mahogany commercially available today is of a much lower grade than that used in this chest. I suggest contacting a furniture conservator or reputable furniture restorer in your area to purchase a small quantity of this veneer. If this doesn't work, use a dense area from some mahogany crotch veneer that displays the grain characteristics of the surrounding veneer on your chest. Back this piece of veneer with

another piece to build up the correct thickness. Secure this veneer patch with hide glue to the substrate.

The finish, which I don't think is original, is most likely a spirit varnish such as shellac, based on the color in the photograph. This coating is easily treated for blemishes, discolorations and losses. First the cloudy areas you described are caused by moisture trapped between the uppermost wax layer and the subsequent coating layer. It is typical for the area around the feet to show this type of damage if they've been exposed to standing water. These areas are treatable by abrading the surfaces with 0000 steel wool followed by a light application of VMP naphtha or mineral spirits to remove the wax layer, which would prevent proper bonding of additional coatings. Then, using the traditional French polishing method (a cotton and wool pad with shellac and denatured alcohol), pad over the area. If additional coloring is needed, sparingly add natural-ground pigments (for a duller, opaque color) or alcohol-soluble dyes (for brighter color) to the inside of the pad. Aniline dyes would be a suitable choice. Continue padding until a desired color and finish level is achieved. The areas where the finish is scraped off the cornice can be treated easily by brushing on several layers of orange shellac, garnet lac or button lac and adding dyes or pigments as above for proper color. The garnet lac and button lac are cruder or less-refined shellacs and are darker than the commercially available orange shellac. It may be necessary to apply a staining layer first, depending on the degree of color needed. The same colorants can be combined in a mixture of 95% alcohol with 5% shellac added as a binder. The higher concentration of alcohol will aid in deeper penetration.

Build and layer the coatings to the desired color and finish. Rub between coats with 400-grit silicon carbide abrasive paper or 0000 steel wool to flatten out the previous coat and to increase the bond for subsequent coats.

The grime layer is mostly a hardened wax layer compounded with polishing oils and natural secreted oils from one's hands along with airborne grease and particulate matter. This layer is easily removed with mineral spirits sparingly dispersed in 000 steel wool and rubbed in the area of deposited grime until clean. Follow up by rubbing this area with dry steel wool to remove any mineral-spirit residue.

Once this grime layer is removed, build the coating layer up to the surrounding surfaces using the French polishing method as previously described. If treating these areas has resulted in a satisfactory appearance, I would suggest not attempting to remove the existing finish.

To further enhance the piece's appearance, abrade the remaining show surfaces with 0000 steel wool, remove the dust and apply a coat of Liberon Black Bison paste wax in the tinted Georgian mahogany tone as directed. This high-quality paste wax is primarily beeswax and is available from Liberon Star Supply (P.O. Box 86, Mendocino, Calif., 95460; 800-245-5611).

To make the waxing and buffing easier, remove the drawer pulls. Make a note of each pull's position for easier reattachment, particularly if the pulls are original, because handmade back plates and posts can vary considerably. The brass back plates and drawer pulls can be cleaned and polished to a higher luster should you desire.

[Bruce Schuettinger is president and wooden artifacts conservator for Antique Restorations, Ltd. of New Market, Md.]

Send queries, comments and sources of supply to Q&A, Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506.*

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Finger-Joining Small Boxes

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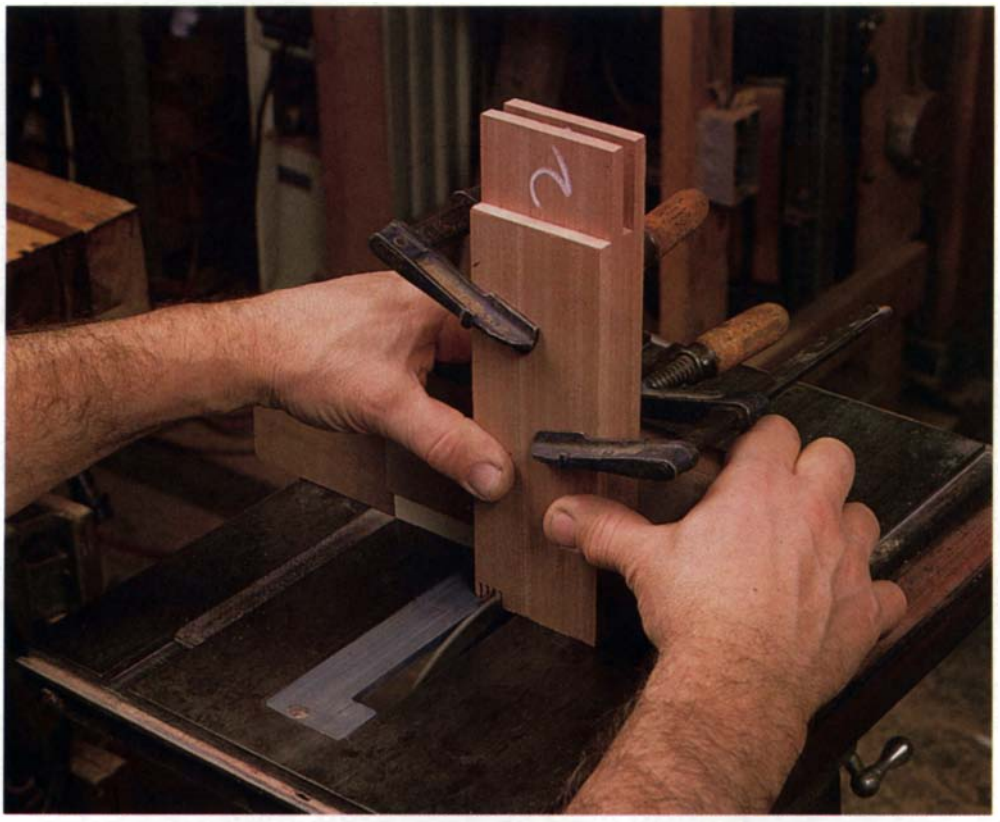
by Jack Danilchak



Gang-cutting box sides speeds the work. *The author clamps all four sides together and makes multiple kerf-width passes using a guide pin to index each successive pass.*

I learned this finger-joining technique from Max, a sawyer friend whose sawmill is in the mountains near Uniontown, Pa. Each finger is only as wide as the kerf of your tablesaw blade, giving the joint a delicate look. But the cumulative surface area of the joint is great, making it quite strong. Because of the diminutive size of the individual fingers, it's a joint best suited to small boxes and drawers (see the bottom photo above).

Although it looks like it would be difficult because of the fineness of the fingers, this is actually quite a simple technique. You cut all four boards that make up the box sides at the same time, as shown in the top photo above, rather than cutting one-half and then matching the second half to the first. After flipping the stack end for end and repeating the process, you assemble the sides offset, joint two of the sides flush with the other two and then rip all to the same width. The key to this technique is getting the jig right in the first place. Once you have your jig fine-tuned, perfect joinery is all but guaranteed.

Making the jig

My finger-joining jig mounts on a tablesaw miter gauge. It consists of a short piece of hardwood and a couple of pieces of brass sheet stock, soldered together and screwed to the bottom of the piece of

Photos: Vincent Laurence

Fig. 1: Finger-joining jig

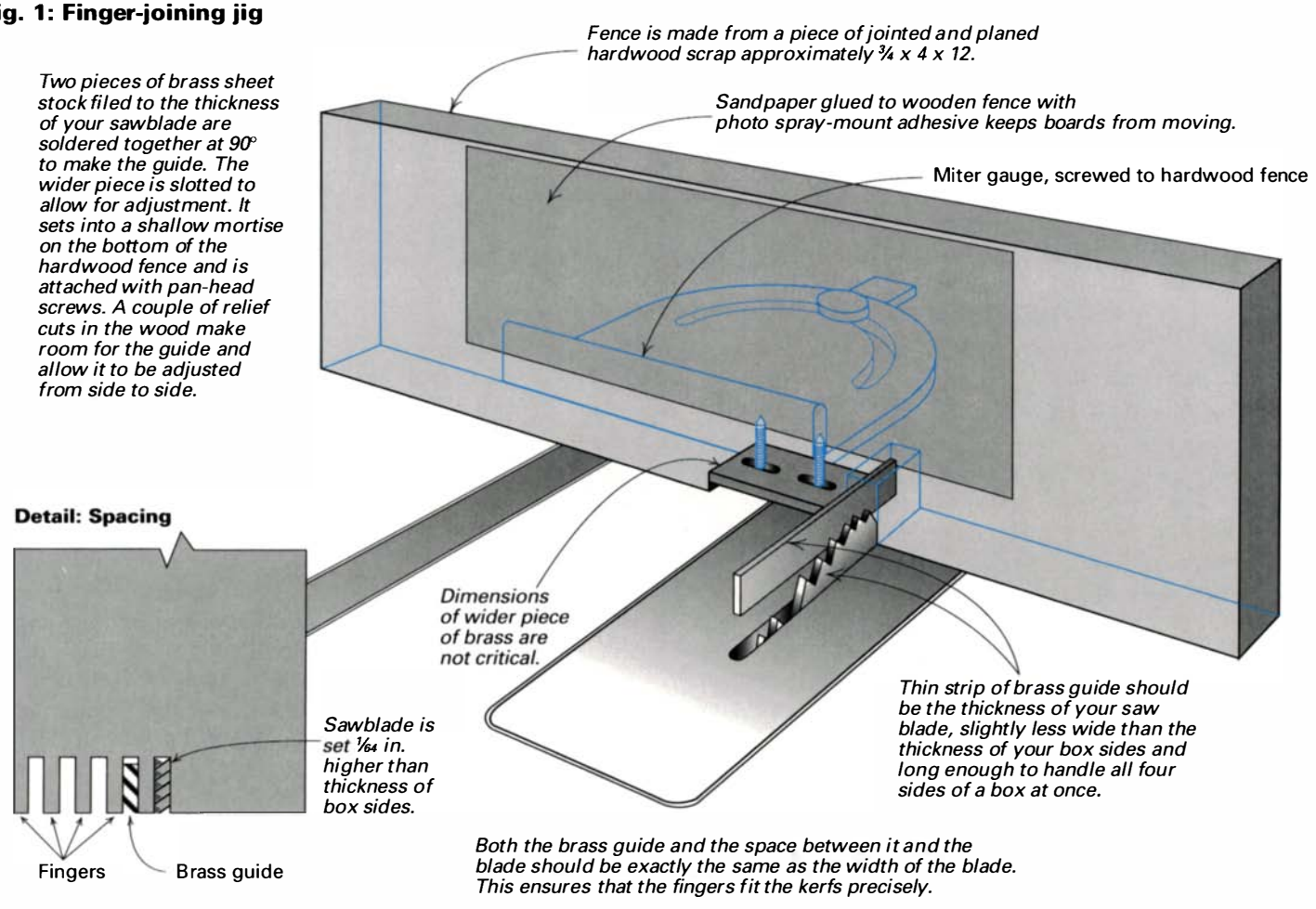
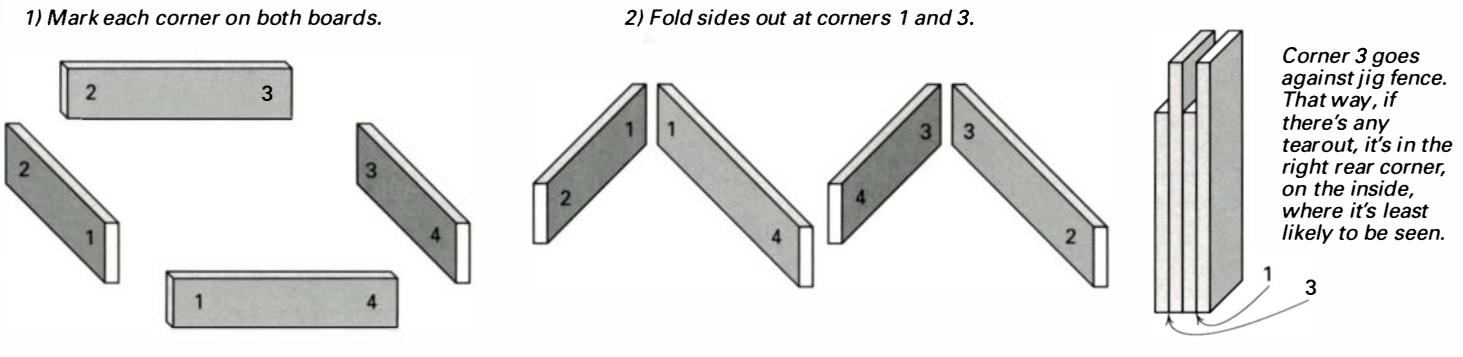


Fig. 2: Arranging box sides for gang-cutting finger-joints



hardwood to form a guide (see figure 1). The critical aspect of building this jig is getting the spacing right so that the joint will go together just right. The way to get this spacing is to make the blade, the guide and the space between the two exactly the same. That way, kerfs and fingers are exactly the same width.

The first thing I do is get the blade and guide to the same thickness. The best way of doing this is to buy brass stock thicker than the blade you intend to use for finger-joining, and then file and sand the brass until it's exactly as thick as the blade.

With my brass stock to thickness, I hacksaw the two pieces to size, solder them together and grind them smooth. I drill two series of adjacent holes across the bottom of the wider piece of brass and then turn the holes into a pair of slots with a needle file.

I mortise the bottom of a piece of hardwood for the wider piece of brass and make a few kerfs into the board to make space for the narrow piece of brass (see figure 1). Then I screw the guide to the piece of hardwood, screw the jig to my miter gauge so the thin brass guide strip is about a blade's width from the blade, and make a series of test-cuts into two 5/16-in. boards. I tweak the position of the brass guide until I get a snug fit with the two test boards and then tighten down the pan-head screws that hold the guide in place.

Finger-joining box sides

Box construction begins with the sides. I rip the side stock about ¼ in. wider than I want it. This allows me to joint stock off the tops of two sides to get the tops even and then to rip all four sides down to final width. The tops of my boxes add about ⅜ in. to the height of the box, so I account for this when I'm figuring the width

Drawings: Matthew Wells

***Clamping jig ensures square boxes**—Reversed hand screws inside a perfectly square box make clamping the author's boxes easy. Lines marked on the bottom of the clamping box allow him to check for square.*

I rip the sides to, usually 2¼ in.

I arrange the sides of the box as they will be when the box is assembled, with the grain wrapping all the way around, and I chalk a number onto both boards that make up each corner, 1 through 4. Then I fold out the two sides that make up corner 1 and the two sides that make up corner 3 so that the outside faces of the box are facing each other (see figure 2). I clamp the stack together with a small hand screw or a couple of little bar clamps, making sure the top edges of the box sides and corners 1 and 3 are flush. Then I butt the stack up against the hardwood jig fence, with corner 3 against the fence and the tops of the box sides against the brass guide.

My tablesaw blade is set 1/64 in. higher than the thickness of the box sides so that when the box is assembled the fingers will be slightly long. It's easier to sand off the pins than to take the whole box sides down to meet the fingers because the kerfs weren't taken deep enough. I finger-join from the outfeed side of my saw, so I can see what I'm doing as I'm pulling the box sides through the blade. It's a small saw, a model maker's saw actually, so I don't have to reach far, and in addition to being able to see better from the outfeed side of the table, I also feel like I have more control pulling the stock into the blade than I would pushing it. But on a standard-sized tablesaw, you'll probably just want to work slowly and carefully from the infeed side of the table, so you're not stretching too far.

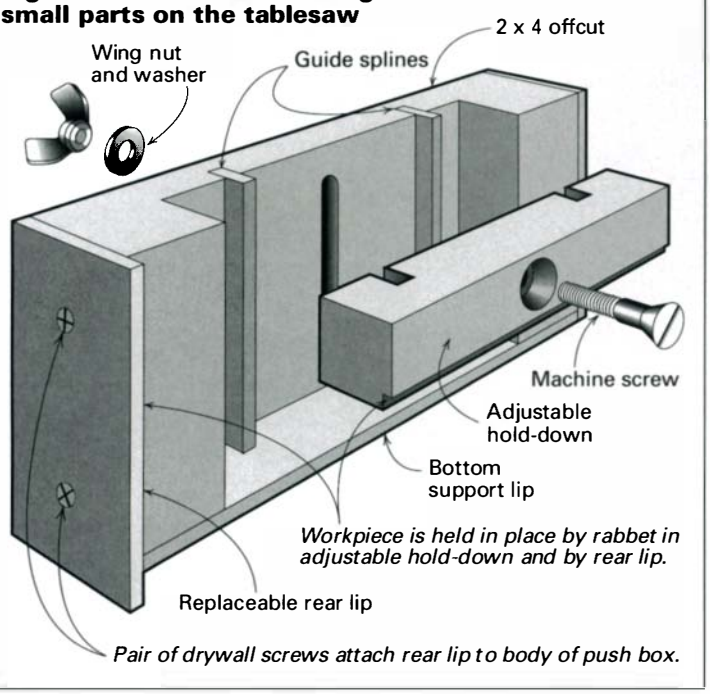
I make the first cut with the top edge of the box sides up against the brass guide. And I make each subsequent cut by moving the box sides so the kerf I've just made is over the guide (see the top photo on p. 40). I'm careful to feed the wood smoothly through the blade, so it doesn't tearout.

I dry-fit the sides once I'm done finger-joining. Two of the box's sides are high (whether it's front and back or the two sides depends on how you've assembled them), so I mark the high sides and run them over my little 4-in. jointer, though you could also do it with a handplane. Then, with the tops of all four sides even, I set the tablesaw fence to about 2¼ in. and rip the sides to final width. I say "about 2¼ in." because, with fingers of adjacent sides alternating, if I ripped to exactly 2¼ in., there's a good chance I'd end up with a paper-thin finger. Instead, I try to split a finger dead-center, so they're equally thick on either side of the corner.

Bottoms and tops

These boxes consist of 10 parts: four sides, a bottom panel and a top made of four frame members and a floating, raised panel. The

Fig. 3: Push box for handling small parts on the tablesaw



***Cut small parts accurately** and keep your fingers out of danger by using an adjustable push box. This jig exerts downward and lateral pressure to keep the workpiece flush against table and fence.*

***Cut spline slots safely** and precisely with simple jig. A toggle clamp and caul hold frame members in place while a pair of screwed supports position the frame members at exactly 45° to the saw table.*

top is not the lid, though. I glue the top to the sides after the box sides have been assembled, let the glue set and then separate lid from box a little bit farther down than where I glued on the top. This gives the lid an internal lip, which is a detail that just makes the box a bit nicer. But I'm getting ahead of myself.

After reassembling the box sides, I set them on an already smoothed and thicknessed bottom panel, usually of pine or another inexpensive secondary wood. I pencil around the inside of the box to mark the inside of the bottom-panel rabbet. I cut the rabbets around the perimeter of the bottom panel with a dado set on my radial-arm saw. For the grooves around the bottom of the box sides, I used a ⅛-in. router bit in my table-mounted router, using stop blocks to prevent the groove from showing on the outside of the box. Then I disassemble the dry-fitted box sides, insert the bottom panel, apply glue to the fingers with an artist's brush and glue the sides together to form the box.

***Cutting open the box to make the top**—Kerf 1/64 in. shy of going through the sides, so the box won't come apart on the tablesaw. A utility knife finishes the job.*

I clamp the box up in a special clamping device I made just for these boxes. The device consists of a perfectly square box with movable clamping blocks that are held in place with wing nuts. For clamps, I use hand screws that have had their wooden faces reversed to exert pressure as they move apart, rather than as they come together (see the top photo on the facing page). A grid of etched lines on the bottom of this dedicated clamping device shows me whether or not the box is square.

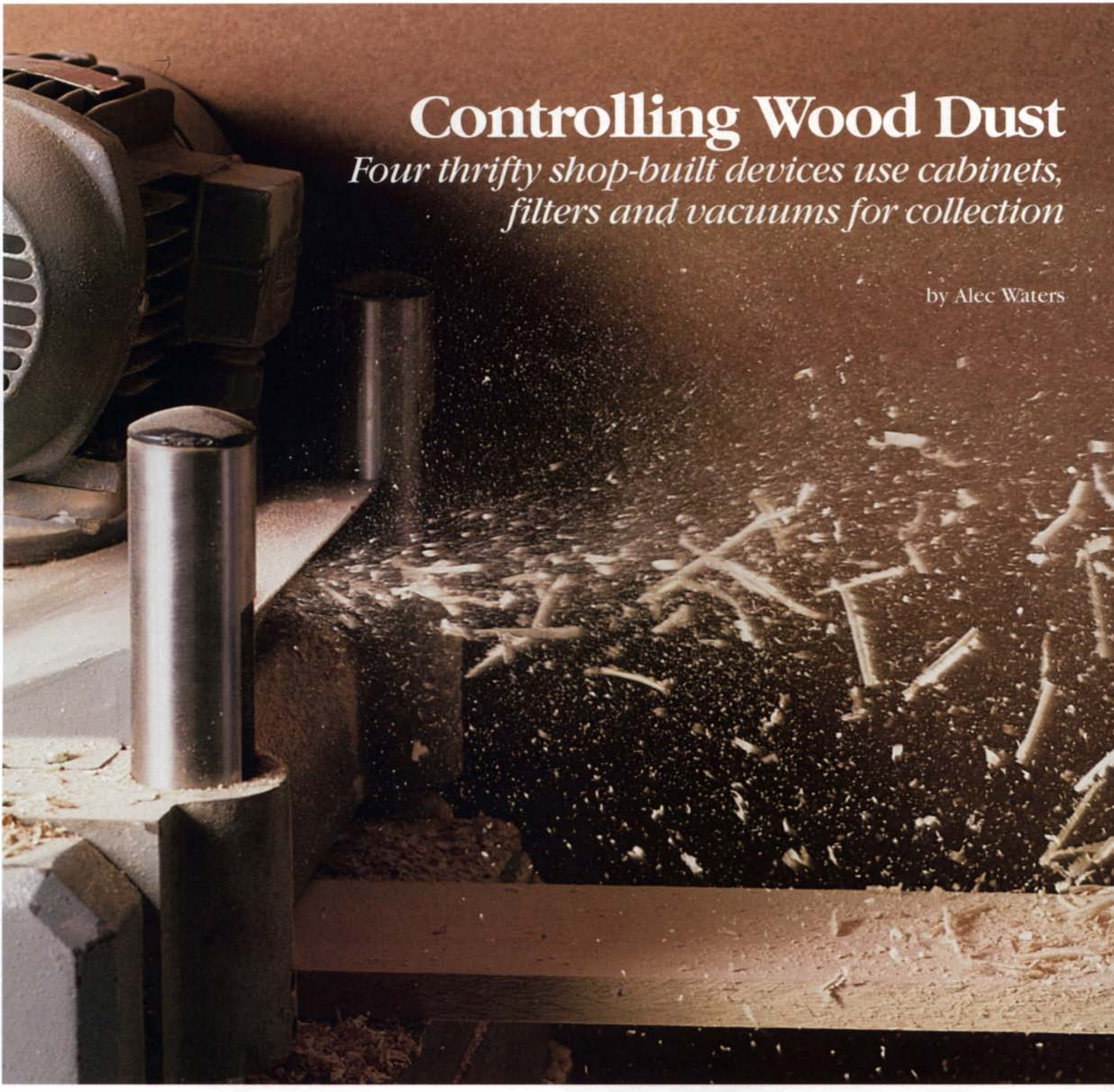
The top consists of five pieces: four frame members and a floating raised panel. For the frame, I rip ⅜-in. stock to about 1½ in. and then miter the pieces on my radial-arm saw. I cut them just slightly over length, so the frame extends past the box sides by 1/16 in. or so on all sides. Then I groove the frame members for the raised panel by running them over the tablesaw blade. They're small pieces, though, and after a couple of boxes, I began to grow nervous about the proximity of my fingers to the blade. To deal with these small pieces, I made a push box. It's kind of an adjustable, enveloping push stick that cradles the frame members while exerting both lateral and downward pressure (see the bottom photo and figure 3 on the facing page). This little jig keeps my fingers safe and my cuts consistent .

I made another jig to kerf the corners of the frame and used a toggle clamp and caul to hold two frame members at a time in place, as shown in the top photo on this page. Supports orient the frame members correctly at 45° to the tablesaw's surface. I use splines made of the same wood to join the frame members at the corners, applying glue with an artist's brush. I leave the top panel, into which I have routed an ogee profile, floating free.

Once the glue has cured on the top, I rabbet around the underside of the top frame to the width of the sides and 1/16 in. deep so that the top pops down into the sides for a good seal. I then glue the top to the box's sides. When this has cured, I sand off the 1/16 in. excess I left around the perimeter of the top, and then I finish the boxes before separating top from bottom or attaching hardware. I use one coat of an oil/urethane finish to seal the box and then apply a few coats of paste wax.

To open the box, I kerf it all around, about ¾ in. down from the top edge of the top frame and about 1/64 in. shy of going through the box sides because I don't want the box to separate on the tablesaw (see the bottom photo). Then I come back and separate top from bottom with a utility knife. After cleaning up the edges of the box's top and bottom with sandpaper and a sanding block, the box is ready for hardware. I drill pilot holes, attach hinges and latch, and call it a day. □

Jack Danilchak works wood in Monessen, Pa.



Controlling Wood Dust

Four thrifty shop-built devices use cabinets, filters and vacuums for collection

by Alec Waters

Wood dust is annoying. Whether you're trying to apply a flawless finish, maintain machinery or keep your shop fire-safe and clean, sawdust and wood chips are a nuisance. More important, though, is the damage that wood dust can do to your body (see *FWW* #83, p. 72). Although humans have fairly effective filtering mechanisms in their noses and lungs, the dust present in woodshop concentrations (see the photo above) can be toxic, and even carcinogenic. In 1989, the Occupational Safety and Health Administration (OSHA) established industry guidelines for dust. For hardwood and softwood dust, the permissible exposure level (PEL) of respirable dust is 5 mg. per cubic meter of air. The total allowable dust is 15 mg./meter. So what does this mean to the average woodworker? It means dust collection and air filtration in the shop are more important now than ever.

Luckily, there are hoards of dust-sucking machines available commercially. For the modest needs of carvers, there are lap-top models (In-Lap Dust Collection Systems, P.O. Box 081576, Racine, Wis. 53408; 414-633-8899). And for the high volumes of dust in production shops, there are cyclone separators (for more on these, see *FWW* #100, p. 76 and *FWW* #103, p. 34). However, for many small-shop owners, the big price tag and size of the manufactured and high-end collectors are deterrents. That's why many woodworkers have come up with their own dust-controlling ideas. Over the last year, *Fine Woodworking* has gathered an as-

Photos except where noted: Alec Waters

***Dealing with two kinds of dust**—Wood dust can be best handled by breaking it into two components: heavier chips or shavings and finer dust. Hence, the need for two-stage collectors, which settle out larger particles before the air stream enters the impeller to deposit the finer dust into a filter bag. Generally, machines with cutterheads, like this planer, produce more chips while saws, sanders and routers produce more dust.*

sortment of shopmade systems submitted by readers. Some units are frugally cobbled together from scrapwood and spare parts; others resemble professionally built machines. I've picked out a sampling of units, both simple and involved, to show what home-brewed ingenuity and resourcefulness can yield. But before I share the designs, I'll discuss general dust-handling strategies.

Collectors, vacuums and filters—oh, my!

Sawdust actually consists of a range of particle sizes. Both single and two-stage dust extractors, so-called source-capture collectors, use impellers (a rotor with fan-like blades) that propel air and dust through ducts to a storage container, usually a bag. But two-stage units take advantage of different particle sizes. They divide heavier chips from lighter dust before the mixture reaches the impeller. The first stage relies on gravity to cause heavier particles to fall into a drop box (usually a barrel or bin). The lighter dust continues on to be collected in the bag. But don't breathe easy yet.

Most dust-collection systems capture from 50 to 90% of the dust. Also, the bags themselves catch dust only so fine. As one reader, Daryl Rosenblatt, says: "Dust collection is a philosophy. No single collector will get it all." And it's the tiny particles (those under 10 microns are respirable) that are so damaging when inhaled, especially to those who suffer allergies. (For a chart of toxic woods, send $2.50 to the Center for Safety in the Arts, 5 Beekman St., Suite 820, New York, N.Y. 10038; 212-227-6220). Depending on the person, the exposure level and the wood species, symptoms can range from eye, nasal and skin irritation to respiratory and cardiac problems. That's where the free-hanging filtration units come into play. Some operate electrostatically (charging the dust particles so they can be removed), and others are fan-powered. Both types use filters to manage the dust. But the only sure way to protect your lungs is to use a fresh-air-supplied respirator that has a proper-fitting mask. At the least, you should use a dust mask. In fact, after much tribulation trying to make his home shop dust-free, Rosenblatt now advocates a four-system approach: a dust collector, a shop vacuum, an air-filtration unit and a respirator.

The shortcomings of conventional dust collectors have prodded other solutions. Because of severe wood allergies, John Timby, a New Mexico woodworker and retired design engineer, developed a two-bag (one is impervious) extraction unit called a "depression chamber" that keeps dust from re-entering the shop. It's designed to remove all micron-sized and under particles. Timby also offers a pair of video tapes for $60, which explore this unit and ways to hook up dust collectors to stationary machines. For more information, write to John Timby, P.O. Box 1904, Deming, N.M. 88031.

Designing your own system

Now that you know how dust behaves, you have to decide what is best for your shop. When designing a collection system, you will want to properly size its motor (in hp), air handling rate (in

cubic feet per minute) and ductwork (in diameter, length and junctions) around your machine requirements (for more on this, see Roy Berendsohn's article in *Fine Woodworking* #67, p. 70). Be aware, too, that universal motors, commonly found in vacuums, won't hold up as well as induction motors most often used in commercial dust collectors.

When it's time to build your system, be sure to eliminate fire and other hazards. For example, ground the duct work to dissipate any static charge, and try to select an impeller material that won't conduct sparks. Also, see that bags have adequate capacity, and clean them often, and see that filters are fine mesh, but won't clog. For air-filtration units, avoid creating an air-flow pattern that will blow across your face. Finally, make sure that there's enough fresh air coming in the shop to replace what's being exhausted.

Designing your own system quickly leads you to where the dust is collected. And here is where the stories on the following pages will help. In all cases, the units were inexpensive to build using readily available materials like plywood. The first unit is a cabinet that collects dust and chips from the most demanding machine in the shop: the planer. The second is a ceiling-mounted air-filtration box, which hangs out of the way and runs quietly. The third unit is a portable dust-collection box, which has an easy-to-clean bin and is fed by a standard barrel-top collector. The fourth unit is actually a mobile stand with an adjustable collector hood that is powered by an ordinary shop vacuum. Just like building a furniture project, the nice thing about these shop-built collectors is you can mix and match features to fit your needs. If you're still not happy with the results (or if your spouse incessantly complains of wood dust and noise), you can always go back to making shavings with hand tools. □

Alec Waters is an assistant editor for Fine Woodworking.

Portable-planer chip collector

Vacuum motor in base cabinet sucks up shavings and dust

by George M. Fulton

Photo: George Fulton

***Planer chips conquered**—To tame his biggest chip maker, George Fulton took a discarded vacuum motor and built this combination planer stand and dust cabinet. By attaching a wand to the flexible hose, he can vacuum up leftover dust.*

The first time I used my new portable planer, I realized that it needed a chip-collection system. As it was, shavings and dust were streaming out of the discharge chute, floating in the air and settling on my work, the table, the floor and on Goldie, my yellow Labrador retriever, who sleeps nearby.

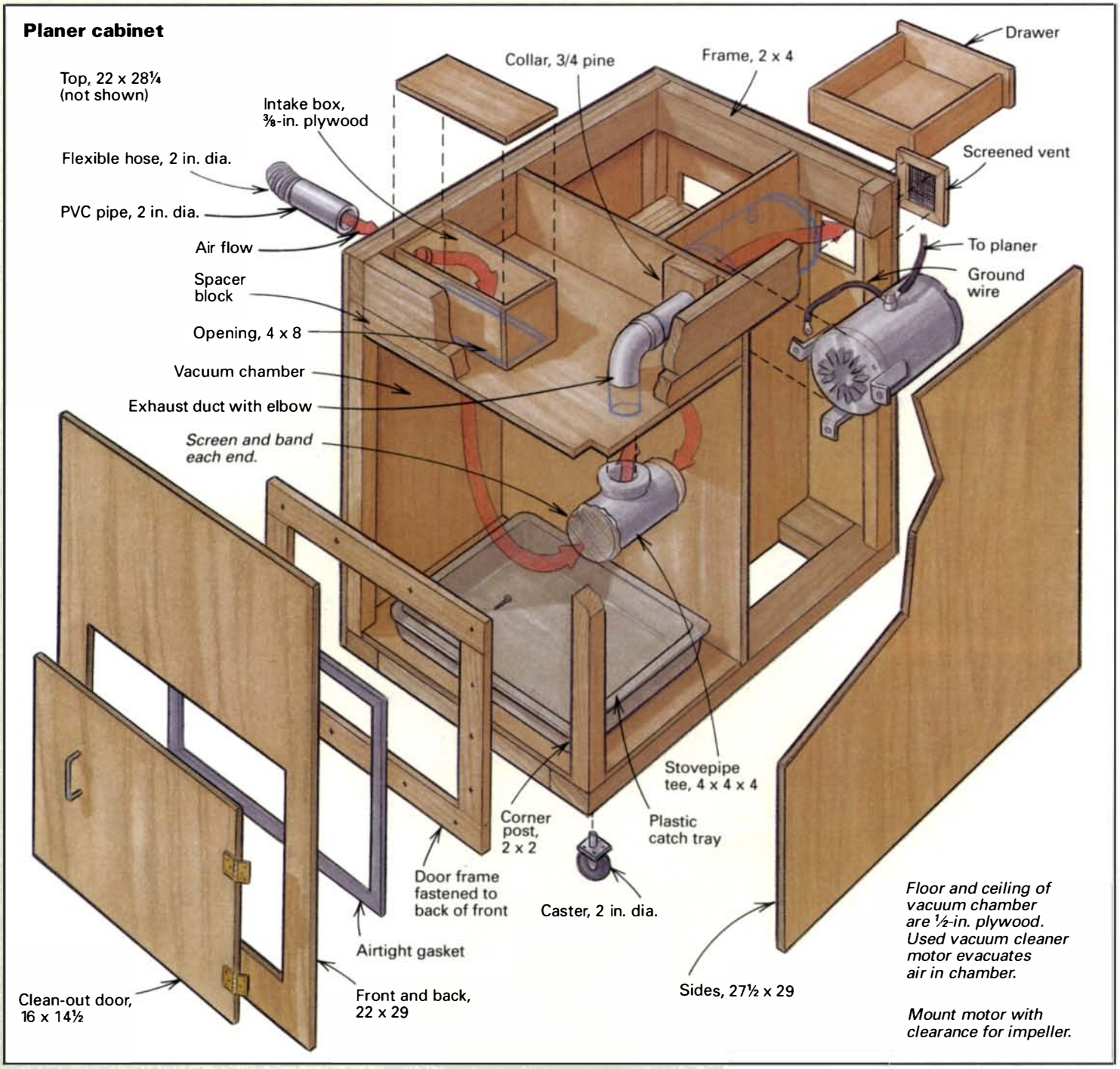
I decided to make a chip-collector cabinet that would remove dust and serve as the base for the machine (see the photo at left). The cabinet had to be compact, connect easily to my Delta planer without substantial modification, and it had to be inexpensive and easy to build. It also had to be stable, like a stand, but mobile so I could wheel the planer out of the way.

Construction: You should be able to adapt the cabinet to any machine by slightly modifying the dimensions or construction shown in the drawing on the facing page. Basically, the cabinet consists of a frame boxed with plywood, a vacuum compartment and top made of plywood, a discarded vacuum motor and a plastic cat litter tray. On the infeed side of the cabinet, I mounted a screened vent to cool the motor, and I built a drawer to hold miscellaneous adapters and tools. On the side of the cabinet, I made a vacuum inlet, and on the outfeed end, I added a clean-out door. I fashioned a dust hood (the manufacturer didn't offer one at the time) out of sheet metal, which mounts to the planer and provides a way to connect the dust-inlet hose to the cabinet.

Dust hood: I formed the dust hood out of .017-in.-thick (27 gage) galvanized sheet metal, making sure that the hood wouldn't interfere with the chip deflector or a workpiece. I riveted the hood to the guard, and then I installed 2-in.-dia. flexible hose, which was compatible with the PVC pipe fittings I had. If you want to hook the cabinet up to a standard collector, you'll probably want to use 3- or 4-in. hose and fittings. Because the planer's thicknessing range is achieved by raising and lowering the cutterhead, I used flexible hose. That also lets me easily disconnect it from the hood, pop on a standard vacuum pick-up wand and clean up dust around the planer.

Cabinet: I constructed the frame, as shown in the drawing on the facing page, using 2x4s and 2x2s. For the box sides, top and vacuum chamber, I used ½-in. and ⅜-in. plywood. To make clean-up easier, I adhered plastic laminate to the cabinet top. I mounted a discarded vacuum-cleaner motor in the exhaust chamber using aluminum angle brackets. I grounded the motor housing using a lug terminal and the green wire of the motor cable. After I installed the vent and drawer on the infeed end, I added a partition between them, so the air is exhausted through the vent and the opening in the floor of the box.

Although the vacuum compartment's seams were tight, I applied a bead of caulk all around the interior corners and inlet box joints. Because the clean-out door had potential to leak air, I surround-



ed the opening's inner frame with a ¼-in. by ¾-in. weather-seal gasket. A pivoting latch compresses door to gasket.

Duct work: The exhaust duct consists of a pine collar, 2-in. PVC pipe and elbow, and a 4-in. tee. I formed a section of aluminum window screen over the two open ends of the tee and secured them with rubber bands. You could cover the screen with nylon stocking to further filter dust. For the inlet duct, I used 2-in. PVC, flexible hose and threaded coupling (see the photo on the facing page).

Wiring and final details: To allow the vacuum to run after the planer is off, I installed a toggle switch next to the cutterhead switch and wired it to the motor. After I secured four furniture casters to the bottom frame of the cabinet, I mounted the planer to the cabinet with bolts and T-nuts. Finally, I placed a plastic waste tray in the vacuum chamber under the inlet box to gather the lion's share of shavings.

Now my dog Goldie dozes fairly contentedly, although she is probably wondering if something can be done about all the noise. □

George Fulton is a retired electrical engineer and a hobbyist woodworker in Arnold, Md.

Drawings: Bob La Pointe

Shop air-filtration box

Get additional protection from fine dust

by Jim Whetstone

Photo: Jim Whetstone

***Ready to filter shop air**—After installing a fine-mesh, filter in his ceiling-hung filtration box, Jim Whetstone can breathe easier. Although he owns a shop vacuum and dust collector already, he wanted additional protection from finer dust.*

I was convinced that my shop's exhaust system was not that efficient. I suppose it was removing fumes and radon gas adequately, but I felt it needed to do a better job of removing dust from the air. So I decided to build an air-filtration box. I made it out of plywood, a fan, a timer and a household furnace filter, which catches the dust. The box hangs from the ceiling: still accessible but out of the way (see the photo at left).

Design and materials: For the box, I used about one-quarter of a 4x8 sheet of ¾-in. birch plywood. The fan is a 9-in. axial fan motor ($55) from Grainger (call 800-473-3473 for the nearest location). I bought a 30-minute mechanical timer (instead of an on/off switch), so I could leave the shop with the fan running. Originally, I used a 12x12 fiberglass furnace filter, which worked okay. But lately, I've been using a finer-mesh synthetic filter, which costs about $1.20 (from American Air Filter Co. 33 Industrial Road, Elizabethtown, Penn. 17022; 717-367-5060). A filter, which arrests 85% of particles in the 3 to 5 micron size, lasts about three weeks if I'm using my machinery heavily. (Be sure to write the installation date on new filters.) I picked up the rest of the hardware and wiring (see the drawing) at my hardware store.

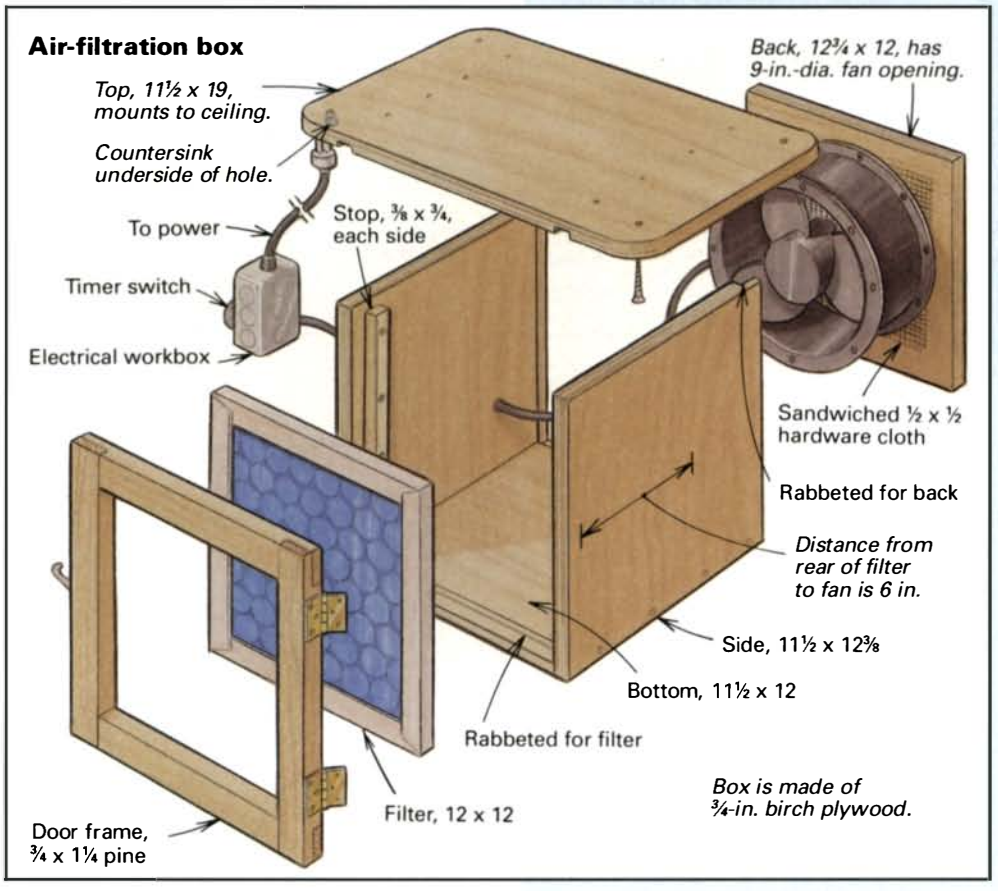
When building the box, I called Grainger to see about the fan-spacing requirements. They advised that a 6-in. space between the filter and the fan would be fine. I made the box's top 2¾ in. longer than the box so that I'd have a mounting surface. I routed rabbets to receive the fan mounting piece and the filter. Before I glued up the box, I drilled all its holes, including the ones for the electrical box.

A simple open-panel door holds the filter in place. I used ¾-in. pine for the door's half-lapped frame and to help direct dust into the box, I chamfered the door's inside edges. A pair of small hinges and a hook-and-eye catch secure the door to the box.

On the back of the box, I cut a 9-in.-dia. hole for the fan using my jigsaw. After I screwed the fan to the back, I dry-assembled all the parts and turned the unit on. Everything worked properly, so I stripped the hardware, sanded the box and then painted and urethaned it to match my other shop cabinets.

Assembly and mounting: When putting the box back together, I added lock washers while mounting the fan to the back. For safety reasons, I sandwiched a piece of ½-in. by ½-in. metal hardware cloth between the fan and plywood. Next I installed the electrical box and wired the timer to the fan. I located the air-filtration box over my bench where there's good head room and a nearby duplex ceiling receptacle. I drilled holes in the box's top 16 in. on center to match my ceiling joist spacing. Finally, I screwed the air-filtration box in place, inserting ¼-in.-thick wood spacers behind the screws, so the unit would hang below the ceiling slightly.

I've been using the 560-cu.-ft.-per-minute filtration box off and on now for a year and have noticed the air is definitely less dusty, though I still use a respirator for certain work. Also,the noise level is quite acceptable (47 dB). I can still hear the radio or television. □



Jim Whetstone has been working wood in New Cumberland, Pa., for more than 25 years.

Dust-collection box

Replacement for conventional drum makes clean-out easy

by Jack Minassian

I built a dust-collection box to replace the 55-gal. steel drum that my Delta dust-collection unit is designed for. The box has a drawer, which lets me clean out dust without having to remove the heavy motor from the drum. The cabinet is ⅜-in. Baltic-birch plywood with exterior poplar strips that protect the plywood edges and allow easy assembly. The drawer, which has waxed oak runners and guides, is made of ¼-in. plywood.

The photo shown at right shows how the box is made. Most of it assembles easily, but a few details are worth noting. When cutting the 22-in.-dia. opening in the top, use a sabersaw fitted with a radius strip, and pivot the saw like a compass. The resulting circular cutout can be used as a form for the support ring. I made my 1-in.-wide ring by laminating 7-ft. strips of 3/32-in. by 1⅛-in. poplar with scarf-joint ends.

To clamp the ring, I used 16-gauge by ¾-in. nails with square wooden pads under the heads. To remove the nails, I pried under the pads. Next I placed the ring over the form. Then, using a center pivot and a sanding disc on my tablesaw, I sanded the ring perfectly round. With the blade back in the saw, I held the ring vertical and rotated it to rip the ring to its correct thickness.

The inside of the door has a gasket made of ⅛-in.-thick self-sticking neoprene, which will compress to about 1/16 in. I hung the door on a 1½-in.-wide piano hinge, and then I installed blocks to the cabinet sides to mount two buckle-hasp latches (made by Brainerd Manufacturing Co.), which are available at most hardware stores.

You can round the edges of the poplar trim either before, or once everything is assembled, using a ¼-in. roundover bit and a router. After you determine the position of your collection unit, shape the support ring for a snug fit. Finish the box as you like (I painted mine Powermatic-machinery green), and then fasten 2-in., 90-lb. swivel casters to the bottom. Finally, install your collector on top. □

Jack Minassian is a retired architect. For a detailed construction drawing, send $6 to Jack Minassian, 15-20 201 St., Bayside, N.Y. 11360.

***Mobile box improves collector**—By replacing his dust collector's 55-gal. drum with a cabinet, Jack Minassian can wheel the unit to any machine in the shop. Opening the door reveals a file-cabinet-like drawer, which can be readily emptied.*

Mobile stand with intake hood

Versatile setup handles a variety of sanding chores

by Gregor Jakob

Sanding dust is an ever-present problem in my woodshop. I've used face masks and left the windows open; then I designed a dust-collector stand that connects to my shop vacuum. The setup works for benchtop sanding (see the photo) and for my stationary drum sander.

To make the stand, I used plywood, pine, melamine, arborite laminate and metal stove pipe. The base has casters and a telescoping column, which provides height adjustment. A pivoting oak head allows the funnel-shaped hood to swivel and tilt. The hood's adapter tube fits my 2-in.-dia. vacuum line. □

Gregor Jakob is a technology teacher in Mississauga, Ont., Canada.

Photo: Gregor Jakob

***Dust-removing helper**—When sanding, Jakob rolls up this hooded stand and connects it to his shop vacuum.*

Doors can significantly affect the appearance of a cabinet. *A simple frame and flat panel are perfect for showing off the wildly flame-figured panel of this door.*

A frame-and-glass-panel door *turns a storage cabinet into a display cabinet. Glass provides a view of the contents, and three drawers hide behind the solid lower panel.*

Doors Make the Difference

Five options dramatically change a basic box

by Christian Becksvoort

Photos: author

***Hand-carved panels** create an interesting textural effect in an otherwise plain door. Dividing the door horizontally makes the cabinet look shorter and wider.*

***A vertical center stile and thin, recessed panels** give this cabinet a tall, narrow appearance. Quarter-round moldings are an easily added detail.*

***Carved, flush panels separated by a vertical stile** add texture to the long, lean look. This combination of styles became the author's favorite door.*

The most obvious feature of many wall cabinets, kitchen cabinets or even freestanding cabinets is the doors. By changing the style of the door, you can subtly or significantly alter the appearance of the cabinet, as I found on a recent job when I ended up making five different doors for the same carcase.

I wanted to design a simple wall cabinet that mounts on a hidden hanger (see the box on p. 52) and that would function in a variety of settings. I started with a basic box for the carcase, as shown in the drawing on p. 53, with the idea of making the door the main attraction.

I carefully selected quartersawn stock for the frame material for this door (and all subsequent doors) to minimize movement. For the single, flat and flush panel, I used a wildly flame-figured cherry board given to me by a friend. Once oiled and polished, the figure seemed to leap off the panel, as shown in the photo at right on the facing page. The simple frame-and-panel construction (see the drawing on p. 53) was the perfect showcase for this magnificent piece of wood.

As I stood admiring my handiwork, I began to wonder, what if...? One idea led to another, and soon I was at work on door number two. For this door, I decided to divide it horizontally with a center rail, yielding two stacked, flat-flush panels, as shown in the drawing on p. 53. The results were okay, but compared to the incredible figure in the first door, door number two seemed rather plain. It needed something to set it apart. After a little midnight inspiration, I took a carving gouge to the panels and textured their front faces, as shown in the photo at left. This was a simple but time-consuming process that required some care and a sharp gouge, especially around the edges to avoid tearout. The oiled, carved facets gave the panels a nice

***Adjustable shelves and drawers with carved pulls** enhance the simple features of the dovetailed carcase. Also shown is the routed finger pull used on the carved, flush panel door.*

three-dimensional look, but I couldn't help wondering if the door might not look better divided vertically.

Thus I began door number three. This door has a vertical center stile and two thin, flat, book-matched panels (see the drawing on the facing page). I framed the panels with 7⁄32-in.-wide quarter round moldings to add some detailing and to create an entirely different look, as shown in the center photo on p. 51. An alternative method would be to shape or rout the stiles and molding into the rails. But this requires more complicated joinery to assemble the door frames.

Door number four was a combination of doors two and three. Door four had vertical panels as in door three, but the panels were flat, flush and carved as in door two (see the drawing on the facing page). I really liked the tall, thin, clean lines of this door, as shown in the photo at right on p. 51. To accentuate the look, I did away with the knob and routed a finger pull on the edge of the door frame. This was my favorite door so far, but what if...?

To give the piece a bit more versatility, I decided to make one last door. Door number five is glass paneled (see the drawing on the facing page) to serve as a display cabinet. A single piece of glass set in the mortised-and-tenoned frame provides an unobstructed view of the cabinet's contents, as shown in the photo at left on p. 50. A small, quartersawn, horizontal panel at the bottom of the door covers three drawers (see the photo at left). Carved pulls recessed in drawer fronts maximize interior drawer space.

At this point, I decided to stop making doors. Although I hadn't yet made the standard raised-panel or gotten into complex carved lattices, end-grain or stained-glass panels, I now had four more carcases to build for my door collection. One has to quit somewhere. □

Christian Becksvoort is a contributing editor to Fine Woodworking *and a custom furnituremaker in New Gloucester, Maine.*

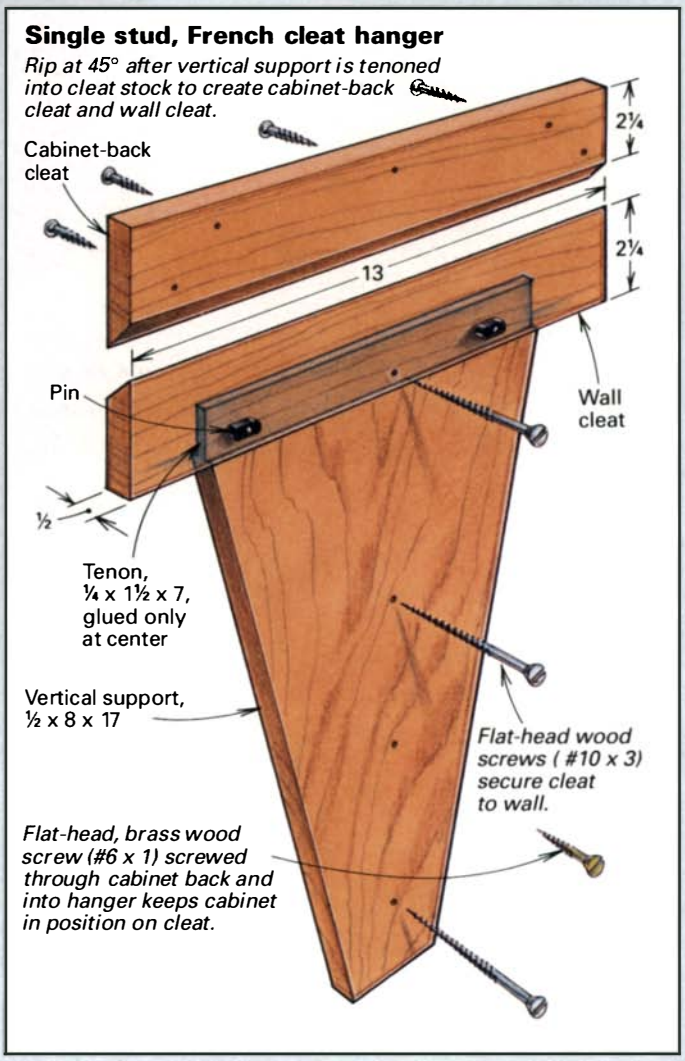
Hidden cabinet hangers

To avoid interfering with the clean lines of my wall cabinet, I chose a hidden hanging system for mounting the cabinet to the wall. I used a variation of a French cleat. A French cleat is a system that uses interlocking beveled cleats, one cleat screwed to the cabinet back and the other cleat screwed to the wall, as shown in the drawing at right. Anyone who has ever tried to balance a wall cabinet with one hand while trying to drive a couple of screws through the cabinet's mounting strip and into the wall with the other hand knows how difficult this task can be. A French cleat makes hanging wall cabinets a breeze. The cleats are easily screwed to the wall and cabinet; then it's a simple matter to press the cabinet against the wall and slide it down so that the cabinet's cleat interlocks with the wall-hung cleat. Recessing the cabinet back an extra ½ in. completely hides the hanging system.

Normally, the wall cleat spans at least two studs and is anchored in a couple of places. Because my cabinet is only 14 in. wide, I was able to screw into only one stud. A single screw into the usual narrow wall cleat would allow the cabinet to swivel on the wall but might not offer sufficient support for the cabinet and its contents.

My solution was to make a T-cleat, as shown in the drawing at right. The bottom of the T is tenoned into the wall cleat and extends down the wall another 17 in., providing plenty of extra space for screwing the cleat to a single stud. Be sure to level the cleat when screwing it to the wall.

After screwing the top cleat to the cabinet-back frame, the cabinet is ready to drop into place on the wall cleat. As a safety feature, I also add a small brass screw through the panel back into the hanger. This keeps the cabinet from being lifted off accidentally and inspires wonder in the uninformed: How can one small screw support that cabinet? —*C.B.*



Drawings: David Dann

Five doors to dress up the basic box

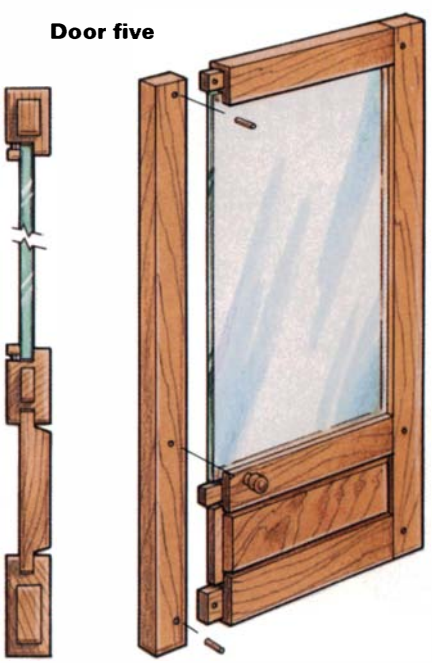
Door one

Door two

Door three

Door four

Door five



***Getting the most out of clamps**—Bernie Maas uses both proven traditional clamping methods and some unconventional ones. The glue-up on the right is clamped with Hargrave I-bar clamps and several Wetzler bar clamps. With student Ron Walker holding the left panel flat, Maas snugs up a pair of Jorgensen double-pipe clamps, which sandwich the panel two ways.*

Clamps in the Woodshop

A look at their variety, construction and common uses

VIDEO TAKES
SEE PAGE 59

by Bernie Maas

A woodworker can never have too many clamps. But having lots of clamps doesn't solve all your glue-up and assembly problems. Knowing which clamps to have, as well as how to use each to its best advantage, is more valuable. I've used most types of clamps, both in my university workshop and in my home shop. I've compared the old standbys, like the double pipe clamps shown in the photo on the facing page, to many of the special-purpose clamps on the market (see the story on p. 57). I've checked out the differences in construction and the features that make certain clamps excel at certain tasks. I've also stumbled onto techniques that make clamps easier or more effective to use.

Instead of looking at every clamp type, I've presented the ones I think are most useful for furnituremaking—the everyday workhorses, such as bar clamps, hand screws and spring clamps (see the photo at right). Though clamps make great helping hands for jigs and hold-downs, I won't talk about those applications here (see "Toggle Clamps," *FWW* #96, p. 74). I also won't include inexpensive C-clamps. While we all use them to some extent, I don't feel they're well-suited for woodworking. That's because when you overtighten an inexpensive C-clamp, it will often spring out of line, making it worthless. There are better clamps that will open wider, deflect less and won't take forever to crank into position.

Choosing clamps for the shop

Compared to machinery, clamps don't rely on high technology to operate. For most models, you twist a handle or turn a crank, and the jaws of the clamp put the squeeze on your work.

How they're made—To help pick clamps, I consider what they're made of and what features they offer. Five questions are worth asking: First, how heavy and bulky is the clamp? I like the body to be stiff so that it doesn't deflect, but light so that it's easy to handle. Hard-steel bodies deflect less than soft-steel ones. And because hard-steel bodies won't dent, they won't influence the travel mechanism. On aluminum and mild-steel clamps, ding marks can prevent the jaw from sliding easily and from aligning properly. Second, what shape is the handle or crank? It should be easy to grip, yet provide maximum leverage. Tiny handles that dig into your palms or strain your fingers while turning will quickly turn you off. Third, how quickly and how far does the jaw travel? I prefer square, Acme threads, like those used in bench-vise screws, over fine, machinist threads. I also like the screw to have at least 3 in. of lead. Fourth, how does the clamp engage? For easy one-handed release, I prefer clamps to have friction-fit, spring-clutch or cam-actuated jaws (see the top photo on p. 56). Fifth, what are the jaws and pads like? I've found clamps that have their jaws pinned to their bodies and ball-joint pad connections, like Wetzler bar clamps, are strong, contact the work solidly and offer wide pivot action. Jaws and pads that are tack-welded, staked or crimped on just don't hold up. I also like models that have plastic or rubber protectors, which keep the jaws or pads from leaving stains.

Service and storage—For all-metal clamps, you should clean them, and add a drop of oil from time to time. Lubricating the threads will make cranking easier. More importantly, though, you should oil the screw's ball joint (without getting oil on the pad). A rusty or dry joint will cause the pad to twist into your work, leaving disc-shaped dings. For my classroom, it's important that the clamps be built to last through heavy use by students, including dropping, glue removal with scrapers and solvents, improper alignment and overtightening. The clamps must also store easily and compactly on a rack or in a drawer. For these demanding reasons, cost comparison rarely dictates which clamps I buy.

Older style clamps still work well—Spring clamps, used here by student Leisa Goerlich to clasp a cleat, are one type the author uses regularly. Two others on the bench are Wetzler bar clamps (laminating walnut) and a hand screw clamping an oak drawer front.

Choosing clamps for the task

Picking which clamp to use for a given job usually boils down to size. Bigger jobs require larger and more rigid clamps. But, of course, clamp sizes do overlap. Nearly 90% of all the clamping I do can be handled by one of the following clamps.

Pipe clamps and bar clamps—For gluing up a panel over 24 in. wide, I use pipe clamps or bar clamps that have an I-beam cross section. I-bar clamps (made by Hargrave and the Colt Clamp Co.) are usually available in 1-ft. increments in lengths from 1 ft. up to 8 ft. I-bar clamps are rigid, won't deflect under load and are pricey. If I-bar clamps are like Cadillacs, pipe clamps are more like Chevrolets. They get the job done and are affordable, especially if you buy your own pipe. Plumbing supply houses usually have the best prices for pipe, but check your hardware store and local yard sales for odd-length cutoffs. One advantage of pipe clamps is you can couple sections together to make a clamp as long as you like. I've made them long enough to yank a deck together.

For medium-sized work (say, 18 in. wide), I use regular bar clamps, either Wetzler or Jorgensen. Both brands offer a range of throat depths. I prefer Wetzlers for deep-reach jobs because they have an easy-to-adjust sliding jaw on the bottom. I opt for wooden handles on bar clamps rather than T-handles. Wooden handles are comfortable and easy to work in tight places.

Hand screws and spring clamps—For small work (8 in. or less), hand screws or spring clamps usually do the trick, although I'll use small bar clamps if I need extra force. Hand screws come in all sizes, and their jaws can be adjusted parallel or flared. Because the jaws are wooden, you don't need pads to protect your work. In addition, these clamps can be positioned so that the jaws distribute pressure over a large area. To open the jaws of a hand screw quickly, grasp the two handles, and move them like you're peddling a bicycle. Spring clamps also come in a host of sizes. The jaws, which work like clothespins, come either as bare metal or

Photos: Alec Waters

***How clamps clamp**—Here's a sampling of clamp jaws (from upper left down): Jet Clamp (turn-screw pivot); Quick-Grip (trigger clutch); Bessey's Klemmy (cam lever) and K-Body (friction slide). For handles, Maas likes Wetzler's wooden grip (top center) and Jorgensen's crank (bottom right) but not the C-clamp's staked rod.*

***Plastic clamps suit delicate jobs.** The rubber pads of Quick-Grip's spring clamp (left) are gentle on work. BTM's lightweight polymer clamps (top) resist rust and solvents. Their miniclamp and Testfabric's clear acrylic clamp are good for restorations.*

sheathed in plastic. Spring clamps make a great third hand when steady, moderate pressure is needed (see the photo on p. 55).

***Miscellaneous clamps and accessories**—*There's a slew of specialty clamps that have features for specific jobs, such as corner-, strap- and edge clamps. There are also tiny clamps suitable for model making, quick-gripping clamps for repair work and disassembly (see *FWW* #102, p. 112), and plastic clamps, which resist rust and solvents (see the bottom photo). In addition, accessories are available to improve the performance of your basic-duty clamps, including replacement jaws and odd-angle fixtures (see the photo on p. 59).

Using clamps

You should plan your clamping strategy before you start assembly. For instance, are you looking to clasp two or more pieces together, or do you want to hold something temporarily? Will you need spacers, cauls, pads? I like to underlay clamps with waxed paper. This makes cleaning the clamps easier, and it protects the work from stains. No matter the clamping situation, dry-assemble your pieces to check their fit before you glue them. Also, keep a mallet, a screwdriver and a putty knife handy. You never know when you'll need to tap something into line, release a sticky spring clutch or scrape off a hardened gob of glue.

***Aim and pressure**—*Clamping pressure should run through the center of a clamp's pad, straight down the axis of the screw and into the jaw. For even pressure and the best glue bond, the beam of force should pass through the center of the pieces you're joining. If the aim is skewed, your panel may buckle or bow, or your lamination may cock. This causes joints to be out of square and prevents good bond. To minimize deflection, orient the clamps' axes as close as possible to the center of the mating parts. Also, keep the jaws of the clamps close to the work. This reduces jaw distortion and the amount that the screw extends. You can also use blocks of wood to extend the reach of the clamp. The blocks can telegraph the force to where it is needed.

When it's finally time to apply pressure, go easy. If you're using sturdy clamps, it's easy to overtighten things. Overtightening can crack a clamp's clutch plate, starve (and thus weaken) a glue joint, or mash the outer edges of your work. Too much force can also make a panel look like a washboard or a section of a barrel. You want to apply just enough pressure to draw the boards together and force little beads of glue out of the joints. For a detailed look at proper clamping pressures, see R. Bruce Hoadley's book *Understanding Wood*, p. 178 (The Taunton Press).

***Laminating stock**—*If you're laminating pieces for a bowl, it's nearly impossible to keep them aligned as you apply the clamps. Everything likes to slide on the glue. To minimize slippage, plant a clamp at each corner, and tighten down alternately as if you were replacing an engine head gasket, torquing a bit at a time, from corner to opposite corner. Then run a row of clamps along the two outside edges using as many clamps as you can spare (see the photo on p. 55). Don't run one row of clamps down the center. The moisture from the glue will be sucked up by the laminates, causing the edges to curl away from each other. The resulting glue clots, encrusted in the gaps, will prevent any remedial clamping action. Basically, you'll end up with firewood.

***Gluing up panels**—*When I align a panel for glue-up, I use splines, biscuits or dowels (for more on this, see Jim Tolpin's article on p. 74 in this issue). I place pipe clamps at about 15-in. inter-

Specialty clamps offer wide options

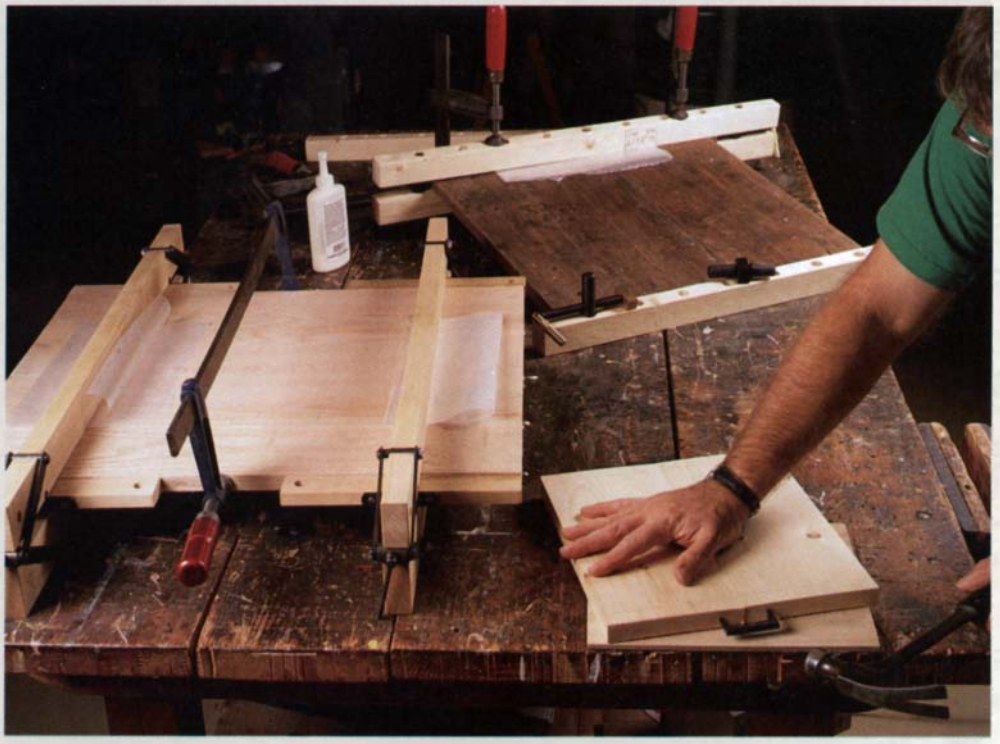
To accompany your standby clamps, you may want to equip your shop with an assortment of specialty clamps. Although I couldn't evaluate all the models, I've included examples of common varieties—a few I'd recommend, others I was disappointed with. Nearly all specialty clamps operate similarly to the following types.

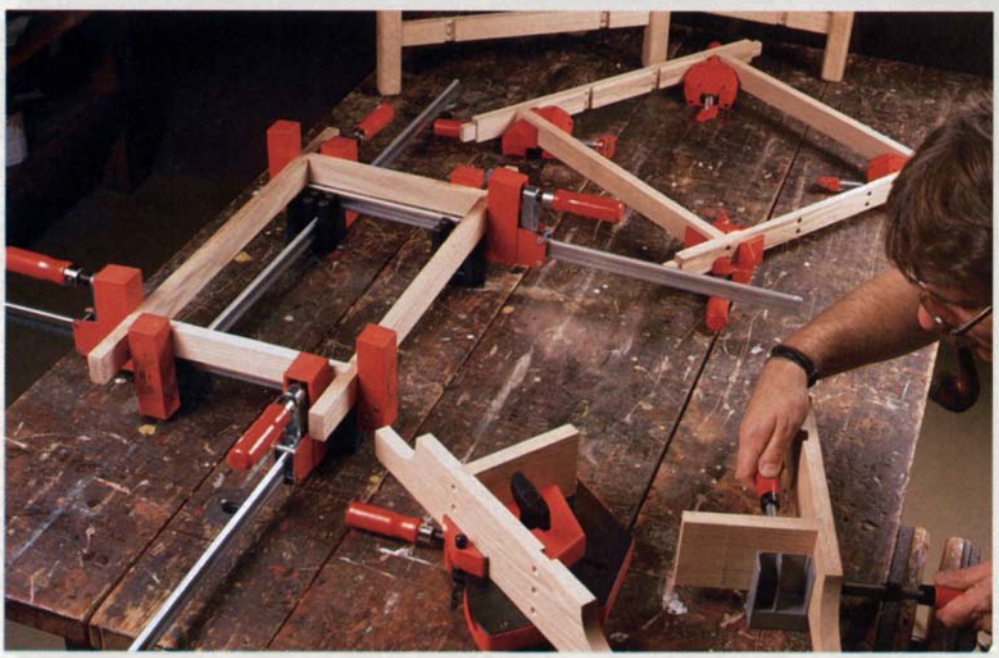
Panel clamps: After trying out the two panel clamps shown in the top photo, I decided that they weren't really serious additions to a shop. Made by Veritas and Mark, the units had Lilliputian handles and short, anemic lead-screws, which made slow work out of what should have been a rapid panel glue-up. Before I could even use the Mark, I tediously had to assembly greasy, small parts. For the Veritas, I had to make cauls, which meant drilling and reaming out three dozen holes. For both clamps, I had to find and add shims to make up the space to the panels. Next I underlaid the joints with waxed paper, so the clamp wouldn't get glued to the wood. Finally, I had to pull my reliable Wetzlers off the rack because the panel clamps didn't flatten the work. Surprisingly, the simple old-time pinch dogs made by Osborne could pull boards together (although only at the ends). To use the dogs, just hammer them into the end grain over each joint.

Frame clamps: If you put together lots of picture or other frames, these are a real time-saver. I looked at Bessey's KP framing system (see the photo below), which deserves a four-star rating in my book. It consists of four deep-throat, length-adjustable (K-body) clamps and a set of four plastic support blocks. The blocks have two pairs of slots for lining up the clamp (one slot is for 90° corners, the other allows a piece to fly past the corner). Although four hands are better than two for setup, the KP system works quicker and more effectively than individual clamps.

Corner clamps: Usually lightly built, these clamps are designed to bring two pieces together at right angles, as shown in the bottom photo. I find they work best aligning corner subassemblies for glue-up. I then use regular bar or pipe clamps to assemble the whole carcase. Don't count on corner clamps to exert much pressure. They're really for alignment only. I looked at three different models. Bessey's Angle Clamp is well-made and has a generous grip. Its single-hand operation beats the pants off my old Stanley 404's. Gross Stabil's Multi-Spanner also gets a thumbs up. Although it's dual-handled, this clamp has a generous depth capacity of just under 2½ in. And an extra set of screw sockets lets you use the clamp for 1-in. or 2-in. stock. Bessey's miter clamp is made oversized and mostly of plastic; the metal unit offered more versatility.

Strap clamps: Often called web or band clamps, strap clamps are useful when you need to exert circumferential or radial pressure. Stave construction and polygonal assembly are two cases where strap clamps are handy (see the top right photo on the following page). A few units use metal banding, but I prefer to use fabric straps be-





Pinch dogs and bar clamps out perform panel clamps *(photo above). After trying the three clamps shown, Maas preferred to hammer in the simple Osborne pinch dogs (right). Both the Mark clamp (holding the left panel) and the Veritas clamp (reassembling the antique tabletop in the rear) required lots of setup and fiddling. Maas still had to use standard bar clamps to get those panels flat and tight.*

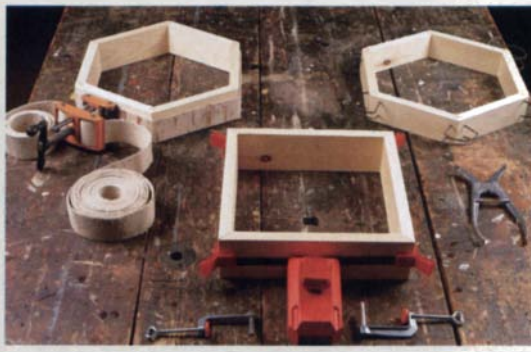
Frame-and-corner clamps tackle casework *(photo left) like joining assemblies in this oak television stand (the legs are in back). The Bessey K-Body (far left) proved the best for squaring and holding a frame. Two other Bessey models, angle and miter clamps (front center and rear) worked well at clasping dado joints. Here, Maas tightens a T-shaped assembly using a Gross Stabil Multi-Spanner clamp (front right).*

cause of their flexibility. My professional-grade Jorgensen model has a cast-iron winder and pre-shrunk canvas webbing. Bessey's newcomer (Poly-Angle strap clamp) uses a nylon strap, a sheet-metal and plastic winder and plastic corner pads that pinpoint pressure at the joint. Unfortunately, the clamp is lightweight. I don't predict its longevity in an active shop. The Bessey also comes with hold-downs. But oddly, they won't open up wide enough to fit a typical 6/4 benchtop.

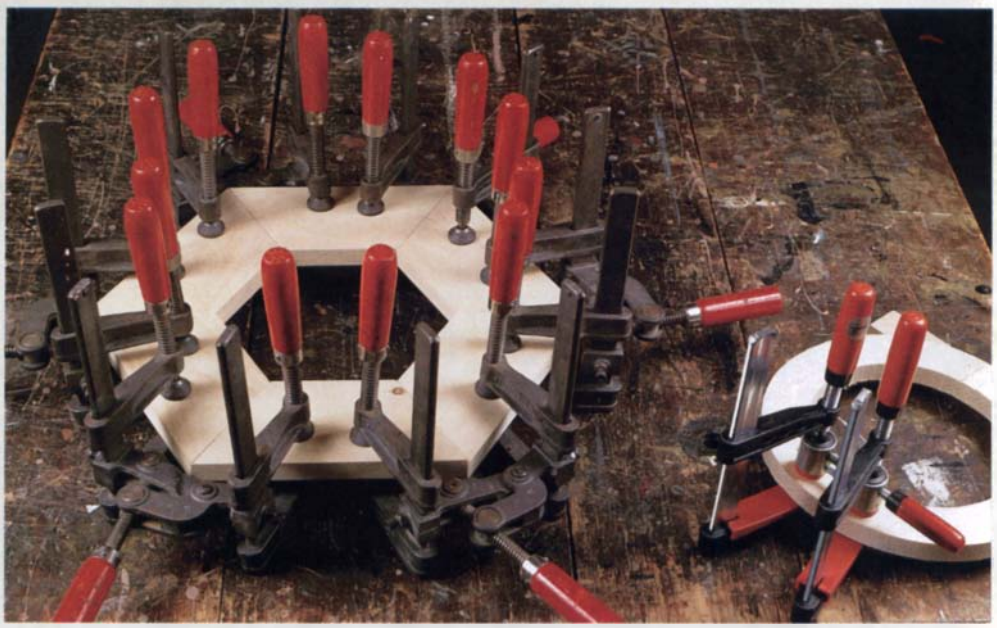
Edge clamps: Edge clamps are a real asset when you're edge-banding plywood (see the top left photo). Usually you place these clamps from 3 in. to 6 in. apart to distribute the pressure. I compared several edge clamps. The pricey, German-made Kantenfix (the small size lists at $49) has the best jaws. They're cam-actuated and surfaced with non-skid rubber. The clamp is self-centering and snaps quickly into position, and its powerful springs grab onto a board as its beefy screw rams the edging home. Wetzler offers an edge-clamp add-on to go with two bar clamps. For pure cranking power, you can't beat this one. Gross Stabil, Bessey and Jorgensen Pony offer three-way edge clamps. The Gross Stabil and the Bessey were heftier than the Pony, whose pads were only lightly staked on. With all three models, the setting and resetting of three screws per clamp does get tiresome.

Miter clamps: Miter clamps are good for precise joint alignment, whether your components are straight or curved (see the bottom photo). I put a couple of versions through their paces. Top billing goes to the Wetzler double-clamp with its superior cranking power. The Gross Stabil miter clamp is an add-on that joins two of their bar clamps. It works on the same principle as the Wetzler, but the Wetzler is more heavy-duty. For easy, speedy setup and astonishing grip, an award should go to Ulmia's miter-joint clips. These clips are inexpensive, U-shaped spring-steel rings that get set into place with a spreader tool (see the top right photo). Their only drawback is the small dings left by the pointed tips. *—B.M.*

Clamps for edge-banding—*Edge clamps (photo above) are lined up here for an end run on plywood. From left to right, the models are two sizes of Kantenfix (carried by Tape & Tools), Jorgensen Pony, Wetzler and Bessey three-way edge clamps. The Kantenfix models were the quickest to use, and the Wetzlers exerted the most force.*



Clamping a many-sided glue-up—*Strap clamps (photo above) are good for joining polygonal frames and stave-constructed projects. But for many applications, you can also apply Ulmia clip rings (top right) with a spreader tool (bottom right). The Jorgensen strap clamp (left) uses a canvas strap. The Bessey Poly-Angle strap clamp (center) comes with plastic corner pads.*



Miter clamps give precise alignment—*This maze of Wetzler clamps (photo right) nicely tightens up a hexagonal frame. The Gross Stabil miter clamp (far right) was easy to install on a circular frame. To work both varieties, first clamp the two portions of the workpiece; then snug the screw that bridges the joint.*

vals; half go over the panel, and half go under it to prevent buckling. With the panel glued and loosely assembled, I lay it gently on the bottom clamps. Then I install the upper clamps to complete the sandwich. For seamless panel joints, the boards' edges must be straight, and the corners must remain crisp. So I try not to smack the boards into line with a hammer. I snug the clamps slowly and evenly. Because I always make the panel oversized, it's easy to remove clamping dents when I trim the panel to size later. To remove a dent I didn't account for (assuming the wood fibers have not been severed), I lay a wet cloth over the damaged area and then pass a steam iron over it.

Flattening misaligned joints—The joints of a panel will often shift as you're clamping. Squashing the panel down with a gang of bar clamps will often not be enough. One way to flatten the seams is to straddle the junctions at the edges with hand screws. Another way to flatten joints is to use stiff, straight strips, or cauls, of wood or metal. I simply make a sandwich of the cauls and panel, and then I apply hand screws or bar clamps (see the photo on p. 54). The cauls act like joists because once set on edge, they remain rigid, so they keep the boards from flexing. If you need an extra pair of hands while you're doing this, dab on some hot-melt glue to tack the cauls in place.

If you want consistently flat panels, invest in several double-bar clamps. Jorgensen offers their #53 model for this and Hartford Clamp Co. offers their #3. Double-bar clamps are actually tandem pipe clamps; one pipe is placed above the panel, and the other smacks up, kitty-corner, to its underside. This arrangement keeps boards dead flat, especially if you have someone (I use one of my burlier students) stand on the bars as the clamps are drawn to the work, as shown in the photo on p. 54.

Squaring up carcases—Glued-up casework can end up looking like diamonds rather than rectangles. This is because clamping pressure can force the case members to bow, which leaves you with no place to check with your framing square. For these situations, I lay the partially clamped carcase face down on a bench or the shop floor. Then I measure the diagonals. Next I make up a pair of V-blocks and place them on the corners of the longest diagonal. I run a bar clamp between the corners and gently draw them a bit beyond where I want them. If the case is severely out of square, I increase pressure gradually over several hours. This lets the wood fibers and whatever elasticity left in the glue give a bit. After I back off the clamps (with the back of the carcase in place), spring back sets everything square. □

Bernie Maas teaches computer-aided design and woodworking at Edinboro University of Pennsylvania.

Video: Surveying clamps

VIDEO TAKES

Over the past 35 years, Bernie Maas has had a chance to see which clamps work and which ones don't. He's also come up with ways to correct misaligned work using clamps. To see Bernie Maas comparing different models and demonstrating common clamping techniques, order "Clampvid," a 28-minute video cassette (VHS) companion to this article. The tape is available for $10. Order #011036, The Taunton Press, PO Box 5506, Newtown, Conn. 06470, or call (203) 426-8171.

—Alec Waters, assistant editor

Accessories can improve your clamping range. *Clockwise from left: Mastodon's Jaw Extenders; Brink & Cotton's Stand-Up pads, hand-screw adapter tips that fit pocket holes to tighten joints; E-Z Hold adapters that add a trigger to a Jorgensen bar clamp; and Bessey's Irregular-Angle set for clamping at odd angles.*

Sources of supply

Clamps

Bessey (*American Clamping Corp., PO Box 399, Batavia, NY 14021; 800-828-1004)

BTM Corp., 300 Davis Road, Marysville, MI 48040; (800) 878-1900

Colt Clamp Co. Inc., 33 Swan St., Batavia, NY 14020-3245; (800) 536-8420

Gross Stabil Corp., 333 Race St., PO Box 368, Coldwater, MI 49036; (800) 671-0838

Hargrave (*Warren Tool Group, PO Box 286, Garrettsville, OH 44231; 800-543-3224)

Hartford Clamp Co., 466 Park Ave., PO Box 280131, E. Hartford, CT 06128; (203) 528-1708

Jet Clamp (*Advanced Machinery Imports Ltd., PO Box 312, New Castle, DE 19720; 800-648-4264)

Jorgensen/Pony (*Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, IL 60622; 312-666-0640)

Kantenfix (*Tapes & Tools, PO Box 1195, High Point, NC 27261; 910-884-5371)

Mark Products, PO Box 46143, Bedford, OH 44146; (216) 232-1281

Osborne (*Garrett Wade Tool Co., 161 Avenue of the Americas, New York, NY 10013; 800-221-2942)

Quick-Grip (*American Tool Co., 301 S. 13th St., Lincoln, NE 68508; 402-435-3300)

Testfabrics Inc., PO Box 62, Sweet Valley, PA 18656; (717) 256-3132

Ulmia (*Garrett Wade Tool Co., 161 Avenue of the Americas, New York, NY 10013; 800-221-2942)

Veritas Tools Inc., PO Box 1720, Ogdensburg, NY 13669; (800) 667-2986

Wetzler Clamp, Route 611, PO Box 175, Mt. Bethel, PA 18343; (800) 451-1852

Accessories

Adapter Tips (*Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, IL 60622; 312-666-0640)

Brink & Cotton (*Warren Tool Group, PO Box 286, Garrettsville, OH 44231; 800-543-3224)

E-Z Hold trigger adapters (*Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, IL 60622; 312-666-0640)

Mastodon, Wade Manufacturing Co., 1040 Balboa St., San Francisco, CA 94118; (415) 386-0310

**Company is a distributor for the manufacturer.*

Knockdown Red-Cedar Trestle Table Works Well Indoors or Out

Hand-chopped mortises complement simple design

by Tony Konovaloff

***This red-cedar table's mass is lightened visually** by its gently rounded and bevel-edged top, tapered foot and thin, slightly tapered wedges. Just the same, the table is built solidly to withstand years of use and abuse, both indoors and out.*

When I was a student at James Krenov's woodworking program at the College of the Redwoods, money was tight. Having virtually no furniture, though, I needed to make some basic utilitarian pieces including a kitchen table. I went to the local lumberyard and purchased just enough 2x stock to make a trestle table like the one in the photo above. I liked that first table's lines and wanted to try it in a nicer wood, so I chose clear, vertical-grained red cedar because it's highly rot-resistant: The table can be used outside as well as in the kitchen or dining room.

Building this table can be done just as easily with power tools as with hand tools and may even be slightly quicker. But the scale of the joinery and the simplicity of the design also make this an ideal project on which to practice cutting joints by hand.

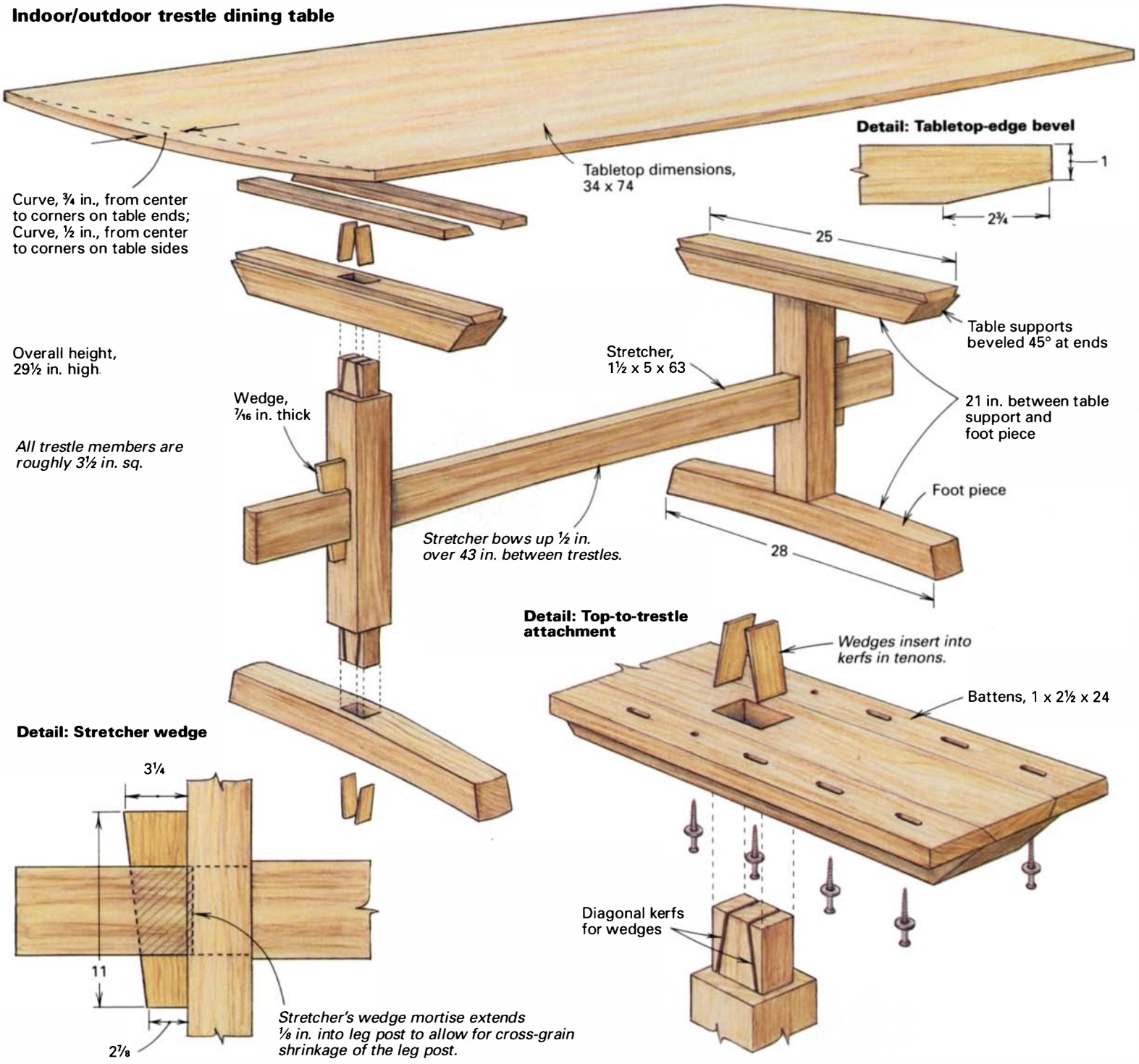
I use hand tools exclusively, partially because acquiring and practicing hand-tool skills is what initially attracted me to woodworking. But mostly I use hand tools because I really enjoy planing and cutting joinery by hand, and I really don't enjoy the scream of electric saws, routers and sanders.

The trestles

I built the two trestles first, then the related pieces (stretcher, wedges and battens) and, finally, the top. By having the trestles and related pieces ready when I finish the top, I can attach the battens to the underside of the top right away, connecting top and base before there's any chance of major wood movement. If I built the top first, it could have warped while I was building the base, making it difficult to connect the two.

I used dimensional red cedar for this project, which I cut to length, planed smooth and laid out for mortises and tenons. I clamped each of the trestle members in my bench vise and bored holes for the mortises using a brace and expansion bit (see the top left photo on p. 62). I set the expansion bit to the width of one of

Photo this page: David Scherrer



my mortise chisels and positioned a depth stop to just less than half the depth of the mortise. To ensure the holes are perpendicular to the surface of the workpieces, I clamped the work so that my drilling motion keeps the bit naturally level. I sight along the bit and the sides of the workpiece to keep the bit from wandering to the left or right. After boring to the depth stop, I repeat from the other side, leaving just a wisp of wood in the middle.

I cleaned out the mortises with a mallet and a registered mortise chisel, which has square sides but is not as thick as a standard mortise chisel (see the photo at right on p. 62). I kept the blade perpendicular to the length of the mortise, and I chopped from one end of the mortise to the other, staying just shy of the marked top and the bottom shoulder lines. After hogging out most of the mortise with the bit and brace and the registered mortise chisel, I came back with a paring chisel. I pared the mortise clean, squaring the ends and making sure the sidewalls are relatively smooth and square (see the bottom left photo on p. 62).

Once I've finished all six trestle mortises (four for trestle assembly, two for the stretcher), I cut the shoulders and then the cheeks on the tenons of the vertical trestle members, smooth all tenon surfaces with a shoulder plane and kerf the tenons diagonally (see the drawing above). Kerfing the tenons diagonally, toward the outside of the tenon (see the drawing), causes the outer sections of the tenon to splay, almost like a hinge. Diagonal kerfs reduce the likelihood of a crack extending beyond the tenon when I drive the wedges home later. Cracks are also less likely with diagonal kerfs because the plane of the sawkerf does not follow the grain.

Next I shaped the two horizontal trestle members: a 45° bevel at the ends of the top pieces (which support the tabletop), a ⅜-in. taper on either side and a ⅝-in. taper on the top of the foot piece (see the drawing). I also planed dovetail rabbets into both sides of both top trestle members where they'll slide into the battens on

Photos except where noted: Vincent Laurence; drawing: Lee Hov

BORING, CHOPPING AND PARING WIDE MORTISES

***Boring holes perpendicular to the face of a workpiece** (left) with a brace and bit isn't difficult if you position the workpiece vertically and at a height that automatically levels the bit. To keep the brace from wandering left or right, just align the bit visually with the sides of the workpiece.*

***To clean large, pre-drilled mortises,** use the registered mortise chisel (below). Its square sides and thick blade keep it snug against the sides of the mortise and parallel to the ends. With a sharp edge on one of these chisels, its mass will make quick work of any mortise.*

***A sharp paring chisel will smooth and square the walls of the mortise** (above), ensuring a good, snug fit of an accurately sized tenon in the trestle.*

the underside of the tabletop. I rounded the ends of the foot pieces slightly to reinforce that motif in the tabletop. Then I relieved the bottom of the foot so that it would rest on its two ends, and I slightly chamfered all sharp edges. With all trestle pieces finished, I applied glue to all mating surfaces, started the wedges into the tenons, inserted the tenons into the mortises and then clamped the trestles closed. I tapped the wedges home. The next morning, I sawed them flush and then planed smooth those surfaces on which the tenons were exposed.

Stretcher and wedges

I planed the stretcher stock smooth, crosscut it to length and marked out the tenons. Then I crosscut the shoulders, ripped the cheeks and cleaned up the tenon surfaces with a shoulder plane. I installed the stretcher tenons into the two trestle mortises, marked the stretcher for the wedge mortises (see the drawing for taper) and then disassembled and chopped the mortises (see the photos on the facing page).

Because this mortise is so narrow (7/16 in. wide), I skipped drilling it and just pounded out the mortises with a mallet and a sash mortise chisel. Some furnituremakers like to work from the middle out when chopping mortises. I prefer working from one end (just shy, actually) to the other, being careful at the ends not to round over or crush the crisp shoulder of the mortise. Also, because this mortise is tapered, I was particularly careful not to gouge the inclined plane against which the wedge will bear. The more perfect the wedge and this inclined plane mate, the less prone the wedge will be to slip and the more solid will be the table's structural elements.

As a final touch on the stretchers, I rounded the ends side to side, using a rasp and a file, to go along with the foot and the tabletop.

CHOPPING NARROW MORTISES

Chopping from just shy of one end nearly to the other loosens the top layer of the mortise *(left). Keeping back from the marked lines at either end keeps the shoulders from being crushed.*

Continuing to remove one level of chips at a time *(below), as deep as a mallet blow takes you, yields a mortise quickly. The thickness of the mortise chisel blade keeps the mortise true between the marked lines.*

To square the end of the mortise, *position the chisel bevel side in, and chop down along the marked line (above), being careful to keep the chisel perpendicular to the face of the piece. For the tapered (outboard) end of the mortise, pare gradually from both sides until you have a straight uninterrupted plane, top to bottom.*

I cut the wedges from scrap. The taper is slight: ¾ in. over a foot. It's important that the taper not be too steep because that would cause the wedges to become unseated with the slightest bump to the table. I chamfered the top of both wedges, so they wouldn't split out when tapped into their mortises. I did the same to their bottoms for the sake of symmetry. I left the sides with crisp edges to maximize the bearing surface in the mortises.

Tabletop

For the top, I edge-jointed, glued and clamped three red cedar 2x12s. I sprang a batten on each of the two sides to mark subtle fair curves that sweep from the centers of the sides in ½ in. to the ends. I also marked fair curves along the ends in ¾ in. from the centers to the sides (see the drawing on p. 61). These curves make the table. I scrub-planed top and bottom roughly flat, left the bottom that way (I like the texture) and smooth-planed the top.

I scribed the underside of the table 2¾ in. in from the edge, and then I marked the edge down 1 in. from the finished top surface for a bevel to lighten the appearance of the tabletop. I used a drawknife to eliminate most of the waste, followed up with a scrub plane and finally took the bevel to the two scribe lines (and to a finished surface) with a smooth plane. I chamfered both top and bottom arrises of the table's edge with a block plane.

I ripped, crosscut and planed the four battens that connect the tabletop to the trestles (see the drawing) and drilled and elongated screw holes in the battens. I screwed them to the underside of the table using the stretcher-connected trestles as spacers. □

Tony Konovaloff is a professional furnituremaker in Bellingham, Wash.

***Sassafras is easily identified**—Its leaves take three distinct shapes (boat-shaped, mitten-shaped and three-lobed), often on the same tree. In winter, it's recognizable for its branches, which grow nearly perpendicular from the trunk. Little more than a shrub in northern states, sassafras is a respectable timber tree farther south in its native range.*

Sassafras

Fragrant wood that works sweetly, too

by Jon Arno

I've known about sassafras since my childhood, growing up in the wooded hills of south-central Michigan. In fact, one of my earliest memories is of helping my uncle collect the roots of sassafras shrubs for making tea. He loved his sassafras tea, and it was a taste I soon acquired. He also taught me to pick the tender young leaves and chew them as a thirst quencher while we foraged in the woods for mushrooms and other late spring delicacies. It was not until much later, though, that I discovered sassafras was more than a shrub, that it would grow big enough to be a timber tree down in the southern part of its native range from Virginia to Arkansas (see the photo at left). Although not common, examples of this species that approach 100 ft. tall and 4 ft. dia. do exist.

From beverage to cooperage

Sassafras is a member of the laurel family, Lauraceae. There are only three species in the Sassafras genus: One grows in central China and another in Taiwan, but only our native species, *S. albidum*, is of commercial significance. Like other members of the laurel family such as cinnamon, bay and camphor, sassafras produces a natural oil, which has a fragrant, spicy odor. When the first explorers arrived along the East Coast of what is now the United States, they were quick to recognize the commercial potential of sassafras, and ship-

Photo this page: Peter Del Tredici

loads of the root bark were taken back to Europe. Sassafras tea, known as saloop in the tea houses of 17th-century London, ranked in popularity with coffee, true tea and cocoa until some now nameless physician announced that it was a reliable cure for venereal disease. At that point, the consumption of sassafras tea, at least in public, sort of dried up.

Although the oil distilled from sassafras bark has remained an important commodity for scenting soap and flavoring foods and medicines, the wood has never enjoyed much popularity in its own right. Most sassafras lumber comes to market mixed with other general-purpose hardwoods (formerly with chestnut and nowadays usually with black ash, *Fraxinus nigra*) and is used for applications such as pallets, loose cooperage and crating.

In appearance, sassafras and black ash have much in common. Like black ash, sassafras is ring-porous and open-grained, with an attractive figure and grayish tan color (see the bottom photos). With an average specific gravity of 0.42 (oven dry weight/green volume), sassafras is only slightly softer and lighter than black ash (0.45), but it is much weaker and less elastic. While black ash is excellent for bending, sassafras is exceptionally brittle. In fact, its modulus of elasticity is actually lower than that of basswood, which is otherwise our weakest commercially available, native hardwood. On the basis of strength, sassafras is vastly inferior to black ash and only borderline acceptable for use in light-duty furniture applications. Also, it tends to split easily, a frailty it shares to some extent with black ash and even more so with its companion, chestnut.

Sassafras is a pleasure to work—It's soft, cuts cleanly and has a tangy aroma. It dents easily, though, and is brittle, so it's probably for the best that this handsome sassafras stepstool made by Kelly Mehler always has been used as a plant stand.

I discover sassafras

Over the years, I've shied away from sassafras because of its weakness. But several summers ago, I needed a substitute for chestnut to make some reproduction clock cases and happened to come across some unusually wide and attractively figured pieces of sassafras for only $1.50 per bd. ft. The color of the sassafras was a little closer to that of chestnut than the black ash I had on hand, so I elected to buy it and experiment with it. The clock cases turned out beautifully, and the sassafras was such a joy to work with that I became hooked on it.

Although not as pungent as the aroma given off by a steaming cup of sassafras tea, the faint scent produced when the wood is sanded is equally spicy and pleasant. Because sassafras is so brittle, sharp blades cut through it, leaving crisp edges. In contrast, ash tends to fray when crosscut, leaving a fine ridge of splinters where the blade exits. And sassafras virtually powders as it comes in contact with high-speed router bits, while ash requires a steady rate of feed or it quickly burns. Also, sassafras has a natural surface luster, so 220-grit sandpaper leaves the wood with a warm reflective glow that you would expect to achieve on most woods only after a coat or two of wax.

The sound of sassafras

Ever since that first experience with sassafras, my desire to work with it has left me searching for appropriate projects. Because of its great weathering properties and buoyancy, it has been used to some extent in boatbuilding and for other exterior applications such as fence building. But these pursuits have never been high on my menu of interests. After racking my brain and ransacking my library of project books for ideas, I finally decided to try it as a

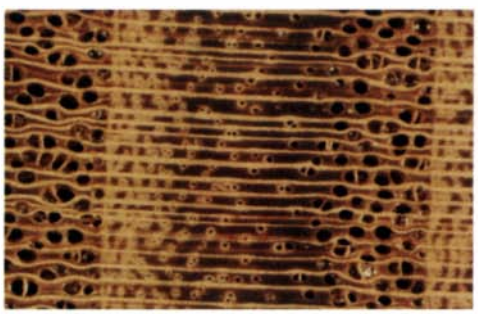


Photo: R. Bruce Hoadley

***Sassafras or black ash?** The strong figure and tawny color of raw sassafras (below right) recall black ash. Darker pieces of sassafras deepen to a cinnamon brown when finished (above right). Sassafras' pronounced grain pattern is due to its ring-porous cell structure, as shown above in the macrograph of its end grain.*

Photos except where noted: Robert Marsala

***Sassafras that sings**—For this Kentucky-style dulcimer in solid sassafras, Jon Arno used an indigenous wood to build an indigenous instrument. He thinks the wood's brittleness may be responsible for the bell-like tone the dulcimer produces.*

soundboard wood in musical instruments. Bingo! The dulcimers I've made with it (see the photo at left) generate a bell-like tone that puts all my previous walnut, ash and cherry dulcimers to shame.

I can't offer a verified, scientific explanation why sassafras possesses such pleasant tonal qualities, but my personal theory is that it is due to the wood's brittleness. Even when cut into soundboards that are less than ⅛ in. thick, the wood is rigid and adamantly opposed to absorbing shock; this must translate the vibration of the strings into sound waves with much greater fidelity.

Sassafras has another attribute that is highly beneficial in dulcimer making: It undergoes little seasonal movement. This will appeal as well to anyone making other things to precise tolerances—drawers, jewelry box lids, cabinet doors. When it's compared to other domestic woods commonly used in instrument-making, sassafras performs well in this regard. With an average volumetric shrinkage of only 10.3%, fluctuations in humidity produce less in-use movement in sassafras than in most other woods. Also, as indicated by the ratio between its tangential and radial shrinkage (T/R=1.55), sassafras develops low drying stress and is not particularly prone to warping. Walnut, with a T/R ratio of only 1.42, is slightly superior in this department, but its 20% greater volumetric shrinkage offsets the advantage. Furthermore, walnut's renowned ability to absorb shock, while an advantage in gunstocks, leaves it with rather limp tonal qualities. In this musical application, sassafras is hard to beat. Of course, some of the softwoods, such as spruce, western red cedar and redwood are more recognized for their tonal qualities, but among our domestic hardwoods, sassafras might well be the best there is. □

Jon Arno sells and studies wood in Troy, Mich.

Working with sassafras

by George K. Rome

Since I first encountered sassafras a few years ago, I've used close to 1,000 bd. ft. of it for bookcases, kitchen cabinets, wet bars, toolboxes and jewelry boxes. It's delightful to work and versatile but with peculiarities and limitations as well as assets.

Being ring-porous, sassafras has a lot of figure. It takes stain well, and the grain pattern is close enough to red oak to pass as the same wood when stained. I've also pickled it pink and white, and it colors better than oak but tends to turn yellow far faster.

Unstained sassafras will turn a dark shade of brown when exposed to sunlight for a month or so, especially when it's been finished with shellac. The toolboxes I've made for trim carpenters, which get real exposure to the elements, turn a striking brown with a silvery greenish cast that is almost iridescent.

I get sassafras from Paxton Lumber (7455 Dawson Road, Cincinnati, Ohio 45243; 800-325-9800) where it's available only in 4/4 thickness. Rough sassafras boards tend to be extremely straight and flat with little internal tension. End checks are extremely common, though, and it's not unusual to lose a good foot off each end of a 10-ft. board. Several times, I've found hairline checks running the length of a raised panel after applying stain. The checks were totally invisible before the stain hit—I swear!

Aside from the checking problems, sassafras is a dream to work. It sands like balsa and cuts almost as easily. Unlike pine and poplar, it doesn't tend to clog sanding belts, but it plays hell with sanding drums on my drill press. It cuts beautifully on the tablesaw, where the wood's softness and lack of internal stress make for cuts that require little cleanup. It seldom burns, but its sawdust is so fine that it's as slippery as medium-density-fiberboard dust when it covers the concrete floor of my shop.

Sassafras gets dented easily by everything from normal clamp pressure to dried glue on the workbench. But a rub with a washcloth dipped in warm water followed by a pass with an iron at the cotton setting will remove most dents. Because of its softness, it's not a wise choice for use as base moldings or countertop edges. But because red oak will stain the same color, I often use oak for the parts of a piece that will receive the most wear.

I've worked with many domestic and exotic woods, and for my money, the only one that's as pleasant and easy to work as sassafras (aside from an occasional piece of mahogany) is black walnut. And we all know if the good Lord made a wood that was nicer to work than black walnut, he kept it for himself. □

George Rome, former owner of furniture manufacturing companies in Taiwan and China, lives in Louisville, Ky.

Sweet details define the furniture of Greene and Greene. *Learning to produce them is key to making furniture that compares to the originals. The author's sideboard (above) and writing desk (below) are fresh designs, but their superbly made and marshalled details give them the ring of the real thing. Both are made of sustained-yield mahogany and Ebon-X, an ebony substitute.*

Building in the Language of Greene and Greene

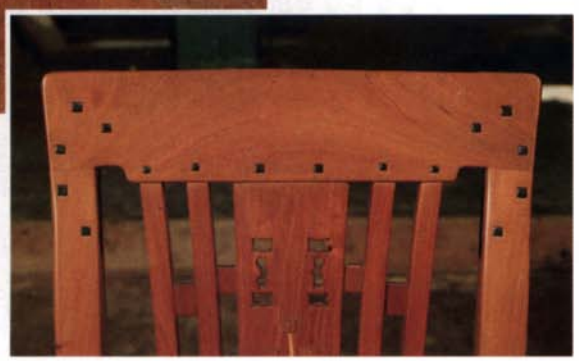
Their furniture's deftness is in the details

by Thomas Hugh Stangeland

I made a roomful of furniture recently in the style of Charles and Henry Greene, brothers who designed houses and furniture in California in the first decades of this century. One of the most difficult aspects of making this furniture was finding ways to produce the details, the little touches that define the Greenes' work and make it so appealing to the hand and eye. The square black pegs, which are left slightly proud of the mahogany surface; the exposed splines also proud and gently radiused back to the surrounding wood; the rounded double-L brackets—these and other signatures of the Greenes' furniture are all deceptively tricky to make well. Once mastered, though, they provide the basic vocabulary for building furniture in the language of Greene and Greene.

The dining chair in the top photo on p. 68, one of a set of eight I built, is a straight reproduction of a chair designed by the Greenes in 1908. Working from photographs, I followed their example as closely as I could. The only concession the client and I made to cost was to leave out a subtle carving detail at the base of the legs. I took a more interpretive approach when I made the sideboard in the top photo and the writing table in the inset photo. For each of these, I used a Greene and Greene piece as a starting point but redesigned the original to satisfy the client's needs, the demands of function and my own sense of proportion. (For an account of

Photos this page: Gregg Krogstad



***Reproducing details**—Square black pegs left proud convey the Greenes' message of hand craftsmanship in the author's reproduction chair (above).*

***To substitute for ebony,** the author used Ebon-X (chemically altered walnut) for black details (right).*

how the sideboard evolved from its Greene and Greene forefather to my final version, see the story on p. 71.)

Springs of inspiration

The Greenes' system of detailing did not develop all at once. It grew gradually as they were exposed to a variety of influences and ideas. Like many craftsmen of their day, Greene and Greene were deeply influenced by the Arts-and-Crafts movement. Arising in 19th-century England in reaction to the mechanization and shoddy goods of the industrial revolution, the movement was a call for honest hand craftsmanship. The Greenes were particularly influenced by Gustav Stickley and other proponents of Arts and Crafts who emphasized openly expressed joinery and function before frippery—features also evident in all the Greenes' work.

What sets the Greenes' work apart is the blending of an Oriental aesthetic with Arts and Crafts. In Japanese temple architecture and Chinese furniture, the Greenes saw ways to soften a composition of straight lines and solids by rounding edges and introducing gentle curves. There's an Eastern overtone as well in the balanced but slightly asymmetrical patterns of the Greenes' detailing.

Doing the details

It's in the material—The impact of the details in the Greenes' furniture is partly a function of the materials they used. Combining ebony and mahogany gives the furniture warmth as well as a strong visual contrast. I wanted to achieve the same effects but without using endangered woods. I considered using maple with walnut accents, but I finally chose sustained-yield mahogany and Ebon-X, an ebony substitute made of chemically altered walnut. The chemical treatment gives the Ebon-X a rich black color but also gives it working properties that aren't that far from ebony's.

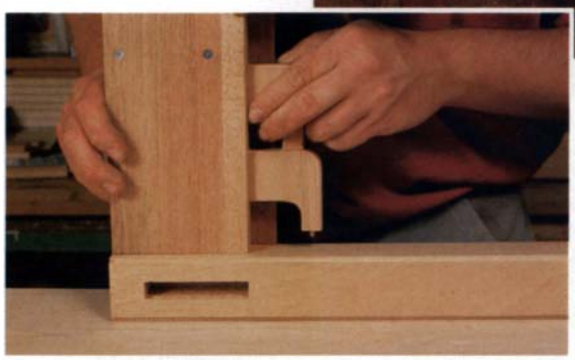
Square pegs—Glinting, square ebony pegs are a hallmark of Greene and Greene furniture. The pegs rise above the mahogany, and each little edge is gently radiused back to the surrounding wood, providing a reflective surface and a tactile message of hand craftsmanship. The pegs emphasize the joints in the furniture and many are caps for counterbored screws. But as I laid out the mortises for them on the crest rails of the chairs, I realized that some of the pegs are purely decorative. I followed the Greenes' example in making the pegs in a variety of sizes, from 3/16 to 1/2 in. sq. As far as I could tell, the variation in size was a matter of aesthetics. I found, too, that their placement was not exactly symmetrical. Rather than being lined up in rows, the pegs were arranged in subsets slightly offset from each other to add visual interest (see the bottom photo).

I made 1/4-in.-deep mortises for the dozens of pegs with my hollow-chisel mortiser. It makes the job quick; the little tearout is not noticeable after I drive in the slightly oversized pegs. You could also use a drill and chisels or chop the mortises by hand.

To make the pegs, I ripped 8- or 10-in.-long sticks of Ebon-X, so they were exactly square in section and fractionally larger than the corresponding mortises. I squared up both ends of each stick on the disc sander with the stick held against the miter gauge. I sanded out the disc scratches with 150-paper on my hand-held orbital sander. These sanded ends would eventually be the exposed surface of the pegs: achieving a totally smooth surface was essential.

It would be murder to make the tiny radiused edges with the pegs already in their mortises, so I did my shaping ahead of time. I rounded down slightly on each edge at the end of the stick with an orbital sander, keeping the roundovers equal. To get the gleam of

Photos except where noted: Jonathan Binzen



***Chinese brackets for strength and a sinuous line**—Drawn from Chinese furniture, curved brackets (above) tie Greene and Greene pieces together visually as well as structurally.*

***Bracket alignment is tricky**—At left, the author locates a dowel hole on his table by sliding the bracket along a guide board clamped to the apron and marking with a dowel center.*

polished ebony, I took the sticks to my grinder and burnished the ends with red rouge on a cotton buff wheel.

When I was satisfied with the finish, I bandsawed about ⅜ in. off each end of all the sticks and repeated the process until I had a good supply of pegs. The bandsawn face would be hidden in the mortise, so I didn't have to clean it up. But I did chamfer the four bottom edges, so they wouldn't hang up or cause tearout when I drove the peg into the mortise. I did the chamfering on my stationary belt sander, holding the little pegs by hand (leave your fingernails a little long for this chore). Or you could do the chamfering against a stationary piece of sandpaper on a flat surface. I put a little glue in the mortise and drove the pegs with a rubber mallet.

***Curved brackets**—*Those little double-L brackets below the seat of the chair and the cases of the sideboard and writing table are derived from Chinese furniture. In addition to tying parts together visually and adding a curve, they provide some resistance to racking forces (see the top photo). While they may look innocent, they're quite a challenge to make.

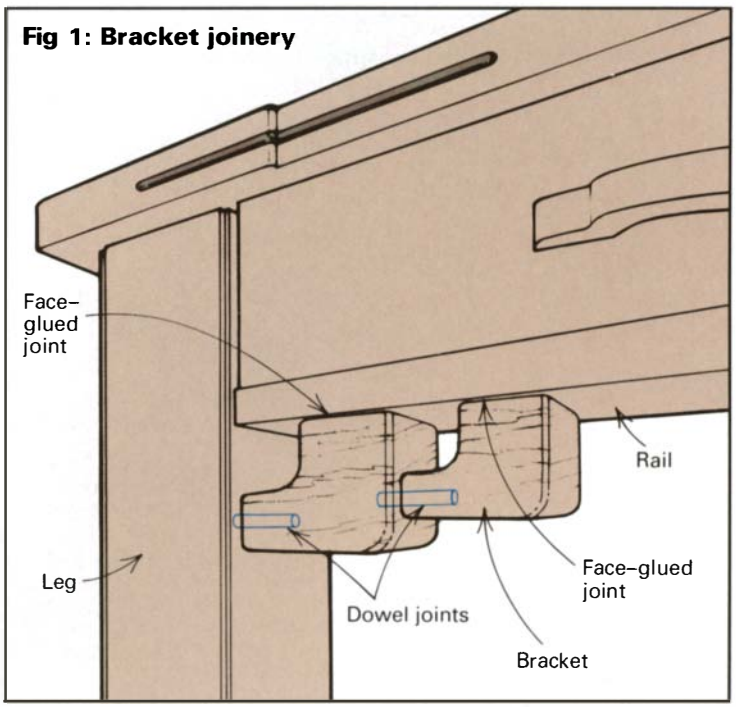
I made the brackets in bunches. I made a Masonite template for each size L and traced it over and over on a board machined to the correct width and thickness. Because the wide end of the L would be face glued, I put it on the edge of the board to give it a long grain surface. I cut the brackets out on the bandsaw and then sanded their outside curves on my stationary disc sander and their inside curves with a sanding drum chucked into my drill press. To be sure I had flat, square glue surfaces, I touched them up using the miter gauge with my stationary disc sander.

All the curved edges on the fronts of the brackets are rounded over, and I did the work with a router inverted in a vise. If you make a small push block with a foam or rubber bottom surface, you'll be able to get your hands away from the action while keeping good pressure on the little workpiece. Because the grain changed direction as I routed around the bend, I found it was important to go fairly quickly and maintain even pressure.

I doweled pairs of L's together and then doweled and face-glued them to the furniture, as shown in figure 1. To drill the dowel holes in the L's, I clamped them in my drill-press vise with stop blocks set up to keep them oriented properly as I tightened the vise.

Gluing up the brackets was a two-stage operation. First I joined the two L's. I laid them on the tablesaw (any reliably flat surface will do) and pushed the dowel joint together by hand. I found if I held them for 30 or 40 seconds, I could leave them and they'd stay tight. When they were dry, I gave them a quick hit on the belt sander to make sure the glue surfaces were flat and square.

Fig 1: Bracket joinery



The second stage was gluing the brackets in place. To locate the dowel hole in the leg, I put a dowel center in the bracket and slid the bracket along a guide board to mark the spot (see the photo at left above). After I'd drilled the dowel hole, I clamped the bracket in place using one small quick-release clamp to pull the dowel joint tight and another to keep pressure on the face joint.

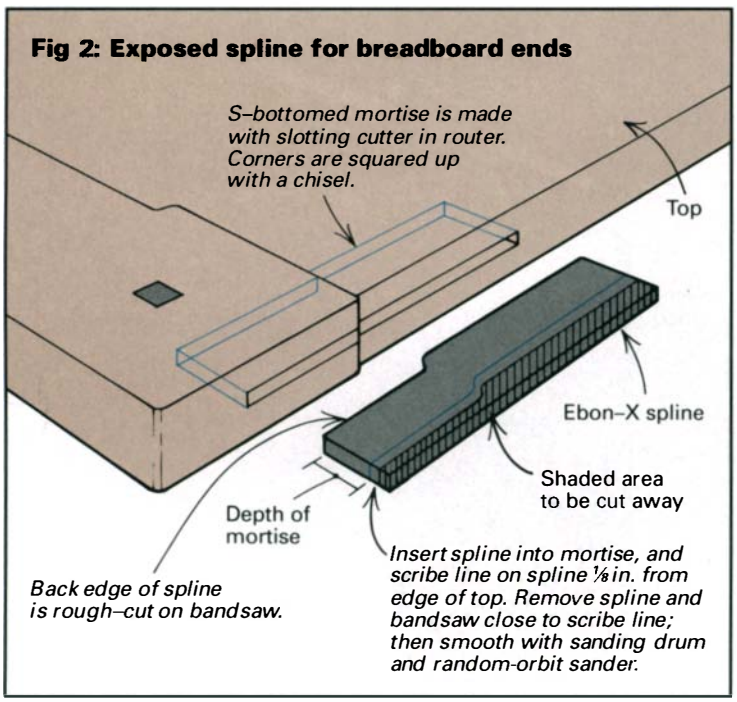
***Exposed splines**—*The arms on the chairs I made are joined to the front legs with large splines shaped in a shallow S. Like the square pegs, the splines are left proud of the surrounding wood and gently radiused back to meet it. The sinuous black line of the Ebon-X in the mahogany arm emphasizes the joint and underscores its

Drawings: Maria Meleschnig

Pulls can make or break a piece of furniture: *Experiment to find the right one by mocking up a range of pulls (right).*

Exposed splines masked movement *of solid panels in the Greene's work. But the plywood top (above) won't move. So the spline (below) is glued to both the panel and breadboard end.*

Fig 2: Exposed spline for breadboard ends



double curve. Here the spline is structural, but where a similar element appears in the breadboard ends of the sideboard and writing table, it is purely decorative.

I made the loose splines for the chair by temporarily screwing a rough-cut dummy spline in the joint and flush-trimming it to the shape of the arm with a router. I removed it and used it as a template with a straight router bit and an oversized bearing wheel to turn out Ebon-X splines ⅛ in. proud of the arm. As with the pegs, I did the sanding, radiusing and burnishing on the exposed edges of the splines before screwing and gluing them in place.

Breadboard on the sideboard—I made the tops of my sideboard and desk breadboard style, as the Greenes did. The breadboard ends are decorative in my piece because I used a veneered plywood panel and didn't have to accommodate seasonal movement. The ends are solid mahogany, biscuited and glued to the panel. At the front, I inserted false loose splines of Ebon-X. Because the breadboard ends extend beyond the panel, the splines had to follow in a shallow S-shape, as shown in figure 2 below.

I routed mortises for the splines with a slot-cutter fitted with a bearing wheel. After chiseling out the ends of the mortises, I cut Ebon-X splines to length and rough-cut their back edges to the shallow S-shape on the bandsaw. Like the square pegs, the false splines stand proud of the surface, so I put them in temporarily and scribed a line following the contour on the edge but spaced away ⅛ in. Then I removed the splines, and bandsawed to the line. I gently radiused the edges that would be exposed, sanded and burnished them and glued them in place.

Pulls—If a door or a drawer front could be compared to clothing on a person, then knobs and pulls would be like neckties, pins and earrings—finishing touches that are key to the overall impact of a piece. I used the same type of pull on the table drawers as I made for the sideboard. I tried a number of different sizes before settling on the right one for each piece, as shown in the bottom photo. The pulls are a variation on the Asian "cloud lift," an abstract representation of clouds found throughout the Greenes' work. I bandsawed the pulls and filed and sanded to finished shape; then I radiused the edges with a router. I had to scale them down considerably from the ones used on the sideboard. For the sideboard, I decorated them with square pegs, but on the smaller pulls for the writing desk, I found they looked cramped so I left them off.

A fitting finish—I wanted the pieces I made to have an immediate presence, a feeling of having been around for a long time: In a sense, they had been. To achieve it, I treated the wood with potassium dichromate, an oxidizing agent borrowed from photographic processing. It comes in powder form and is mixed with water and sponged on. Before applying it, I wet-sanded every surface to raise the grain and knock it back down. While applying the potassium dichromate, I kept an air hose handy to disperse the puddles that formed in the inside corners. If they are left to stand and soak in, the color will be uneven. I then sprayed three coats of catalyzed lacquer, sanding between coats with 320-grit paper. □

Thomas Hugh Stangeland is a professional furnituremaker in Seattle, Wash.

A new Greene and Greene sideboard

With my reproduction Greene and Greene chairs around his dining table, my client asked if I would make a sideboard to go with them. I quickly agreed but soon found it to be an entirely different undertaking. Reproducing the chairs had been a matter of mechanics: I had to figure out how to do what the Greenes had done. But making something in their style to fit a specific site would be a matter of interpretation.

My starting point for the commission was a sideboard the Greenes' made in 1909. But I would have had to contort the original to make it fit the site. The three drawings at right show the development of my sideboard: the Greene's original (top), a drawing midway in the adaptation (center) and the final version (bottom).

Site specifics: The client intended the sideboard to be a visual anchor at the end of the room, so it had to be visible above the backs of the dining chairs. And it had to fill a long alcove. These requirements brought the sideboard's overall dimensions to 7 ft. long and 42 in. high—quite a bit longer and higher than a typical sideboard. I would have to do all I could to keep the piece from looking abnormally high.

Reapportionment: The Greenes' sideboard has doors at each end and a bank of wide drawers in between. I decided to change this arrangement for several reasons. First, because the sideboard had to be so long, drawers located in the center would wind up being far larger from side to side than they were from front to back: a recipe for drawers that bind. I also thought wide, central drawers would emphasize the length of the piece. And my client, who entertains on a large scale, was concerned that the cabinets in the original were on the small side. I solved all these problems by moving the doors together into the middle, so they would open on one large cabinet and by splitting the drawers into two banks, one on either side of the doors, as shown in the center drawing.

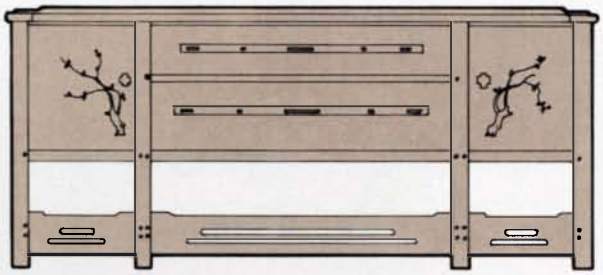
To help mask the height of the sideboard, I resorted to unusual proportioning on the drawers. Where a normal silverware drawer is 3 in. high, I made these 6 in. It would have been possible to stay closer to normal sizes if I had added a fourth drawer, but having more drawers in a stack emphasizes the vertical lines. I also preferred the appearance of three drawers. Call it mystic balance if you will, but an odd number of drawers always looks better to me.

How many legs? The Greenes' sideboard has eight legs joined by wide stretchers. I decided to omit the stretchers and adopted the bracket detail from the chair to add decoration and a bit more strength below the case. But the number of legs didn't seem right. I did a sketch of a sideboard with four legs, but I thought such a long sideboard would appear ill-supported on four legs even if it could have been made soundly. I drew a version with eight legs (see the center drawing). But that tended to emphasize the height of the piece and made for a clutter of brackets. So I drew a version with six legs; that immediately looked right to me.

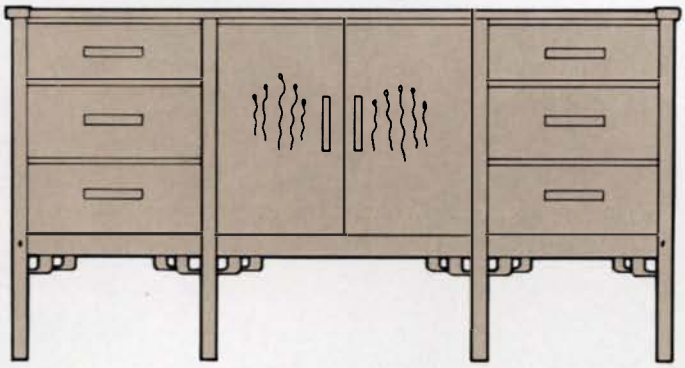
Plate rail—With the placement of the legs, doors and drawers determined, I turned to the plate rail. The Greenes' sideboard has a low, solid plate rail. I wanted something that would lighten the sideboard and relate to the brackets, so I designed a low, open plate rail by adapting the bracket shape, stretching it out horizontally. I also took the opportunity to make a visual link to the legs. By creating a little vertical center point in the plate rail, I carried through the line of the middle leg.

I used my bracket-making techniques to produce the parts of the plate rail. I doweled the parts together as before, but because the assembled rail was somewhat delicate, I screwed it to the sideboard's top from below rather than gluing it. This way, I could transport it separately and then attach it on site. *—T.S.*

Evolution of a sideboard

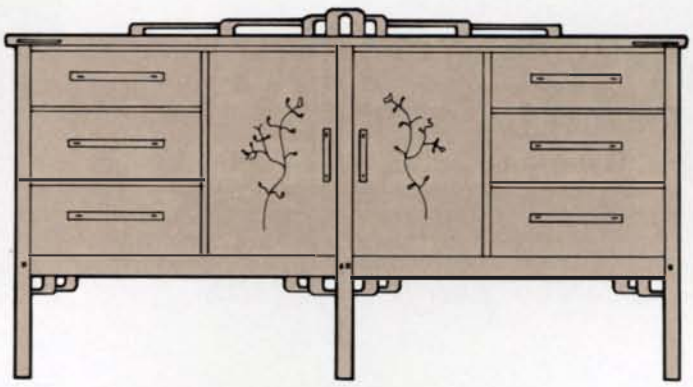


Sketch for Thorsen House sideboard, Greene and Greene, 1909



Early sketch for the author's sideboard

Doors have been moved to the middle to make the cabinet more spacious. The wide stretchers have been removed in favor of brackets.



Final version of the sideboard

Two legs have been eliminated, giving the piece a more horizontal appearance. Bracket form has been adapted to make an open plate rail. Drawer handles have been elongated. The stylized tulip inlay of the earlier version, drawn from the chair splats, has been replaced with a more naturalistic composition.

***Perfect miters**—Guided by Ed Speas' shooting board (left), a Lie-Nielsen #9 miter-plane easily shaves a 45° miter on molding. The fence is reversible, so the fixture can handle left- and right-hand cuts.*

***Fixture doubles as a bench hook** (below). To convert the shooting board to a bench hook for 90° sawing, the author simply removed the miter fence (here resting in the bench trough).*

Shooting Board Aims for Accuracy

Multi-task fixture guides saws and planes for perfect joints

by Ed Speas

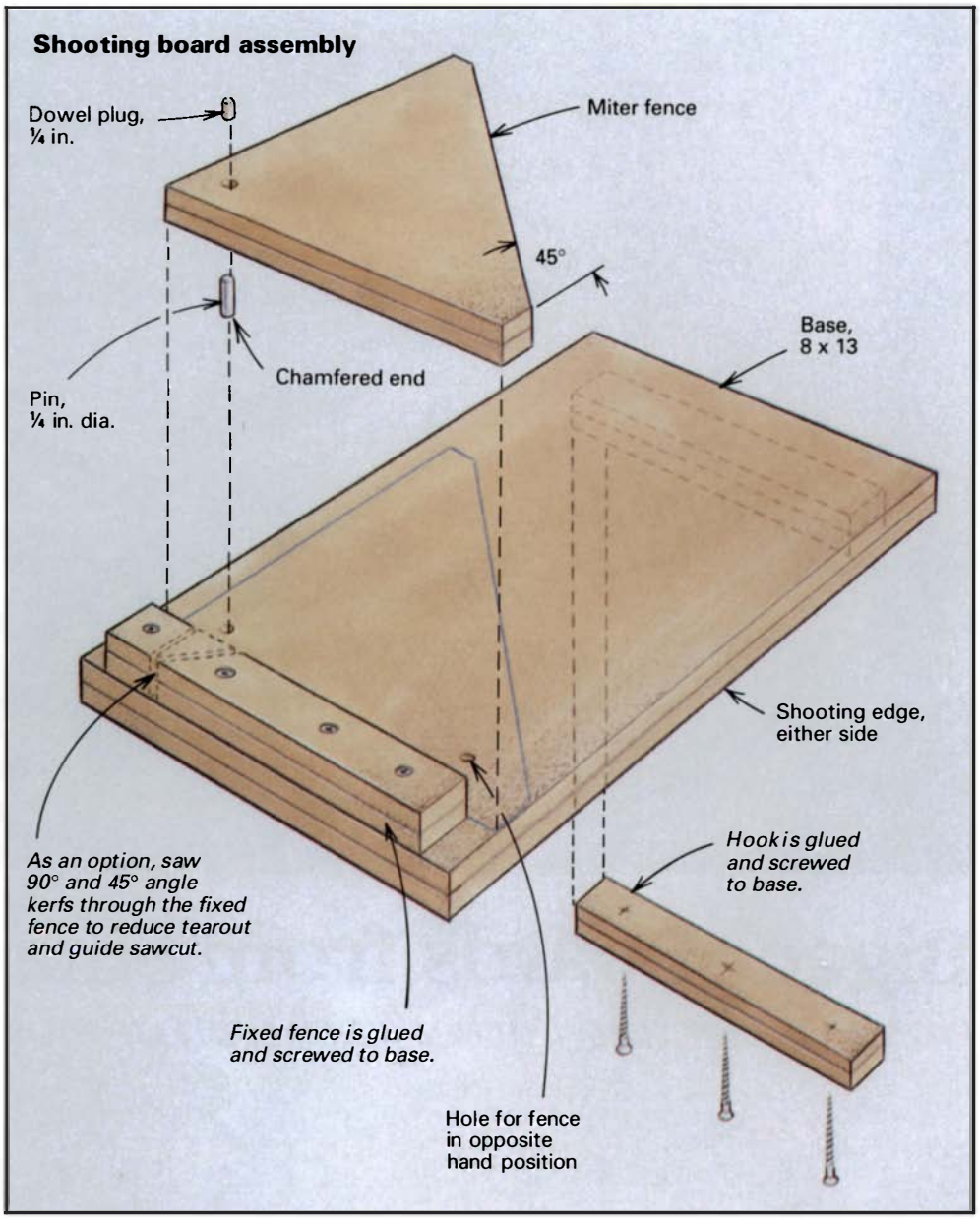
Fitting miters has been every woodworker's problem at one time or another. Whether you are making a picture frame or joining molding, if your angle of cut or your piece lengths are not perfect, you have to repeatedly shave a smidgen to get a tight joint. Although a chopsaw or a tablesaw can save time and effort, it may not be the best choice for extremely clean and accurate cuts. If you use a handsaw, it tends to wander if not precisely guided. And even then, I don't know too many folks who can really get consistent forty-fives with a hand miter box alone. Trimming 90° cuts can also be a problem. A sawblade, hand or power, rarely leaves a smooth enough surface. If you sand the end grain, again, you risk introducing error.

You can eliminate these difficulties by using a simple fixture called a shooting board. When guided by a shooting board, a plane with a razor-sharp edge, set to take a light cut, can accurately slice off wispy thin shavings, as shown in the photo at left above. And the end grain will be left with the smoothest surface possible. To use one of these fixtures, first place a workpiece against the fence, and lay a handplane on its side with the sole against the edge of the base. Butt the work up to the plane sole, and then push the plane by the work in several passes.

The shooting board I use is an adaptation of an old bench hook, or sawing board. I made this combination bench hook/shooting

Photos: Alec Waters

board so it would either hold stock while sawing (see the photo at right on the facing page) or precisely plane the ends of stock. One of the fixture's unusual features is its removable 45° fence, which makes it both a miter and a right-angle shooting board. The fence is reversible as well, so I can pare miters from the left or the right side, a great advantage when I need to work each half of a joint in molded work.



Making the fixture

My shooting board consists of a rectangular base and fence, a triangular miter fence and a hook strip, which serves as a bench stop and a clamping cleat. I made all of the parts out of medium-density fiberboard (MDF). To get the 1-in. thickness I wanted, I first laminated two pieces of ½-in. MDF, about 9 in. by 25 in. Next I cut out pieces in the sizes shown in the drawing at right, making sure all the corners were exactly square and the 45° angles were dead accurate, not just close.

When assembling the shooting board, I was concerned about how much pounding the fixed fence would take. That's why I both glued and screwed it to the base. I attached the hook the same way. First I drilled and countersunk the screw holes. Next I aligned each piece with a square and glued and clamped it to the base. Then I fastened each in place with bugle-head drywall screws.

The removable miter fence registers against the fixed fence and is held down by a snug-fitting pin. I used a ¼-in. bolt with the head cut off for the pin. As an alternate, a hardwood dowel would work, but I suspect over time the pin would become loose. Because the location of the pin and the size of its holes are critical, I bored the holes with my drill press. First I drilled a ¼-in. pin hole through the miter fence in the location shown in the drawing. Next I clamped the fence to the base in its right-hand position, so I could drill through the pin hole into the base. I flipped the miter fence and did the same thing to make the hole for the left-hand position. I chamfered the end of the pin and then tried its fit in the base holes.

Using cyanoacrylate glue, I secured the pin in the fence hole, letting the chamfered end hang out about ½ in. on the underside of the fence. For aesthetic reasons, I plugged the top ¼ in. of the fence hole with a dowel. With the shooting board together, I clamped it in my bench vise. Then I laid my plane on its side and took a shaving off the shooting edge, both sides. Because a standard plane iron does not go all the way across the sole, the iron leaves a rabbet along the base. This is necessary for proper registration of the plane. After dusting the fixture off, I finished the whole thing with oil. After it was dry, I waxed the shooting board to keep it slick and clean.

Shooting square cuts and miters

To use the shooting board, clamp its hook in an end vise to keep the fixture stable. Make sure your bench is dead flat, or lay down a flat auxiliary table before clamping the fixture. While steadying the workpiece, hold the plane with a firm grip, and keep it tight against the edge of the shooting board as you take multiple passes. Use the largest bench plane you have. A Stanley #7 or #8 jointer plane works best, but a #5 jack plane will also do, as long as it has a sharp iron, squarely set, and its sole is true and square to the plane's body. Even better, you can use a miter plane, which resembles an oversized block plane and is specifically meant for shooting (see the photo at left on the facing page).

When shooting the end grain of a right angle cut, it's a good idea to knife an edge line around the board, which will prevent tearout, and then plane to the line. When shooting 45° angles, tearout is rarely a problem. In this mitering mode, the shooting board can trim tiny amounts (see the photo at left on the facing page). This is crucial when fitting a lipping around a veneered panel, for example, where the length of the lipping from inside miter to inside miter has to be exactly the length of the panel. Because the fence pin serves as a pivot point, you can adjust the angle of cut slightly to bisect a corner that's not quite square. Just insert a paper shim where needed between the fences. I have a stack of old business cards that work great for this. □

Ed Speas is a woodworker in Ballground, Ga.

Drawing: Bob La Pointe

Bigger Boards from Smaller Stock

Create wider and thicker stock with clamps and glue

by Jim Tolpin

Gluing up smaller boards to make a big board—it wasn't always this way. When a 19th-century cabinetmaker needed a wide floating panel for a door or a case side or perhaps a top for a bureau, he went to his stock of wide boards (up to 30 in. was not uncommon) and found what he needed. If he needed 4-in.-thick stock for table legs, the loft of his shop could almost certainly provide it for him. Glue and clamps were used mostly for final assembly.

Today boards of these widths and thicknesses are difficult to come by, and if you can find them, the prices are staggering. Edge-gluing narrower boards to come up with wider ones and face-gluing thinner boards to create thick blanks is now routine for most professional woodworkers. But unless you're careful how you prepare the stock and apply the glue and clamps, the results may be disappointing.

Misoriented boards may cause poorly matched grain patterns; boards with widely varying moisture contents can result in irregular surfaces; and boards with less than perfectly jointed surfaces can produce gaps along the joints or splits in the boards themselves. Too little or too much glue will result in either a starved joint or an engorged glueline, either of which could result in eventual joint failure. Improper clamping techniques cause problems as well: open joints, surfaces that are difficult to flatten, stains and dents. But mastering a few basic principles of stock preparation for glue joinery, glue application and clamp use, for both edge and face laminations, should ensure success.

Preparing the stock

When joining two or more boards together, you must understand how the boards will move relative to one another. To avoid ridges across the surface of edge-laminations and ledges along the sides of stacked face laminations, I use wood of the same species and moisture content. When possible, I use pieces cut from the same board, a strategy that also helps achieve pleasing grain matches across the joints. I'm also conscious of how I orient the growth rings. Because wood moves significantly more tangentially than it does radially (as much as three-to-one in some species), it's important to keep growth rings roughly parallel to each other (see figure 1 on the facing page). As for whether alternating boards should have their growth rings all facing in the same direction or inverted, I generally opt for the former, finding it easier to hold a single arch flat than to try to restrain a wavy surface.

Because it's invariably necessary to resurface glued-up stock to smooth the joined surfaces to one another, I always

Photos: Vincent Laurence

***Accessories aid in glue-ups**—A laminate-faced gluing stand, hardwood edge protectors and end cauls are all part of the author's clamping routine. The stand provides a flat reference face for the lamination; the edge-protectors keep the edges from being crushed by the clamps; and the end cauls, clamped with C-clamps, flush-up the face of the glue-up at its ends, ensuring that the assembly doesn't become distorted by the pressure of the pipe and/or bar clamps.*

use oversized stock. For example, to ensure a ¾-in.-thick panel, I use stock at least 13/16 in. thick, taking 1/32 in. off each face after laminating. If the stock is squirrelly, where the face ripples rather than simply curves, I start with a full ⅞ in. or more. For the same reasons, I make a stacked lamination over-width, cutting, joining and thicknessing it to final dimension after it's glued up.

Because most commonly used woodworking glues, epoxy excepted, are not strong over a gap, it's critical to get mating surfaces as straight and flat as possible. For edge-gluing, I joint the boards so that the entire length of their edges touch with just hand pressure (see the photo at right). With no pressure on the boards, they should be ever-so-slightly concave. The additional pressure required to close the middle of the joint line adds an inward stress to the ends of the boards that helps inhibit end splits.

However, I've learned that attempting to overcome convexity along an edge with clamps and glue is futile. Though you might get the clamps to close the gaps initially, you're building an outward stress into the board ends that will eventually resolve itself through end splits or by overpowering the glue joint. Better to joint the boards true.

I also check the stock to be face-glued and reject or resurface any board with a warped face. I could subjugate the warp with clamps, but I'd pay sooner or later: The bad board would eventually transmit its distortion to the rest of the assembly.

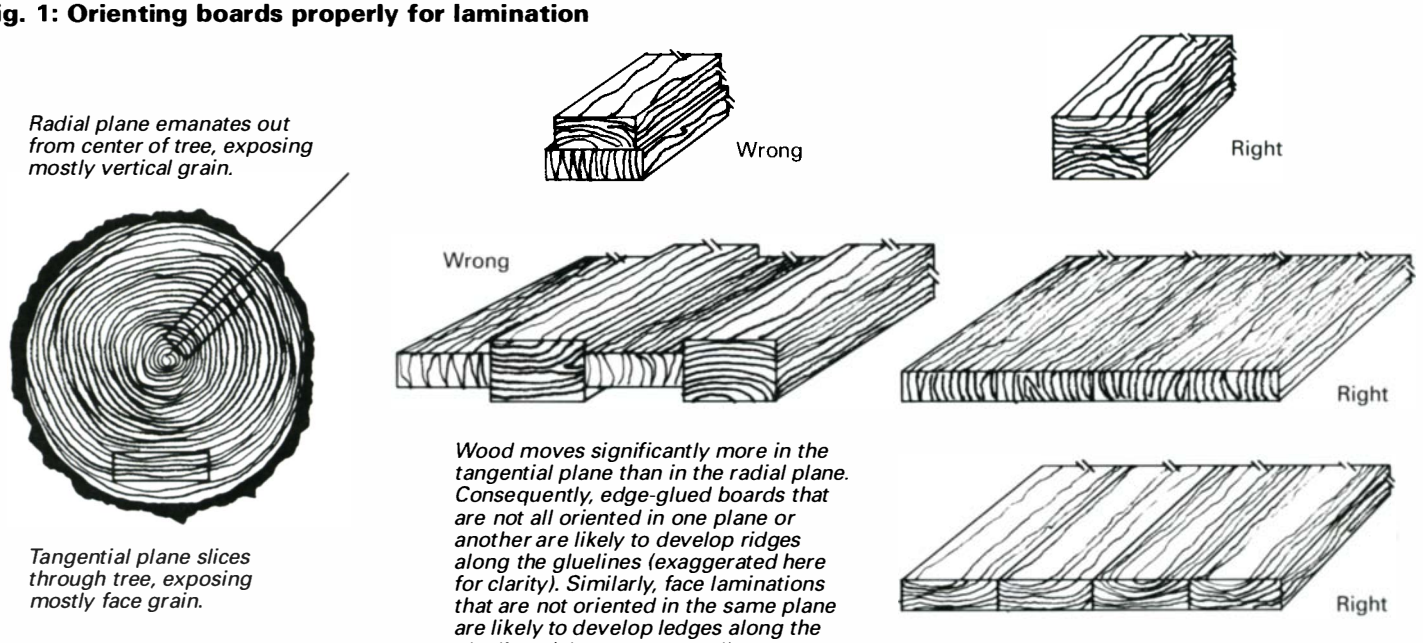
To ensure a flat surface when joining boards edge to edge, either the edges must be square to the faces or the two boards must join at complementary angles. With my jointer carefully adjusted and using a firm and steady feed technique, I can generally produce a perfectly square edge over the length of a board. But for insurance, I often hold two boards together and joint their edges simultaneously to produce complementary angles, which however negligible, will cancel each other out, resulting in a tight joint and a flat board (see the photo and figure 2 on p. 76).

Maintaining edge alignment

Though it's not necessary for strength, I use dowels, biscuits, a long spline or a

***Sprung joint keeps ends together**—The slight concavity of a sprung joint adds an inward stress to the ends of the jointed boards, making the joint less likely to open. The gap between the two boards at center is no more than 1/32 in.; hand pressure should be enough to close it.*

Fig. 1: Orienting boards properly for lamination



Drawings: Matthew Wells

***Jointing two boards together can be done safely and easily** by pinching the boards together and maintaining steady, even pressure against the jointer fence.*

routed glue-joint profile along the jointed edges to help keep surfaces aligned. This minimizes the amount of post-glue-up surfacing I'll have to do (see the top photo on the facing page). These options are particularly useful when edge-gluing long boards or stubborn, squirrelly stock, especially if you're working alone. With edge alignment taken care of, you can concentrate on closing up the joint or joints before the glue sets up.

Applying glue

Unless I suspect that my joints will require the glue to be strong over a gap (for example, when face-gluing wide boards where clamping near the middle of the faces is awkward), I avoid epoxy. It is expensive and generally runny and messy. Also, because of its toxicity, I have to wear protective gloves and a respirator when using epoxy. For the same reasons, I try to avoid powdered urea-formaldehyde glues, such as Weldwood's plastic resin glue, except when I need to take advantage of its long open time, such as for a project with a lot of parts or one with a complex clamping setup. For most of my woodworking, I rely on the ubiquitous yellow glue (polyvinyl acetate, or PVA). I find that its strength is more than adequate and that its set-up time is ample for most clamping situations.

Using the proper amount of glue is critical for peak performance. If you use too much glue, the joint is only as strong as the internal cohesion of the glue itself, which isn't high for yellow glue or the urea-based glues. Also, a thick glueline looks ugly. If you use too little glue, you've starved the joint, rendering it susceptible to failure under stress.

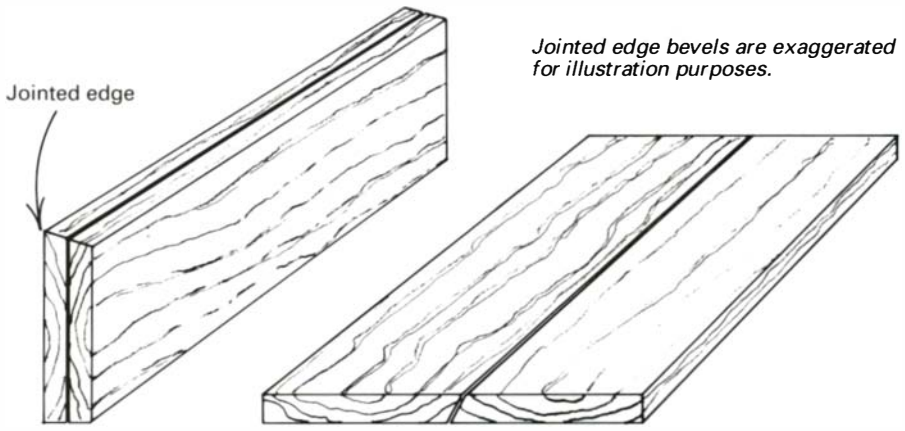
Unfortunately, knowing how much glue to use is more an art than a hard science. The variables are many and include type of glue, age, temperature, humidity, type of wood and moisture content of the wood. It's impossible to control all of them. After using a particular type and brand of glue for a while, you become familiar with what that glue looks like at the proper film thickness.

I use a rubber roller or a stiff brush to spread yellow glue evenly across both joint surfaces. If it's opaque, I know I've put on too much, so I wipe a little off. I shoot for a thin, translucent film with no "holidays," or skipped areas, visible in a strong side light.

The glueline tells me if I applied the right amount of adhesive: With yellow glue, if the excess beads up so much it's dripping off the wood, I've put on too much. I look for a bead line of glue, with the boards clamped tight, that stays put. If no bead, or almost no bead, appears, I can tell I've starved the joint, and I need to release the clamps and apply more glue immediately (see the bottom photo on the facing page).

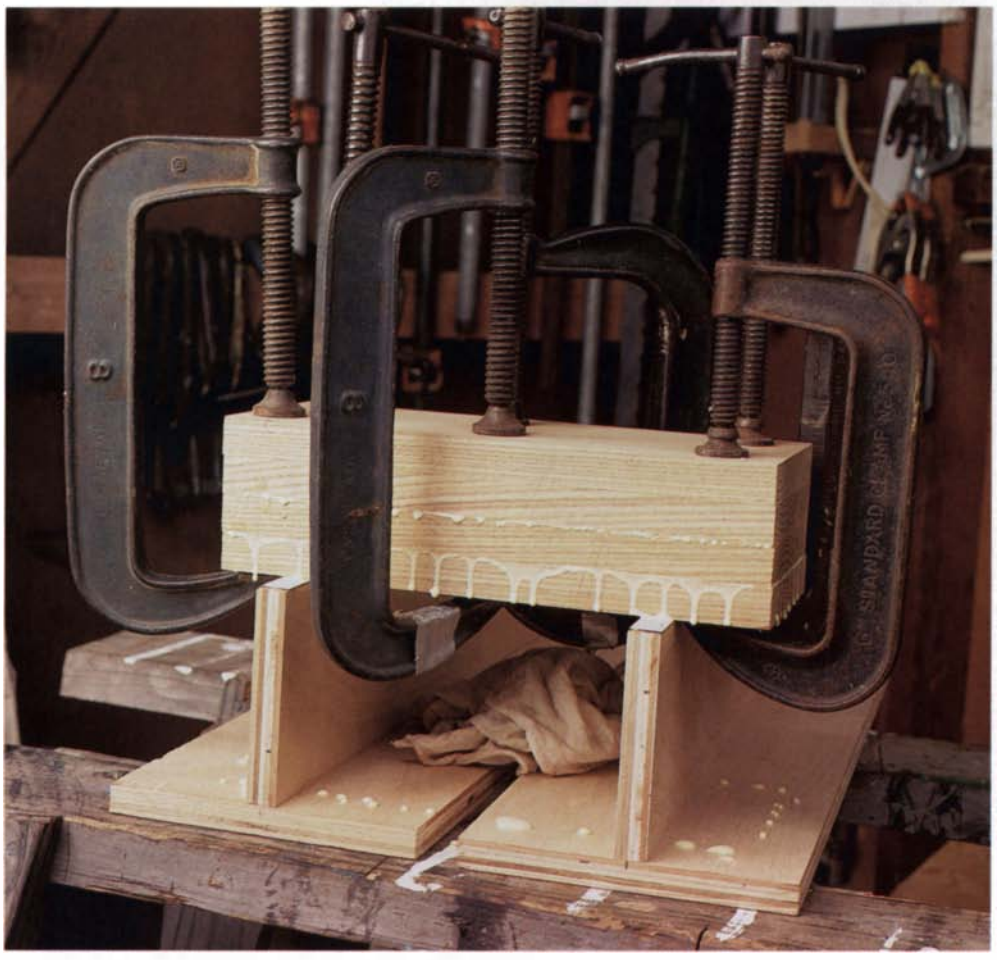
Working with the ureas is trickier yet. This glue is so fluid even a starved joint produces excess that runs out of the joints. As with yellow glue, I look for a thin, even film on both surfaces. To reduce squeeze-out, I don't apply as much clamping pressure. Experience, again, is the best teacher.

Fig. 2: Jointing complementary angles for edge-gluing



Simultaneously jointing the edges of a pair of boards that are to be edge-glued ensures a flat glued-up board even if the jointer fence is not perfectly perpendicular to the beds. Any deviation from a 90° edge on one board will be precisely made up in the other.

***Alignment aids make clamping easier—** Dowels, splines, biscuits and glue-joint profiles (left to right), are all effective means of guaranteeing alignment when edge-gluing. Though they don't necessarily add a great amount of strength to a joint, any of these will keep your boards flush so that you can concentrate on clamping up.*



***Squeeze-out reveals if right amount of glue was used.** This photo of a face lamination shows a starved glue joint (top) with no glue beads; a joint with just about the right amount of glue used (center), where the beads are fairly even and stay put on the glueline; and a joint in which too much glue was used and the excess is dripping down the lamination (bottom).*

Clamping basics

It's important to protect the boards you're gluing up from being damaged by the clamps. Clamps exert tremendous force and can inflict deep dents into most wood surfaces: The softer the species the greater the potential for doing irreparable damage. I protect the laminations by either using pads on the clamp heads themselves or by inserting scraps of wood between the stock and the clamp heads. I'm also careful to protect the stock from being stained by the clamps. Many woods react with the iron of the clamp bars to create stubborn chemical stains. Oak, because of its high tannin content, is especially susceptible. I'm careful either to keep the bars away from the wood or to insert waxed paper, plastic wrap or some other barrier between the wood and clamps.

When deciding where and how many clamps to apply to the glue-up, I shoot for more rather than less in most applications. It's nearly impossible to use too many clamps, though it is easy to overtighten them and starve the joint. If you're stressing your wrist tightening the clamp, chances are you've overtightened it. Back it off a bit, and come back to a comfortable one-hand twist. Being stingy with clamps is just as bad (or worse) than overtightening, though, and more often than not will lead to a failed glue joint. With the exception of epoxy, glues depend on pressure and a tight wood-to-wood bond to reach full strength. Finally, because clamps exert their force over a small area, I use hardwood cauls whenever possible to distribute the pressure more evenly.

Edge-gluing

I use either the common pipe clamp, the bar clamp or the double pipe clamp to join boards edge to edge. (For a further discussion of the variety of clamps and their uses, see p. 54 in this issue.) Double pipe clamps have a significant advantage over both pipe and bar clamps. Because they apply pressure evenly above and below the boards, your chances of getting a flat, warp-free panel are greater.

Pipe clamps work well for virtually all edge-laminating situations and are both inexpensive and versatile: You can join pipes together to create clamps of whatever length you need, and you can even bend the pipe to go around a curve. The pipe clamp's only major failing is that it doesn't provide a straight, flat support surface for the boards. But it can be dealt with by providing a gluing stand and using cauls on the ends of the boards, as I'll discuss in greater detail below.

Bar clamps lack the versatility of pipe clamps in that their length is fixed, but the bars will generally provide a flat reference

Glue can be removed neatly and without any danger of tearout. *Wait until the glue has become rubbery, usually a little less than a half-hour with yellow glue in average conditions. Then the glue bead will stick to itself but peel right off the surface of the wood, leaving no trace.*

surface for the boards you're gluing up. In addition, because of their rectangular profiles, bar clamps are capable of exerting much more force before distorting than pipe clamps, which is useful when gluing up thicker stock.

When I need to do an edge-to-edge glue-up, I begin with a dry run, laying out the boards edge to edge, applying light clamping pressure, and making a final check of the fit of the joints and the match of the grain patterns. When I'm satisfied, I number each board to keep them in order, and I make hatch marks across each joint to aid in alignment later on.

Next I set up the gluing stand, as shown in the photo on p. 74, and reposition the boards on it. I set the hardwood edge protectors in place and then slide bar or pipe clamps under the boards.

I spread glue on all mating surfaces with a roller or brush and then rub the joints together to even the glue film. I install any splines, biscuits or dowels and then press-fit the boards together. The first clamp I tighten is the one nearest the middle of the assembly. I'm careful not to let the pipe or bar touch the boards, and I apply just enough pressure to bring up a bead of glue. As I'm tightening down on the clamp, I make sure that the faces are flush across the joint. Then I work out from this clamp toward either end. I alternate top and bottom clamps, manipulating the boards as I go by lifting or depressing them near their ends to bring their faces flush. I place the last clamps about 4 in. to 6 in. in from either end.

I use flattening cauls across the ends of the boards, applying pressure either with C-clamps or wooden hand screws, and I check to make sure the joints are flush as I go along. Waxed paper or plastic wrap will keep your cauls from becoming a part of your glue-up. Recalcitrant boards sometimes respond to a firm tap with a hammer; just remember to protect the face of your glue-up with a block of wood.

Once the assembly is clamped up, I usually remove it from the stands and lean it against a wall. To keep the glue-up free of warp, I make sure the assembly stands nearly vertical, with all the clamps parallel to one another.

When the glue beads becomes rubbery, about 20 to 30 minutes in average temperature and humidity conditions, I roll them off with a scraper blade (see the photo above). If you wait too long, the glue will set up, making it hard to remove, possibly tearing out wood fibers as you chip it away. At the other end of the spectrum, if you hurry and try to wipe up the glue just as it's beading up on the joint line, you risk spreading out wet glue in such a thin layer that it's invisible. But when you try to finish the wood, it refuses to take stain or finish wherever glue has sealed the pores.

When the glue has dried, I remove the clamps and scrape off any remaining glue. Recommended clamping times vary; consult the can or bottle, and note that they are temperature-dependent. Then I surface the glued-up panel to final dimension, using either a planer with sharp knives, handplanes and scraper, or sanders.

Face-gluing

When stacking up boards face to face, I usually use the C-clamp and the sliding-bar "speed" or "fast-action" clamp. If I am looking for brute strength, I will use large C-clamps, which are capable of providing over a ton of force. The sliding-bar clamps, though quicker to apply and available with comparatively deep throats, can exert only about a quarter of that amount, so I use them for lighter-duty work.

Wooden hand screws are also useful for face laminations, especially if the top and bottom faces of the assembly are not parallel to one another: The double-screw arrangement allows you to orient the two clamp faces at different angles. While their clamping force is somewhere between that of C-clamps and sliding-bar clamps, hand screws do have the additional advantage of a large, non-marring footprint. For them to be effective, however, they must be adjusted so that the jaws are in full contact with the outer faces of the boards you're clamping.

When I'm face-gluing, I always cut the pieces oversized by at least ¼ in. in width and length.

Just as when edge-gluing, I set up a gluing stand and dry-assemble, checking to see that the faces fit tightly on all sides. I orient the boards with their hearts out because this tends to keep the edges closed if the boards have any drying left to do (see Bruce Hoadley's discussion of this in *FWW* #101, p. 28). I also make hatch marks across the joints for alignment.

Then I roll or brush the glue onto both faces, stack the pieces on the gluing stand and apply clamps. I generally use cauls top and bottom unless I'm taking off a lot of stock to get down to final thickness. If the stock is 6 in. or wider, I first apply deep-throat clamps to compress the middle of the assembly. Then I apply clamps around the perimeter. I don't worry about putting on too many; it's not a problem having as many as 20 C-clamps in a 1-ft.-sq. area.

Just as with edge-gluing, I wait until the glue has become rubbery to remove it. After the glue has dried, I clean up any residual glue and joint and plane the lamination down to final size. □

Jim Tolpin is a writer and woodworker in Port Townsend, Wash.

Make Your Own Dovetail Jig

Quick and easy system for routing this traditional joint

by William H. Page

The blanket chest I wanted to make for a gift was basically a large box joined with dovetails at the corners. I didn't have enough time to hand-cut the joints, and I didn't want to pay $300 for a commercial jig to do the job, so I set to work developing my own jig.

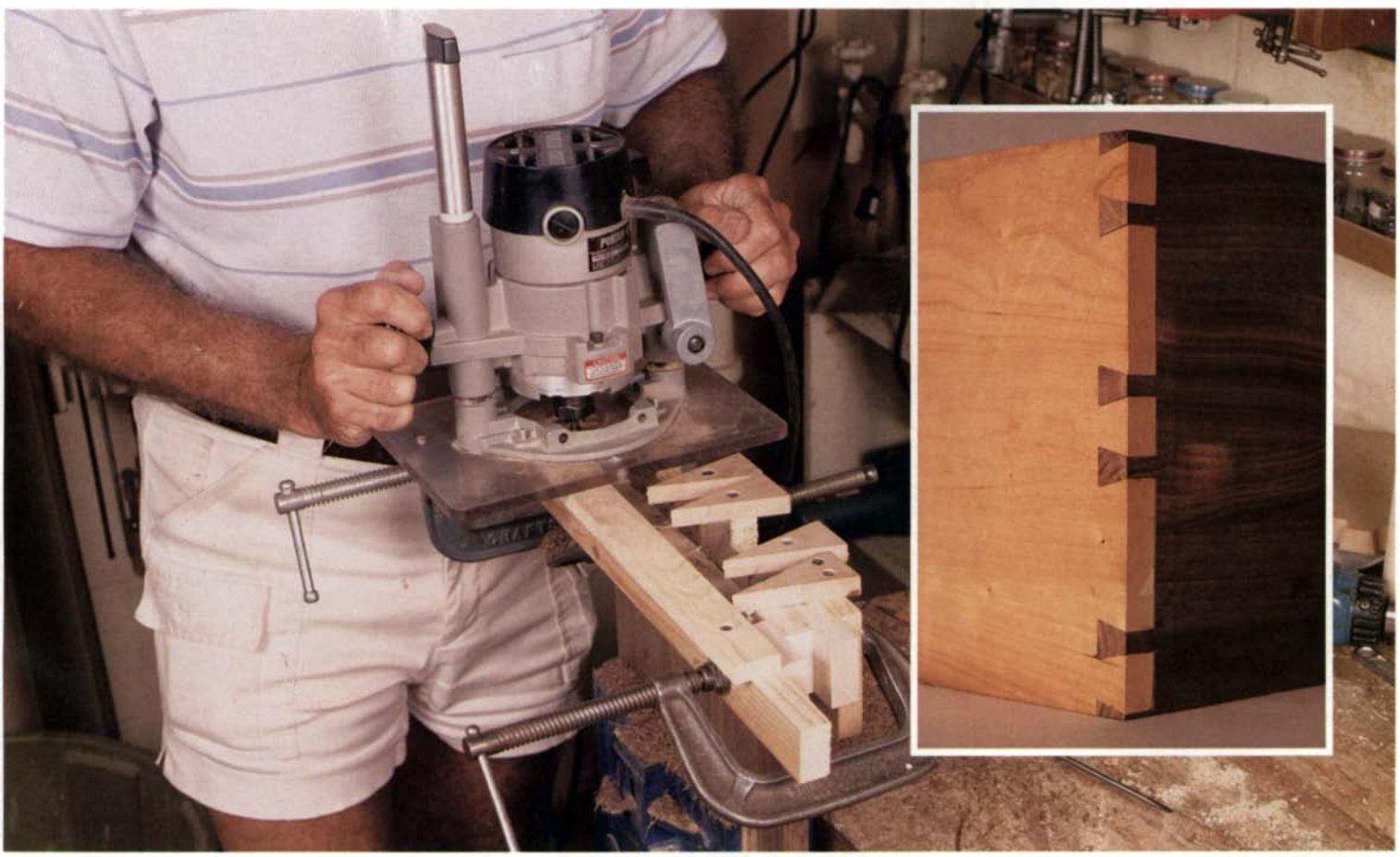
Shop-built from scraps, these unusual jigs, one for the tails and one for the pins, cut tight-fitting through-dovetails (see the photo below), a task that even many commercial jigs can't handle. Designed for routing dovetails for large carcase construction, the jigs can be built in less than two hours for just pennies.

Layout is quite simple and can be done as the tail jig is being assembled. Fingers screwed to the tail jig guide the router bits; the key is ball bearings. The bits used to cut the joint are guided by bearings the same diameter as the cutter. Pin and tail size and spacing are variable, and jigs can be built to handle any width board.

Basics of jig construction

Before making any of the jigs, the project stock must be jointed, planed and cut to final dimensions. The stock should be flat and square, and be sure to include a couple extra feet of stock for making and testing the jigs. The jigs are assembled around some scraps cut from the actual stock. This way, the jigs precisely fit the stock and eliminate the need to fiddle with adjustments or set-up routines, ensuring perfect-fitting dovetails.

I start with the tail jig, and in the process of making this jig, I also cut a guide board that precisely locates the pin templates for as-



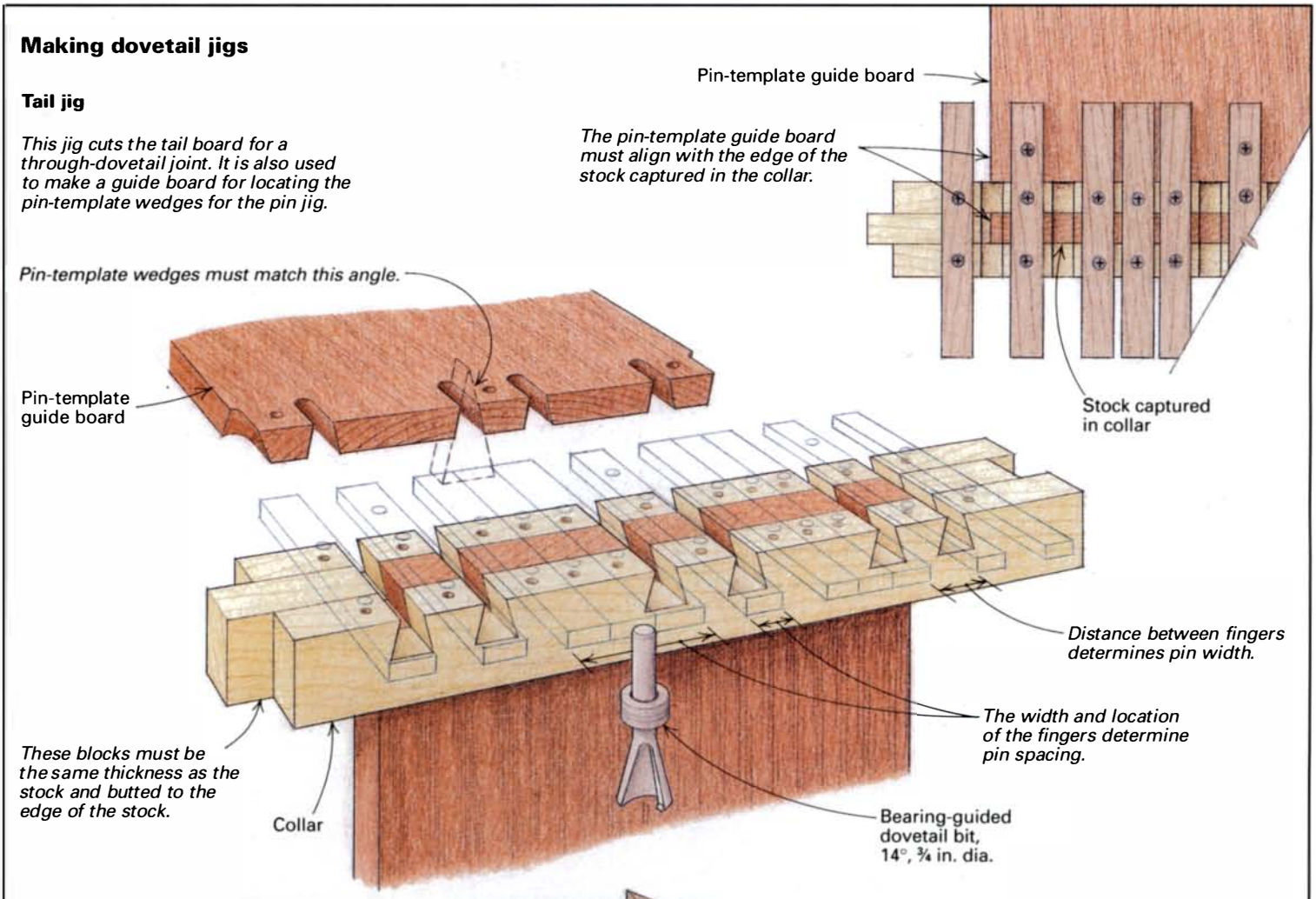
***Precise through-dovetail joints** (see inset photo) are easy to rout with the aid of a couple of shop-built jigs. Here, the author completes the second part of the joint by routing the pins with a bearing-guided straight bit. The bearing rides against pin templates that have been positioned accurately using a guide board routed with the tail jig, which is the first jig to be built.*

Photos: Charley Robinson

Making dovetail jigs

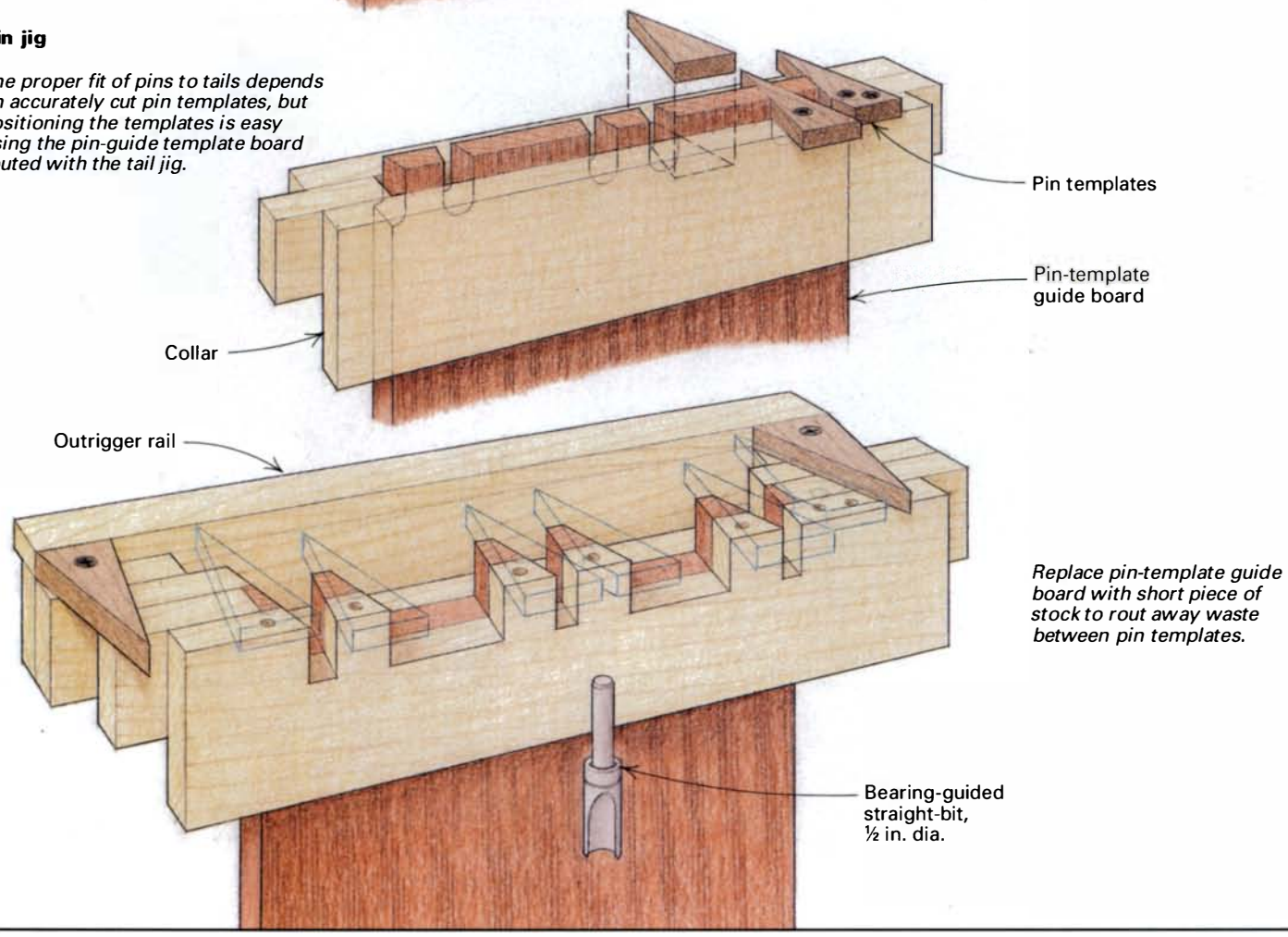
Tail jig

This jig cuts the tail board for a through-dovetail joint. It is also used to make a guide board for locating the pin-template wedges for the pin jig.



Pin jig

The proper fit of pins to tails depends on accurately cut pin templates, but positioning the templates is easy using the pin-guide template board routed with the tail jig.



Drawing: Vince Babak

sembling the pin jig. Using the tail jig to rout the pin-template guide board ensures a perfect match of pins to tails.

The tail jig consists of a collar that surrounds the stock to be joined and a series of fingers screwed to the top of this collar, as shown in figure 1 on the facing page. The fingers serve as a stop when inserting stock into the collar and as a guide for the bearing on the bit. The location of these fingers across the top of the collar determines the spacing of the pins.

With the fingers in place, I run the dovetail bit through the collar of the jig and a scrap piece of stock clamped in the jig. These cuts create the tail piece, or the openings that the pins will fit into, and prepare the jig for use. The collar must be clamped to the stock to avoid any movement that could affect the accuracy of the cut.

The pin jig consists of a collar built around the pin-template guide board, but instead of straight fingers, the pin templates for this jig are wedges with an included angle to match the cut of the dovetail bit, as shown in figure 2 on the facing page. An outrigger attached to the pin collar provides full support for the router when routing the pins.

With both jigs assembled, I rout a joint in a couple of pieces of scrap clamped firmly in the collars to test the fit and to be sure I like the pattern before proceeding with my good stock.

***To make a tail jig,** build a holding fixture that forms a collar around the stock, screw guide fingers to the top edge and then rout between the fingers to create the sockets.*

Making the tail jig

To make the tail jig (see figure 1 on the facing page), I clamp a short piece of the prepared stock in my bench vise. I begin by building the collar around this piece of stock, using 2-in.- to 3-in.-wide scraps that are about 4 in. longer than the width of the stock. The collar pieces are clamped flush to the end of the stock so that they overhang equally on both sides of the stock. The end collar blocks should be butted tightly to the side of the stock, as shown in figure 1.

The guide fingers that are glued and screwed to the top of the collar are simply strips of hardwood or plywood about ⅝ in. thick and about 8 in. long. Position the strips for any pin pattern that you want, but keep in mind that the pins must be at least ¾ in. wide, the diameter of the bearing that will ride against the fingers. Also, the distance between the pins must be at least equal to the diameter of the straight bit used to cut the pins. The fingers also must be square to the collar. To avoid pin cutouts where I don't want them, I fill gaps between the fingers.

To rout the tail jig, I chuck my bearing-equipped dovetail bit in the router and set the depth of cut about 1/32 in. deeper than the thickness of my prepared stock. (Bearing guided bits can be made by gluing a bearing the same size as the bit to the bit's shaft, or they can be ordered from Freud, 218 Feld Ave., High Point, N.C. 27264.) I then rout the tails by running the bearing between the fingers. I make two passes in each slot to be sure the bearing rides firmly against both fingers for each pin cutout or else the pins won't align properly with the tails. This completes the tail jig, and in the process, I've made a scrap tail piece to test the fit of the joint.

Making the pin jig

The first step in making the pin jig is to use the tail jig for cutting the guide that locates the pin templates, so the pins and tails line up. I do this by butting a piece of prepared stock against the back side of the tail collar and screwing down through the fingers and into the jig stock. This piece of stock must be the same width as the workpieces to be joined, and its edges must align with the edges of the jig, as shown in figure 1 on the facing page. To create the pin guide, I run my router between the fingers of the tail jig as before, cutting approximately an inch into the stock, as shown in the photo below. After routing, I unscrew the pin guide and then clamp it in my bench vise with the routed end up.

As with the tail jig, I build a four-piece collar around the pin guide clamped in the vise. I let the pin guide extend about ½ in. above the collar, so the routed slots can be used to position the pin templates on the collar.

The pin templates are ⅝-in.-thick wedges that I cut on the tablesaw from a long strip about 3 in. wide. I set my miter gauge to 14°(because I used a 14° dovetail bit), cut one edge of the wedge, flip the strip over and then cut the other edge of the wedge. I test-fit the wedge into the pin guide, make minor adjustments to the miter gauge as necessary and then cut a new wedge. I continue this process until I get a wedge that fits snugly into the pin guide with no gaps on either edge (see figure 1). Then I cut a wedge, or pin template, for each slot in the pin guide.

I then push the pin templates firmly into place on the pin guide and glue and screw the templates to the collar. To fully support the router, I needed to attach an outrigger rail to the collar in front of the pointed end of the templates.

To route the pins, I set up a second router with a bearing-guided, ½-in.-dia. straight bit. Again, the depth of cut is just a hair deeper than the thickness of the stock. Before routing away the waste between the pins, I removed the pin-template guide board from the jig and replaced it with a short piece of the prepared stock. Then, with the router sitting on the pin templates and the outrigger rail, I routed away all the material on the collars and the scrap stock that is not covered by the pin templates, as shown in the photo on p. 79. I used firm pressure to be sure the bearing rode tightly against the templates for an accurate cut. Routing the waste completes the jig and cuts a pin test piece.

I remove the test piece and try it in the tails previously cut. If the joint is too loose or too tight, it's usually a result of not keeping the guide bearing firmly against the sides of the fingers or pin templates. You might want to try running the router through the jigs again with new test pieces in place. Minor misfits can be adjusted by shaving the edge of the pin templates or adding masking-tape shims. If you're satisfied with the fit and spacing, slide the appropriate jig over the end of your stock and start cutting. The actual routing of joints takes about five minutes each. □

Bill Page is a woodworker in Toledo, Ohio.

Fitting a big cabinet into a tight corner—This entertainment center fits deftly into a corner, despite its size, due to the added wall returns that butt to the walls at 90°.

Build Depth in a Corner Cabinet

Wall returns and traditional detailing soften impact of grand entertainment center

by Phil Lowe

Because television cabinets house such big components, they are, of necessity, large themselves. And when one of these big, heavy cabinets is stuck in a corner, they jut obtrusively into the room. However, this entertainment center includes design features that lessen its physical impact on the room yet let it remain aesthetically grand.

These design features are wall returns, a trapezoidal back design and architectural elements true to its Chippendale heritage (see the box at right). The trapezoidal back, as shown in the drawing on p. 85, gives the cabinet greater depth without it protruding further into the room. The wall return joins the cabinet side at 45°, about 8 in. behind the face of the cabinet, and butts to the wall at 90°. So a cabinet that is more than 24 in. from front to back appears to be less than a foot deep, as shown in the photo at left. My technique for adding wall returns is relatively simple because I cut all joinery on the tablesaw.

Design parameters

When laying out this piece, I was confronted with three restrictions. First, the piece had to fit into a corner with one wall only 33 in. long. Second, the cabinet had to contain a television and VCR. Third, the cabinet had to have retractable doors for unobstructed television viewing.

Cabinet's depth is revealed. With the doors open, the true size and purpose of the cabinet is apparent, but still the wall returns on its sides keep it from being overbearing.

This third parameter probably had more to do with the final size of the piece than any other factor. Widening the cabinet to accommodate a larger television decreased the depth at the sides of the cabinet, leaving less room for the wider doors. Thus the final dimensions were a compromise between the cabinet-stretching techniques that follow and the pocket-door hardware (see *FWW* #104, pp. 70-74).

I gained several inches of interior space by adding a trapezoidal back (see the drawing on p. 85). This back design has intermediary panels intersecting both the primary sides and the cabinet back at 45°. Running parallel to the walls, these intermediary panels move the back panel closer to the apex of the corner into what would normally be wasted space behind a rectangular cabinet pushed into a corner.

The most significant feature, however, was the wall returns. The wall returns give this freestanding unit a built-in look rather than appearing to be just stuck in the corner. The wall returns also enabled me to extend the center section forward to accommodate the depth of the television and the door hardware.

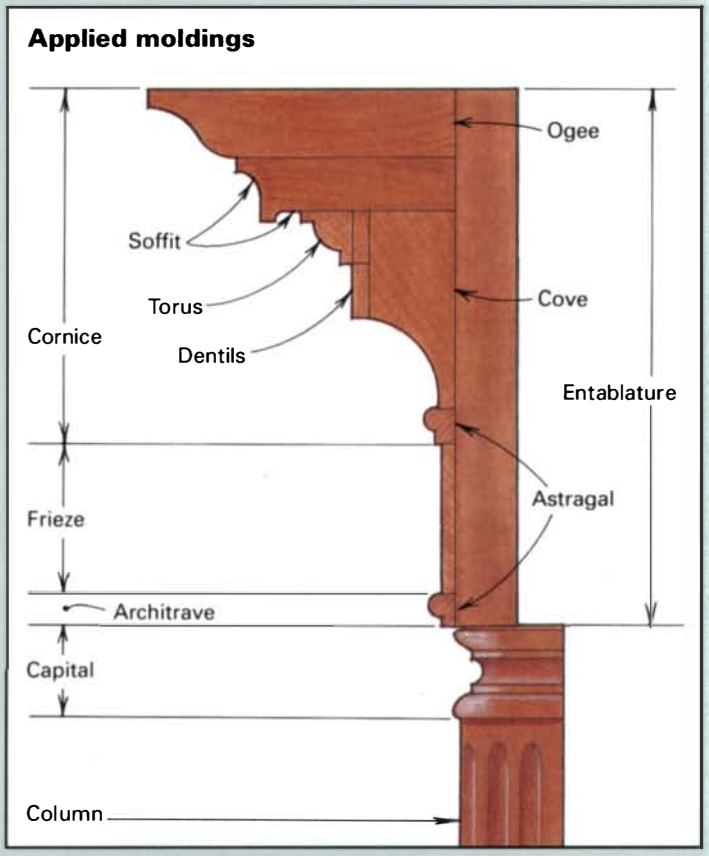
Construction tips

Whenever I build a large piece like this, I always make it in sections. Individual sections make the piece easier to handle, easier to finish in the shop and easier to move.

I buy my stock ahead of time and saw, joint and plane the stock, leaving it slightly oversized. This is particularly important for re-

Photos except where noted: Susan Kahn

Building moldings one stick at a time



Eighteenth-century designers frequently borrowed architectural details to add grandeur to their pieces. Built in the style of Thomas Chippendale, this modern entertainment center also includes numerous architectural elements, such as the quarter columns and the entablature that adorn the top of the upper case, as shown in the photo above.

While the moldings look complex, they were all built up one piece at a time to simplify construction. Stacking simple shapes, such as ogee, torus, dentil, cove and astragal (see the drawing above) on top of one another, creates the complex entablature shown in the bottom photo on p. 84. To give you a better idea of the process, I'll take you through the techniques I follow to create this molding.

Shaping molding: I shape or rout smaller profiles, such as the astragals or torus, on the edges of large pieces of stock that can be safely handled, and then I rip the molding from the edge on my tablesaw with a sharp blade. Edge-molding works great for many profiles, but fretwork or dentils require some different techniques.

I cut the fretwork on a scrollsaw with the mahogany stock sandwiched between two pieces of pine to prevent tearout. I stack up two pieces of mahogany to reduce the amount of sawing needed, leaving plenty of extra length for pattern matching. Then I nail the sandwich together at the ends where the waste would be. After laying out the fretwork pattern on the top piece of pine with a marking gauge, combination square, layout knife and spacer block the same width as the frets, I drive some more nails into waste sections in the middle of the molding.

Cutting out the pattern entails feeding the scrollsaw blade through drilled access holes for each void. I cut out the voids that have the nails last. When sawing the fretwork, I find it easier to cut the center first and then work toward the ends. While the

fretwork is still sandwiched, I clean up the sawmarks with a file.

The dentils are also made in a sandwich of mahogany nailed between pine. I cut the dentils on my tablesaw with a dado blade and a dentil jig that is similar to a finger-joint jig (see Jack Danilchak's article on p. 40 in this issue).

Each succeeding cut just requires moving the most recent dado onto the registration block and making the next cut. I start cutting in the middle of the dentil stock before putting the registration block in the jig. After inserting the block, I work to one end, and then I flip the dentil stock around and work from the center to the opposite end.

Assembling the entablature: To start assembling the molding, I scribe a line parallel to the door opening where the bottom astragal will begin. And then I carry it square across the sides and the wall returns.

All of the moldings are held in position, marked for length and then cut, mitering the ends either 45° or 22½°, depending on the joint. I then handplane the mitered ends as necessary to get a perfect fit. Each molding, starting with the bottom astragal, is applied all the way around the carcase before starting on the next molding. All moldings are just glued on unless subsequent moldings will hide any nails. This way, I don't have to worry about nail holes or filler spoiling the look of the completed molding.

I take a great deal of care when gluing on and clamping the bottom astragal. I make sure that it lines up with the scribe lines because all subsequent moldings will be registered off this piece.

When gluing on the fretwork, which is next, I choose a portion of the pattern to line up with the cabinet's centerline. That ensures the pattern can be carried around the corner of the carcase without a break when it's mitered.

Built-up architectural-style moldings add grandeur. *Versatility in molding design is achieved by cutting each shape individually and then combining the shapes on the carcase.*

Trying to brush glue onto a piece of fretwork invites a heavy application and lots of drips and runs. To overcome this problem, I first spread the glue on a piece of scrap stock and then lay the fretwork on the glued scrap. The fretwork picks up just the right amount of glue to minimize squeeze-out and the nasty task of trying to wipe glue out of all those little openings.

Next I mitered and glued on the top astragal molding and then the cove molding. But the cove can be nailed along the top edge, which is covered by the next molding to go on, the dentil molding. Before cutting the dentil molding to length, be sure the pattern will line up at the corners. The dentil molding also can be nailed along its top edge. The soffit is cut, glued and nailed to the top of the cove and dentil before gluing the torus molding to the underside of the soffit and the dentil's face. The final molding is the ogee, which is glued and nailed to the top of the soffit. *—P.L.*

Photo: Charley Robinson

Making wall returns—*A tablesawn rabbet completes the tongue that joins the wall return to the carcase side. The first two cuts to shape this tongue were also cut on the tablesaw.*

sawn stock that has a tendency to bow, cup or twist. After a few days of acclimation in my shop, I joint and plane the stock again. Generally, I'll glue up any panels at this point, so I'm not held up during the construction process.

Adding wall returns

First I prepare the carcase sides flat and square. For this cabinet, I added quarter-column spacers and partitions to the front inside edges of the sides. After crosscutting the sides to length, I ripped them to width with a 45° angle along the back edge.

I fitted the top and bottom frames, drawer dividers and drawer runners to the sides. But before gluing up the case, I used a dado blade in my tablesaw to rip a ¾-in.-wide groove on the outside face of the side to position the wall return. Because I was working with a short side wall the cabinet butted up to, I was somewhat restricted in the placement of the wall return, but I found about 8 in. of exposed cabinet side provided a well-balanced appearance.

To shape the tongue on the front edge of the wall return that mates with the dado in the side, I make three cuts on the tablesaw (see the wall-return detail on the facing page). I start with some stock slightly wider than needed. The first cut rips the front edge at a 45° angle. The second cut removes the tip from the 45° angle just cut, and the third cut, made with a dado blade, as shown in the photo above, cuts a rabbet along the opposite edge of the wall return and finishes the tongue that mates to the side dado.

The tongue should be slightly shorter than the depth of its mating groove, so the wall return will seat fully in the groove. This will leave a clean, smooth line where the outside faces of the wall return and the cabinet side meet. If the tongue is slightly long, it can be handplaned until it fits properly. Also, the tongue should be the same width as its groove for a snug fit. A rabbet plane can shave away excess stock, or if the tongue is a little loose, a strip of veneer glued along the inside edge of the tongue will tighten up things.

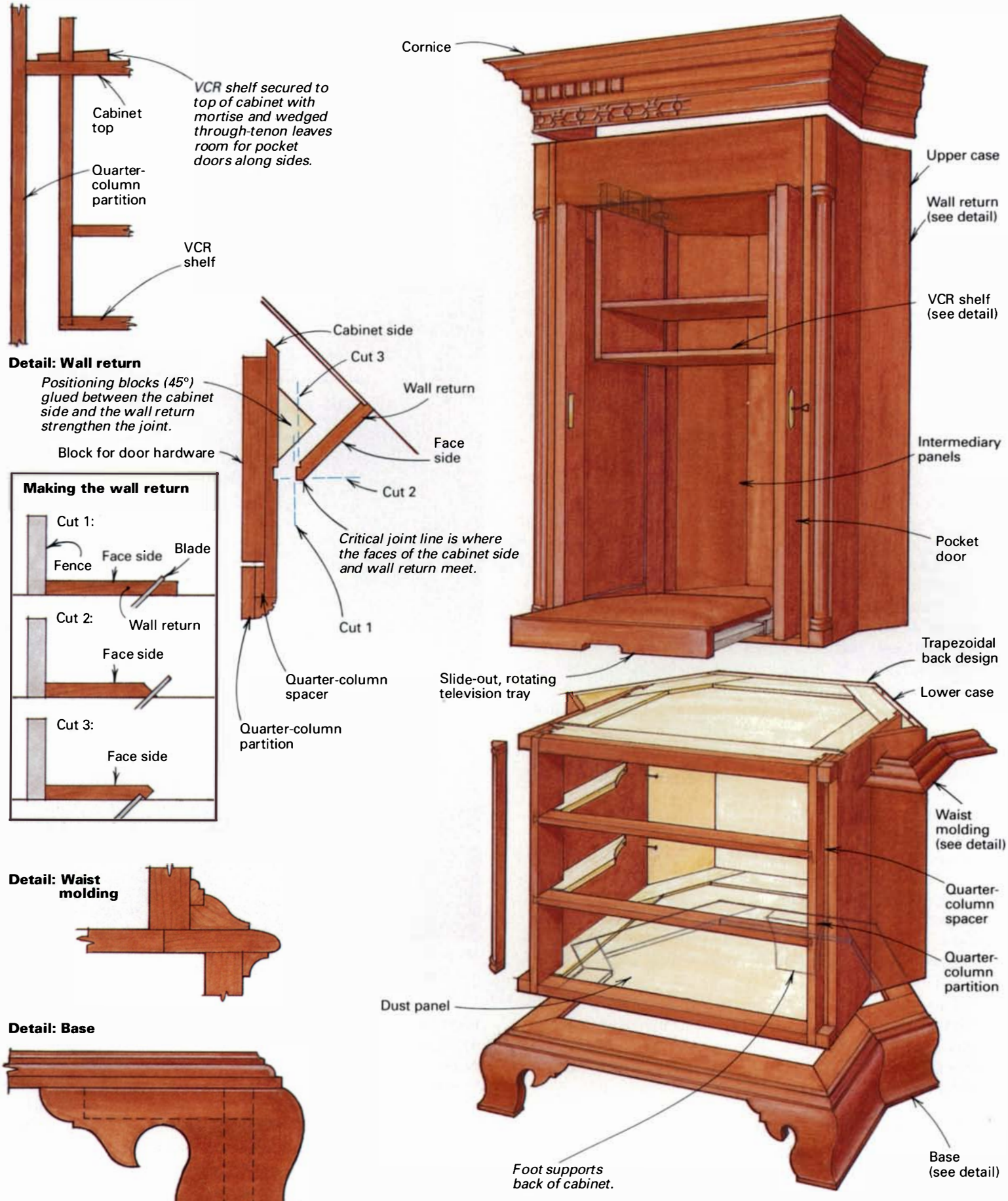
When the tongue fits properly in its groove, I rip the wall return to width and rabbet the inside back edge to accept the back panel. After gluing the returns in place, I glue 45° positioning blocks (see the wall-return detail on the facing page) between the returns and the cabinet sides to fasten everything firmly in place.

When undertaking a piece of this magnitude, it's easy to be overwhelmed by it all. But, if you view the task at hand as individual jobs, it is easier to trudge through. Then the accumulation of all these techniques can result in a grand piece of work. □

Phil Lowe specializes in designing, fabricating and restoring fine furniture in Beverly, Mass.

Entertainment center construction

Extended sides and wall returns minimize the visual impact but maximize the depth of this piece. The upper and lower case have similar construction.



Drawings: Kathleen Rushton

Vacuum Motor Turns into a Spray Rig

Enjoy the benefits of high-volume, low-pressure finishing in a compact unit

by Nick Yinger

For years, I did my spray finishing with a conventional compressor-driven setup. I was never entirely satisfied with the arrangement, and I recently built my own high-volume, low-pressure (HVLP) unit, as shown in the photo at right, to replace it. What bugs me about conventional spraying? For starters: finishing the inside of a case with a swirling cloud of overspray billowing back in my face. I can't see what I'm doing, and I wind up ingesting a big dose of chemicals no matter what kind of mask I wear. Even when I'm spraying water-based finishes, which are inherently safer, I find overspray annoying. Although they're neither toxic nor flammable, water-based finishes are expensive, so it makes even less sense to blast these precious fluids all over the booth with air compressed to 50 pounds per sq. in. (psi). HVLP spraying looked like the answer to these problems. This method promised to transfer 70% to 80% of the material from the gun to the object compared with 20% to 30% with a conventional setup. To accommodate a stream of warm, dry, low-velocity air, HVLP guns have large hoses and air passages. They use copious amounts of air—as much as 30 cu. ft. per minute (cfm) but at only 5 psi. (For pros and cons of HVLP, see the box on the facing page.)

I had a 3-hp compressor, so it seemed a simple matter to install a large, low-pressure regulator to feed 5-psi air to the gun. But there was a catch. A 3-hp piston compressor won't pump 30 cfm continuously at any pressure. The rule of thumb is 1 hp per 4 cfm of air, and we're talking about large, healthy, industrial horses not puny, underfed, home-improvement horses. Because 8- to 10-hp compressors are expensive and connecting my small compressor to a tank the size of a submarine seemed impractical, I decided I'd investigate the turbine compressors sold with HVLP guns.

I borrowed an HVLP unit from a friend and used it to finish some bathroom cabinets. It performed beautifully: almost no overspray, good atomization and good fluid and pattern control. My only criticisms were that the hose seemed cumbersome, and the handle of the gun became uncomfortably hot.

As I used the HVLP unit, I couldn't help thinking that if it acts like a vacuum cleaner, sounds like a vacuum cleaner, it must *be* a vacuum cleaner. I peeked inside. Sure enough—a two-stage vacuum cleaner turbine with an 8-amp motor! Soon thereafter, I set out to build my own HVLP turbine compressor.

Build your own HVLP unit

An HVLP machine is a centrifugal turbine compressor contained in a box with an inlet to bring air into the turbine and a plenum or outlet chamber to capture the compressed air discharged by the turbine and route it to your sprayer hose (see the drawing on p. 89). The turbines used in large vacuum cleaners are integral with their electric motors and are referred to as vacuum motors.

Shop-built spray unit—*A high-volume, low-pressure unit like this one that the author built is ideal for on-site work or in the shop.*

First buy a vacuum motor—Go to an industrial supply company, or get their catalog. I bought mine at Grainger (contact their marketing department at 333 Nightsbridge Parkway, Lincolnshire, Ill. 60069; 800-473-3473 for the nearest location); their catalog lists 45 vacuum motors, ranging from $40 to more than $280. You'll find a wide selection of features, such as bearing type, motor voltage, number of compressor stages and motor amperage. Most important for this application is *bypass*, not flow-through motor cooling. This means the motor is cooled by a separate fan. With this design, the motor won't overheat if the vacuum inlet or outlet is obstructed.

Single-stage compressors move large volumes of air but produce the lowest pressure. Two- and three-stage units supply higher

Photos: Jonathan Binzen

Conventional spraying vs. HVLP

by Dave Hughes

Okay...it's 8 a.m., and you've just entered your shop, coffee in hand. Standing before you is your latest project, nearly completed. It just needs to be lacquered. You take a deep breath, fill your spray gun, crank up the compressor, put on a particle mask and go for it. Fifteen minutes later, the atmosphere in your shop resembles that of Venus, every tool is covered with a fine white dust, the shop's out of commission for the rest of the morning and you've got a serious headache. Sound familiar? If, like most of us, you've tried to do finishing with conventional spray equipment in a small shop space, it probably does. Well, there's an alternative. It's high-volume, low-pressure (HVLP).

By now, most professional finishers have an HVLP unit in their arsenal of tools and increasingly, the units are finding favor with folks who do only occasional finishing. One big reason is that HVLP units have far higher transfer efficiency than conventional spray units. This means, simply, that most of the stuff you're spraying goes where you want it to go. A painter friend of mine did his own little test when HVLP first hit the market. He painted one cabinet with a traditional, compressor-driven gun and an identical cabinet with an HVLP unit. When he was done, there was three times as much paint left in the HVLP cup. Where was the paint missing from the conventional gun? All over.

Aside from transfer efficiency, HVLP offers a string of clear benefits over conventional setups:

- They are compact, lightweight, self-contained, easy to set up and clean.
- The guns have a wide variety of spray-pattern settings for finishing intricate shapes as well as broad, flat surfaces.
- The low-pressure air supply is adjustable and so creates far less bounce-back of material from inside corners.
- The dry, heated air helps materials flow on smoothly, level out nicely and set up quickly. It also helps avoid blushing on cold, damp days.
- Your shop is not rendered useless for hours. (But open a window anyway.)

Drawbacks? There are a few:

- HVLP units are not really a high-production tool but are more suited for small- to medium-sized projects.
- Standard models have a rather cumbersome air hose all the way to the gun, limiting wrist mobility somewhat.
- As with any quart-gun arrangement, you can't spray upside down, and you're constantly, it seems, filling it up. (Higher priced models offer a 1- or 2-gal. pot that stands on the floor for less-restricted gun movement and less-frequent fill ups.)
- And there's that whining motor—it reminds me of a car wash vacuum.

HVLP is a definite advance for the small-shop woodworker or finisher who wants professional results. With prices starting under $500 and savings from high transfer efficiency, they're a good investment. From the money you save, stake yourself fifty bucks for a decent charcoal respirator and a pair of earplugs. □

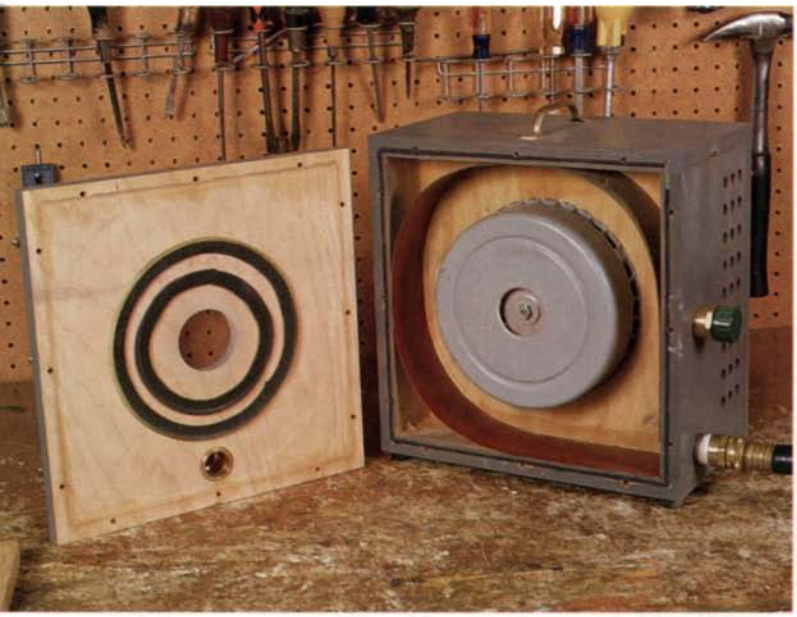
Dave Hughes is a professional finisher in Los Osos, Calif.

High volume, low pressure (HVLP) in a small package. *At 15 in. sq. and 18 lbs., the shop-built turbine-powered HVLP spray unit in the photo below is a fraction of the size and weight of the standard medium-sized compressed air setup in the photo at left.*

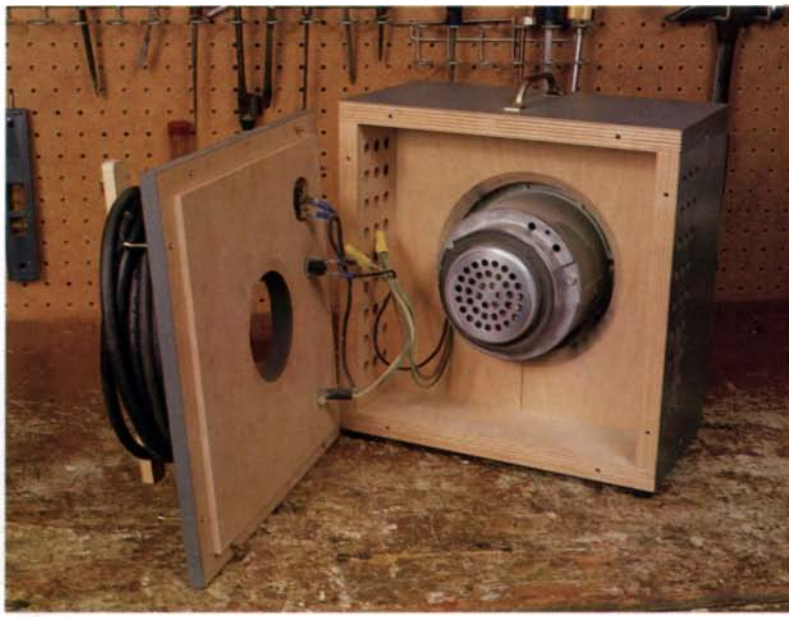
pressure air at some sacrifice in volume but typically have more powerful motors and, hence, better overall performance. I chose a two-stage turbine with a 13-amp motor rated at 116 cfm that costs $163, an Ametek model #115962. I could have purchased a less powerful unit, but I wanted to be able to operate two spray guns on occasion, and anyway, I like overbuilt machinery. For a one-gun setup, you might try the Ametek 115757-P, which costs $63. For the rest of the parts in my HVLP unit, including the hose but not the gun, I spent less than $70.

Make a cradle for the motor—These motors are designed to be mounted by clamping the turbine housing between two bulkheads using foam gaskets. Make the rear bulkhead first. Cut it to size, bandsaw the circular hole and then chamfer the back side of the hole. The chamfer will ease the flow of motor-cooling air away from the motor housing. Cut the positioning ring to size, and rough out the hole with the jigsaw, leaving it slightly undersized. I made a Masonite routing template to exact size by cutting the hole with a fly cutter on the drill press. Use the routing template to finish the hole in the positioning ring.

Cut the housing sides, top and bottom to size, and make the dado for the rear bulkhead in each of them. Then drill the cooling outlet holes in the side pieces. Assemble the housing with the rear bulkhead in place, and when the glue has set, drop in the posi-



***Improving sprayer output**—Plastic laminate coiled in the outlet chamber acts as a fairing and increases output by lowering resistance. Weather stripping and rubber tubing form gasket seals.*



***Mounting electricals**—Switch, cord and circuit breaker are mounted in the back panel. Holes in the side of the back chamber are for motor-cooling air. A wooden cleat holds the wound cord.*

tioning ring, and glue it in place. I used screwed butt joints for the housing pieces and relied on the bulkhead to stiffen the box.

Gasket and sealant—The turbine is held in the circular rabbet created by the bulkhead and positioning ring and is isolated from the wood by silicone rubber sealant. To hold the turbine centered in the rabbet while the silicone sets, cut three 2-in.-long pieces of ⅛-in.-inside-dia. (ID) soft rubber tubing that compresses to about 1/16 in. under moderate pressure. (This surgical tubing, with a wall thickness of 1/32 in., is available in hobby shops and medical supply houses.) Lay the housing on its back, and put a generous bead of silicone in the rabbet. Lay the three pieces of tubing across the rabbet at 12 o'clock, 4 o'clock and 8 o'clock, and push the turbine down into the wet silicone. If you want the turbine to be easily removable later, spray the rim with an anti-stick cooking spray such as PAM before setting it into the silicone. Let the silicone set, and trim off the squeeze-out and tubing ends later.

With HVLP, far more of what you spray sticks to the object you're spraying.

Next rout the gasket grooves around the front edge of the housing, and press lengths of 3/16-in.-ID soft rubber tubing into them. Make the front and back covers, and apply the rings of ½-in.- by ½-in. adhesive-backed weatherstrip, as shown in the photo at left, and then screw on the front and back.

Holes in the box—I tried various locations for the outlet holes and found no detectable differences. But I did get better output when I installed a fairing made from a strip of plastic laminate, which makes the outlet chamber roughly cylindrical (see the photo at left). Drill one or two 1-in. outlet holes in the housing, and screw ¾-in. pipe thread close nipples into them. Attach adapters to the nipples to provide ¾-in. male hose threads.

I attached a large shop-vacuum air filter to the front cover. Four short dowels hold the base of the filter in place, and a bracket pulls it tight against the cover. The bracket consists of two threaded rods screwed into the front cover joined by a hardwood crosspiece with a bolt through its center. A washer and wing nut secure the closed end of the filter against the crosspiece. You could also try using a large automotive filter. In that case, a Masonite or plywood disc secured by a similar bracket could hold the filter against the front cover.

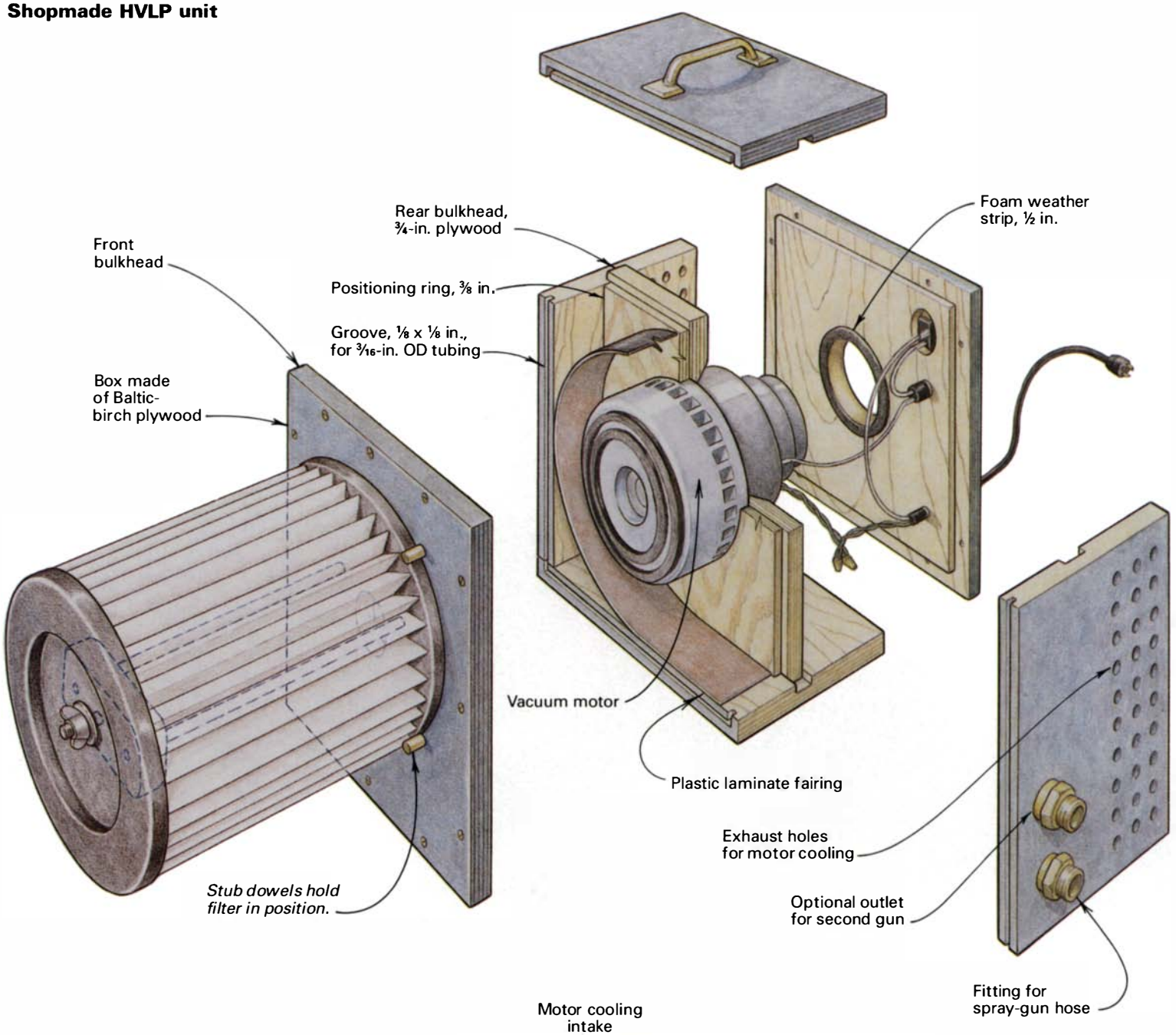
Electricals—Mount the electrical parts: a heavy-duty switch, a circuit breaker with the appropriate rating for your motor, and the supply cord through the back cover, as shown in the photo at right. Then add rubber feet, a carrying handle and a cord-storage device.

Nice hose—I tried three different types of hose. All were ¾ in. ID and can be equipped with ordinary garden hose threaded fittings or quick-connect couplers. The most flexible was the lightweight, corrugated type provided with most factory-built HVLP sprayers, but its rough inner surface doesn't deliver as much air as smoother types. Plastic garden hose is cheap, smooth inside and flexible when warm, but in use, the heated air causes the hose to become too soft and to kink easily. My favorite is Shields Vac extra heavy duty/FDA hose available from marine distributors. It is made of a soft flexible vinyl molded around a hard vinyl helix. It's recommended by the manufacturer for use in boat plumbing below the water line, which means it will withstand a lot of heat as well as mechanical and chemical abuse.

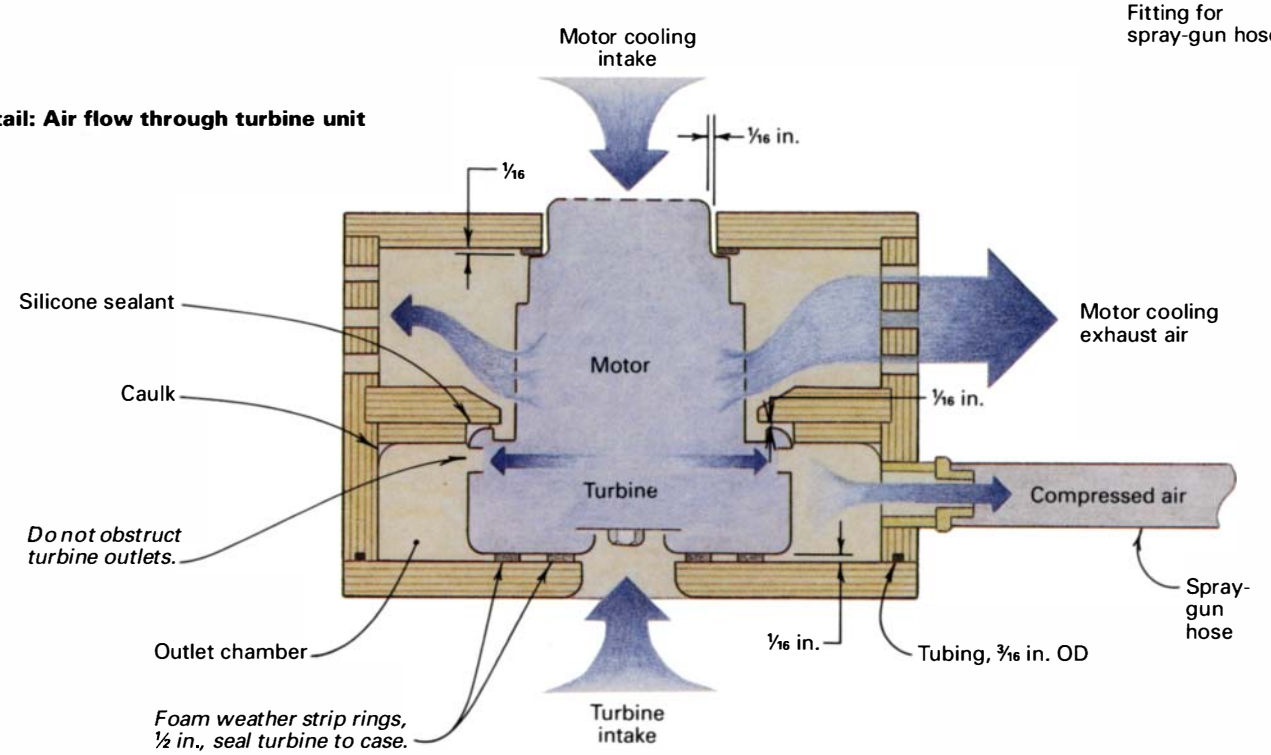
Gun control—You can't just hook up your old gun to your HVLP turbine. HVLP guns are designed to enable them to atomize fluids with low-pressure air. List prices for these guns start at around $250. Of the HVLP guns I've tried, my favorite is a DeVilbiss (contact DeVilbiss at 1724 Indian Wood Circle, Suite F, Maumee, Ohio 43537; 800-338-4448 for a local supplier). The current model most like mine is their JGHV 5285 that lists for $365. It has stainless-steel fluid passages and a stainless-steel needle, so water-based finishes won't cause corrosion. And much to the relief of my palms, the handle is a nylon composite that doesn't get hot in use. □

Nick Yinger is a professional land surveyor in Kirkland, Wash.

Shopmade HVLP unit



Detail: Air flow through turbine unit

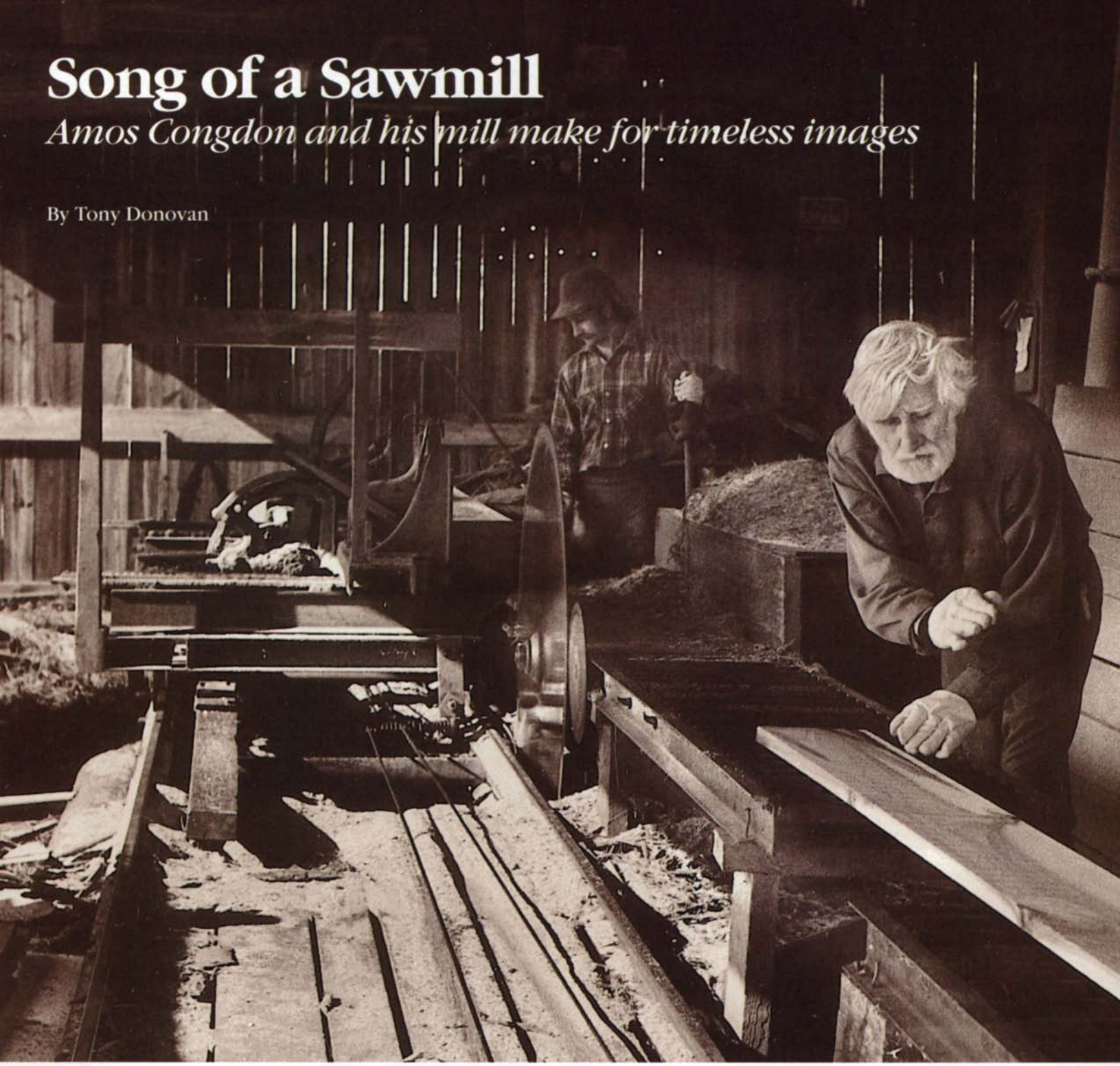


Drawing: Heather Lambert

Song of a Sawmill

Amos Congdon and his mill make for timeless images

By Tony Donovan



The sawyer rolls the first log onto the mill carriage, slapping his hook into its side and turning the log into place. The log seems to scream when it's drawn into the saw. I take hold of the first slab off the log and pull it clear of the blade. The saw is turning more than 700 times a minute. It's a blur, a hiss and a whir under the noise of the diesel.

I lift the heavy slab and carry it across the tracks, throw it on a pile; I turn back as the sawyer, Amos Congdon, a veteran of 60 years in the mill, sets the next cut.

We're sawing oak, for planks to saw down further into lath for lobster pots, for common lumber, for an occasional grade board, and for the railroad tie that's the center of each log. It takes less than a minute to saw out the simple tie log.

When luck is with us, the sawyer will make his cut, and the slab will fall safely away from the saw; he'll pull the log back and make a second cut, even a third, with each new piece pushing in between the others and the saw. The next log is crooked and hard to roll. The sawyer takes longer to find the right position for the cut.

The mill platform is in disarray. My side is strewn with scraps of wood and bark; lumber piles jam the floor, white, yellow and pink, depending on what we've sawn.

The sawyer's side is equally cluttered. Soil, strips of bark and branches fill the space between the skids. Where my side is bright with new-sawn lumber, the sawyer's side is dark. Behind the skids are broken logs, poison ivy pulled off the pine we sawed last summer, black pieces off the carriage, oil leaked on the floor, all of it covered with the gray film of diesel exhaust.

A fan set in a pipeline pulls wood chips and dust off the bottom of the saw. The line runs from under the saw, angling up and out the roof to the back of the mill and to the hill of sawdust there.

Photos: Tony Donovan

Sawing whitewood, *Amos Congdon slides a board down the saw carriage at his sawmill in Lyme, Conn.*

Keeping the saw sharp *is a constant vigil, and Congdon dresses each tooth with care.*

The disarray of the mill, *characteristic of many small sawmills, belies its efficiency and the skill of its workers*

A mountain of sawdust *forms outside the mill. Congdon trudges through the dune-like pile, leaving tracks as if on some search for a desert oasis.*

I've often wondered the reasons for the mess. While not all mills are in disarray, enough of them are like ours to make it typical. It can't be laziness. It's not incompetence: The tools are sharp, and despite the speed, we're rarely hurt.

I've worked this mill at industrial speed, four of us working 10 hours a day. I've worked with just the sawyer and with the old man teaching a new sawyer.

The sawing is essential. The rest recedes. It builds a conceit. Felling the tree. Logs pulled from the woods in chains, waiting in silent piles to be sawn, the scream of the log as it's pulled into the saw. We all feel these things; we all talk about them.

Sawing is our compensation. When I started here almost twenty years ago, one sawyer told me—I suppose as a warning—that once I'd worked here I wouldn't want to stop. It's proven true. It's the exhilaration of the work, to feel my spine stiffen, to feel my heart beat fast. I love this place where so much happens, the smell of wood and sawdust, the effort and speed, the step away in time when the saw starts. □

Tony Donovan is a writer, photographer and sometime sawmill worker living in Ivoryton, Conn.

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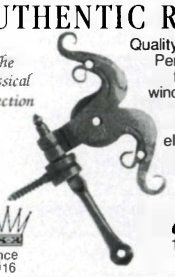

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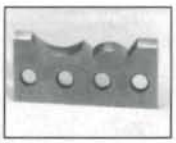

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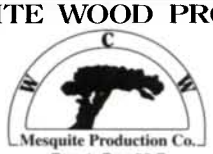

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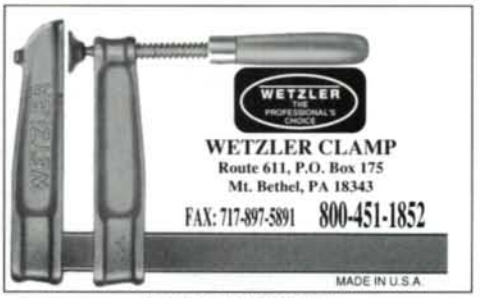

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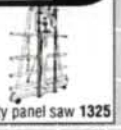

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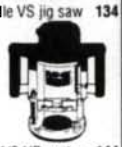

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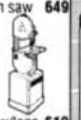

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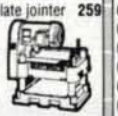

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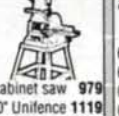
31-280 NEW Sanding Center w/Stand
$749



36-755	10" cabinet saw	979
36-751	10" cab.w/30" Unifence	1119
36-752	10" cab.w/50" Unifence	1229
70-200	20" floor drill press	839
31-380	4"x132" edge sander	1499

50-901 NEW! 3 HP, 230V Cyclone 2 Stage Dust Collector
$1,679

50-902	5 hp3 ph cycln collectr	1799
50-903	5hp 230v cycln collectr	1999
43-155	*New* 115v invrtd pin rtr	1399
43-156	*New* 220v invrtd pin rtr	1399

"Jorgensen"

8" Handscrew
$12

1	10" handscrew	13
2	12" handscrew	15
3	14" handscrew	19
4	16" handscrew	25
7224	24" I-bar clamp	19
7236	36" I-bar clamp	21
7248	48" I-bar clamp	23
7260	60" I-bar clamp	25

SIOUX

690 Air Palm Finish Sander
$134

690VV	air sander w/vacuum	169
8000	3/8" VSR 0-1300 drill	129
8020	1300 rpm electric scrdrvr	169
8030	kls 3/8" R.A. drill 0-1500	149

TROJAN

TWC-24 Work Center
$99

MS-2000 *New* mitre saw stand 259

Milwaukee

6527 Variable Speed Super Sawzall
$174

5377-1	1/2" kylss hamr drill kit	209
5369-1	3/4" SDS hamr drill kit	239
5371-1	1/2" hammer drill kit	189
5365-1	Hawk 1" SDS rtry. h. kit	349
5353	Eagle 1-1/2" rtry hmr kit	529
5660	1-1/2 hp 10 amp router	189
5680	2 hp 12 amp router	209

6490 10" Miter Saw w/C.T. Blade
$269
Free Blade

6507	VS sawzall with case	144
6508	VS sawzall with case	144
6528	VS super sawzall	174
5397-1	3/8" hammer drill kit	139
5375-1	1/2" hammer drill kit	179

0407-1 NEW! 12 Volt VSR Cordless Kit w/Keyless Chuck & Extra Battery
$174

6127	5" random orbital sander	149
0222-1	3/8" VSR 3.5 amp drill	108
0229-1	3/8"vsr keyless drill	114
0234-1	1/2"VSR 0-850 magnum	129
0236-1	1/2" drill w/case & bits	159
0244-1	1/2"VSR 0-600 magnum	129
1676-1	2 sp. hole hawg kit	269

6368 7-1/4" Saw w/C.T. Blade, Case and Fence
$139

6369	7-1/4" saw w/ct blade	149
6758-1	0-4000 VSR screwdriver	98
0380-1	3/8" keyless angle drill	169
0375-1	3/8" close quarter drill	129

6767-1 5 Amp Heavy Duty Screw Shooter Kit
$139

3107-1	vs right angle drill kit	214
6142	4-1/2" angle grinder	124
5455	7" 1750 rpm polisher	138
5460	7" vs 0-1750 polisher	169
6256	VS top handle jig saw	144
6010	1/2 sheet finishing sander	124
8975	dual temp. heat gun	59

BIESEMEYER

50L12 50" Commercial w/12" Left
$299

26L12	26" commercial fence	269
52L12	52" homeshop fence	239
40L12	40" homeshop fence	209
28L12	28" homeshop fence	199

Nailers.

2655 Original Cordura Tool Belt System
$99
Tools Not Included

Emglo

AM78-HC4V 1-1/2 HP Vertical Twin Tank
$299

AMDOL78-HC4V	1-1/2hp oilless	299
AM99-HC4V	2hp ver.twn.tnk	389
AM99-HC4	2hp twin tank	379
AM78-HC4	1-1/2hp twin tank	299
AM39-HC4V	3/4hp v twin tank	289
K15A8P	1.5hp wheelbarrow	599
K2A8P	2hp wheelbarrow	669
K5HGA-8P	5hp Honda whlbrrw	749
K4WGA-8P	4hp Wisc whlbrw	649
045	3/8" x 50' Goodyear hose	20

JET

WBS-14CS 14" Wood Bandsaw w/Enclosed Stand
$544
NEW!

JBS-18	18" bndsw 2hp w/stand	969
WBS-20	20" wdcttng bandsaw	2299
OVS-10	oscillating spindle sndr	1849

DC-650 1HP, 650 CFM Dust Collector
$229

DC-1200	2 HP, dust collector	439
DC-1900	d. col. 3 hp/1900 cfm	599
EHVS-80	6x89 edge sander	629
JSG-6	6"belt/12" disc sander	569

JJ-6CS 6" Long Bed Jointer
$479

JJ-4	4" deluxe jointer	369
JJ-8CS	8" long bed jointer	1069
JJ-12	12" long bed jointer	2799

JTS-10JF 10" Saw With Jet Fence
$539

JCS-10A	10" cab. saw w/Jet fnc	969
JSS-20VS	*NEW* 20" VS scrll saw	314
JDP-14M	14" bench 16 s. press	349
JDP-17MF	17" floor 16 s. press	414
JDP-20MF	20" floor 12 s. press	729

JDPN-607.2 18 Ga. 3/8" - 1-1/4" Nailer w/Case
$109

JDPN-671.46g	1" 1-1/2" nlr w/cs	219
JDPN-6013.2A	18g1/4" stplr w/cs	109
DHC-15T4	1-1/2hp pncake comp	299

JWL-1236 12" VS Wood Lathe w/Stand
$549

JWP-15H0	15" planer 3 hp	1229
JWP-208-1	20" plnr 2sp/3hp	1899
JWP-20H-1	20x7 planer 3hp	2999

READER SERVICE NO. 301

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Saturday 8:00-4:00 CST

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SKIL

2736-04 12 V, 3/8" VSR Keyless Drill Kit W/2 Batteries — W/Bit Set!
$139

3400	10" table saw w/dado set	199
7484	5" random orbital sander	109
1605	plate jointer w/case	139
77	7-1/4" worm drive saw	144
5525	***New!*** 6-1/2" circular saw	119
5660	8-1/4" 60° pro bevel saw	149
5860	8-1/4" 60° rafter master	179

makita

6095DWE 9.6 V. 3/8" VSR Keyless Chuck & 2 Batteries
$139

5007NBK	7-1/4" saw w/case	129
5007NBA	7-1/4" saw w/elct. brk.	134
2711	10" table saw w/brake	569
2708W	8-1/4" table saw w/ct bl.	299
LS1030	10" mitre saw	239
2012	12"port. planer w/dust cht	539
B05000	5" random orb. sander	69

LS1011 10" Compound Mitre Saw
$549

6201DWE	9.6v Makpak kyls 2 bt	159
6011DW	12v keyless vsr kit	169
6211DWE	12v MakPac kit w/2 bat	169
3612BR	3 hp plunge router	209
9820-2	blade sharpener	209
HP2010N	3/4", VSR hammer kit	179
JR3000V	VS recip. saw kit	138
N1900B	3-1/4" planer w/case	134
2040	15-5/8" stationary planer	1699

POWER TOOLS & ACCESSORIES FOR INDUSTRY AND CONSTRUCTION

2694 7-1/4" Super Sawcat w/Brake & Case
$154

2695	8-1/4" super sawcat w/br.	174
3034	7-1/4" circular saw	99
79-034	# 400 workmate	109
79-039	***New #*** 2000 workmate	159
3660	12" mitre saw	299
2765K-2	12v, kylss supr cyclone	169
1311	1/2" HD VSR Holgun drill	124
1180	3/8" HD VSR Holgun drill	109

5014 3/4" Rotary Hammer w/Case
$199

2037	0-4000, VSR, 5A scrugun	99
2054	0-2500, VSR, 5A scrugun	159
2059	0-2500, VSR, 5A tek gun	119
2670	1/2" HD impact wrench	159
5073	1/2" VSR hammer drill kit	179
1703	10" miter saw, bag,&CT bl	199
3157K	VS orbital jig saw kit	149
3105	VS orbital cutsaw kit	149
4076	Wildcat grinder 6000rpm	159
2750	4-1/2" angle grinder	84

Jem

MSX-636 Triangular Orbital Sander w/Case & Paper
$189

FUJI

Three Stage Turbine High Volume Low Pressure Sprayer
$599

SENCO

SN60 NEW Full Head Stick Nailer w/Case
$449

SN325+	***NEW*** 6d-12d nailer	419
SLP20	***NEW*** 5/8"-1-5/8" brad nlr	279
SN70	6d-16d frame nailer	479
SFN-1	1"-2" finish nailer	309
SFN-II	1-1/2 to 2-1/2 fin. nlr.	389
SKS	1/4" crown finish stapler	279
M-II	1-3/8" to 2" HD stapler	369
SPS-RFR	roofing stapler	349

PERFORMAX S/T

16-32 NEW 16"-32" Bench Drum Sander — Optional Stand
$799

	Powerfeed attachment	309
Per-ST100	radial saw srfc sndr	279
ProMax III	stationary sander	1589
SuperMax	25" stationary sander	2269
SuperMax-25	25"dual drm sndr	2749
SuperMax 37	37" drum sander	2995
SuperMax37x2	37"dual drmsndr	3449

HITACHI

NR83A Full Head Stick Nailer
$389

NR83AA	clipped head stick nlr	414
NV83A	full head coil nailer	414
NV45AB	coil roofing nailer	399
N5008AA	5/8" to 2" HD stapler	319
NT65A	1" to 2-1/2" brad nailer	324
NT45A	5/8" to 1-3/4" brad nailer	274

KRAUSE

121482 12' Multimatic Alum. Ladder
$129

121499	16 foot ladder	149

AEG

TXE-150 6" EVS Random Sander
$142

FSPE-100X	3x21 VS belt sander	179
BSPE-100X	***New*** barrel grip jigsw	159
BSPE-100X	***New*** top hdle jigsaw	159

VEGA

U26 Utility 26" Fence
$169

U50	utility 50" fence	189
PRO40	professional 40" fence	239
PRO50	professional 50" fence	249
DU-36	utility 36" duplicator	395
D-36	prof. 36" duplicator	569

BAUER CORPORATION

30406 6' yellow, 300 lb Fiberglass Stepladder
$79

30405	5' fiberglass ladder	69
30404	4' fiberglass ladder	59

Lignomat

Mini-Ligno Wood Moisture Meter 6-20%
$99

Mini-ligno E	6-36%	109

Wap

766RDF Turbo Vacuum
$429

Drywaller	turbo drywaller vac	529

shop-vac

890-11 10 Gallon, 2 Stage, 2 HP By-Pass S. Steel Vac
$289

610-50	10 gal. S.S. cont. vac	174
750-01	300 CFM Tool Mate	249
464-38	12 gal. poly. cont. vac	189

BOSCH

1370DEVS 6" H.D. Random Sander
$224

3272	3-1/4" planer 4.2 amps	89
1608U	underscribe lam. trmr	149
1609KX	laminate trimmer kit	209
1195VSR	3/8" 6amp hmr drill	139
1194VSR	1/2VSR 6amp hmr dr.	159
B7000	***New*** corner detail sander	79
B4050	***New*** in-line jig saw	124
B1650K	***New*** plate joiner kit	179
B7300	6" random orb. sander	139
B9250	5" 8.5 amp grinder.	149
B2300K	12 V vsr 3/8 drill kit	179

1613EVS NEW! Microfine Plunge Router
$184

1614EVS	1-1/4 hp,vs, pl router	159
1613	1-3/4 hp 25,000 pl router	179
1614	1hp 27000 rpm pl. router	159
1289D	1/4 sheet palm sander	69
1347AK	4-1/2" grinder kit	109

BOSCH

1587VS Top Handle Jig Saw w/Case & 30 Blades
$209

1587VS	top handle jigsaw	164
1584VS	barrel grip Clic jig saw	164
1632VSK	VS recip saw kit	159
3051VSRK	kyls3/8VSRkit w/2bat	144
3054VSRK	12v 3/8"vsr kit .2 bat	189
3258	3-1/4" power plane	139
1654	7-1/4" saw w/ct blade	114

3283DVS Dustless Random Orbital Sander
$95

3283DVSK	5" random sander kit	119
1348AE	5" elec. mini grinder	119
1608	laminate trimmer	98
1609	offset base laminate trmr	149
1942	heavy duty heat gun	79

1273DVS 4x24 V.S. Belt Sander
$214

1273D	4x24 sander with bag	209
1272D	3x24 sander with bag	204
3270DVS	3x21 vs sander w/bag	169

1615EVS 3 -1/4 HP, VS Plunge Router
$259

1608DW	drywall cutout tool	94
1604	1-3/4 hp router	144
1606	1.75 D-handle router	189
1609K	3 in one trimmer kit	179

1003VSR 3/8" Keyless 0-1100 Drill
$94

1021VSR	3/8" VSR 0-1100 drill	109
1022VSR	3/8" 0-1100 XHD VSR	114
1023VSR	1/2" 0-550 hd VSR dr.	129
1024VSR	3/8" 0-1000 m. midget	124
1025VSR	1/2" 0-650m. m drill	124

1404VSR 0-4000 Drywall Driver
$89

1405VSR	0-2500 drywall driver	109
1420VSR	0-4000 hd drywall dr	99
1421VSR	0-2500 hd drywall dr	119

11212VSR 3/4" Bulldog SDS Rotary Hammer
$199

11214VS	1.75 VS rotary hmr	749
11304	Brute breaker hammer	1199
11305	demolition hmr 10 amp	729
11220EVS	1-1/2" spline hmr	499
11219EVS	1-1/2" spline w/stop	569
11310EVS	vs demolition hmr	549

Elu

3338 2-1/4 HP Electronic VS Plunge Router
$199

3339	3 hp vs plunge router	269
3380	joiner/spliner w/case	175
2721	1.5hp fixed base router	149
3379K	plate joiner w/case	239
3375	3-1/8" universal planer	169
4024	3x21 VS sander	184

Lamello

TOP 10 Plate Joiner w/Case
$539

COBRA	***NEW*** Jointer	269

TARGET

VC-8 8" Versa Cut II Tile Saw
$749

PT1075	10" 1 hp tile saw w/bld	799
PT10100	10"1-1/2hp tile sw w/bl	849

CALCULATED INDUSTRIES INC.

3088 Construction Master III Calculator
$69

3391	Scale Master Plus dig scale	89

STANLEY BOSTITCH

N80S-1 16d Stick Nailer
$359

N60FN1	1-1/4"-2-1/2" finish nailer	339
N12B-1	coil roofing nailer	399
N80C-1	coil nailer	359
T31-1	5/8" to 1" brad tacker	149
T50S4-1	sheathing/deck stapler	369
T40S2-CT	roofing stapler	299
MIIIFS	floor stapler	549

qual-craft

2200 Pump Jack
$58

2201	top brace	20
2203	guard rail holder	21
2204	work bench	38
2601	***NEW*** wall jack	109

HONDA Power Equipment

EB2500XKIA NEW! 2500 Watt Construction Generator
$999

EB3500XK1A	3500 w generator	1439
EB5000XK1A	5000 w generator	1799
EB6500SXA	6500 w generator	2399
EW171AB8	4000 watt gen/weld.	2099
EB12DAGA1	12,000 w. dsel gen.	7499

EX1000A 1000 Watt Generator
$639

EM2500XKIA	2500 watt gen.	1029
EM3500SXK1A	3500 elec. start	1549
EM5000SXK1A	5000 elec. start	1899
ES6500KIA	6500 electric start	2599

GX160K1QX 5 HP Horz. w/Oil Alert
$339

GX240K1QA	8 hp horz. engine	499
GX340K1QA	11 hp horz. engine	599

For optimum performance & safety we recommend you read the owner's manual before operating your Honda Power Equipment. Connection of generators to house power requires transfer device to avoid possible injury to power company personnel. Consult a qualified electrician

Porta-Nailer

401P Hardwood Floor Nailer
$199

501	floor face nailer	199
120	universal router table	329

SPIRIT

SV10K NEW! 1 Watt Communication Radios (Pair)
$339
Complete with charger & batteries.

DAVIS Davis Instruments

7425 NEW Weather Wizard III
$189

7440	weather monitor II	359

DEWALT

DW682K Plate Jointer Kit w/Biscuits
$225

DW360	7-1/4" saw w/brake	149
DW304K	6amp vs recip saw kit	144
DW318K	top hdl vs jigsaw kit	154
DW625	3hp elec, vs plng router	269
DW704	12" miter saw w/brake	319
DW3647	1/4" saw w/brk rear pvt	149
DW675K	3-1/8" planer w/case	169
DW431	3x21 vs belt sander	184
DW947K	13.2v 3/8" vsr drill kit	209
DW160	3/8" RA shorty drill	139

OW705 12" Compound Miter Saw — Dust Bag
$349

DW945K-2	12v 3/8 vsr kit w/2 bt	169
DW944K	9.6v 3/8 vsr kit w/2 bt	149
DW106	3/8"4 amp keyless drill	74
DW250	0-4000 drywall driver	89
DW2540	2500 deck screwdriver	89
DW610	1-1/2 hp, 1/2" router	149
DW514K	3/4" SDS hammer kit	239
DW280K	all purpose scrwdrvr kt	119
DW290	1/2" impact wrench	174
DW510K	1/2" vsr hammer dr kit	169
DW615	1-1/4 hp vs plng router	159
DW991K	14.4 v cordless drill kit	NEW
DW972K-2	12v cordless drl kit	NEW
DW962K-2	9.6v cordless drl kit	NEW
DW421	5" random orb sander	NEW

David White

LP6-20 20X Sight Level Package
$199

ALP8-20	***NEW*** auto level pkg.	549
LP6-20XL	***NEW*** sight level pkg.	259
ML100	visible beam laser	1099
AEL-300	auto laser level	1599
LTP6-900	level transit pkg.	379
ALTP6-900	18 auto lvl trnst pkg	479
AL8-22	22 x auto level	424
LT6-900	20 x level transit	244
LT8-300	26 x transit	445
LT8300P	26 x opt. transit	519
ALT6-900	18x auto level transit	399
ALP6-18HD	18x auto package	379

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READER SERVICE NO. 301

Veritas beading tool

Veritas Tool has come up with a new version of the venerable beading tool. Before routers, beading tools were used to add beads, flutes or reeding to cabinetry and fine furniture. For small jobs, a beading tool is still quicker than setting up a router and jig. The new Veritas beading tool is an elegantly simple design, consisting of a round hardwood dowel slotted to receive the cutter and a wooden handle into which the dowel slides (see the photo below). A thumbscrew in the handle bears on the dowel to lock it in place. The handle also serves as the tool's fence. Three screws on the dowel permit the cutter to be positioned at two different locations along the dowel. If you're working in a tight area, you just clamp the cutter between the two outer screws. But if there is enough clearance on the piece you're beading, you can clamp the cutter between the inner screws, extending the cutter-holding dowel to provide your left hand (if you're right-handed) a better purchase on the tool.

I was impressed with how easy it was to scratch a fine bead on a cherry board. It took just a minute or two and just a few passes to get the hang of where to apply pressure and when. Eight optional cutters are available, and they include beading, fluting and reeding profiles. The tool comes with a standard pointed cutter as well as five hardened steel blanks for shaping your own profiles.

My only complaint with the tool is the cutter-holding dowel quickly became galled from the pressure of the clamping screw, making it difficult to fine-tune the cutter's position. A small brass pressure plate inside the handle would cure this problem and much improve an already fine tool. The Veritas beading tool costs $34.95 and is available through mail-order catalogs as well as from Veritas Tool (P.O. Box 1720, Ogdensburg, N.Y. 13669-1720; 800-667-2986). *—Charley Robinson*

Photo: Charley Robinson

Old-fashioned profile tool works well. *Veritas Tools' beading tool is a contemporary version of a tool that's been around for a long time. Veritas' model cuts well and is simple to use.*

Remote-control dust-collection switch

Ever since I first connected a shop vacuum to my router table, I've been looking for an easy, convenient way to turn on my dust collector and whatever power tool I was using simultaneously. My shop has since expanded to include a full array of stationary tools and a central dust-collection system, but every time I use my bandsaw, tablesaw or radial-arm saw, I first have to walk across the shop to the dust collector and switch it on.

I've considered running a special setup through my electrical service panel that would automatically turn on the dust collector any time a tool is switched on. But these systems all seem to be too complicated and/or expensive. Consequently, I've continued to make the trek across the shop, or I've just not used the dust system if I was only making a few cuts.

Recently, however, I discovered a product that is saving me a lot of steps, time and effort and is helping to keep my shop cleaner. The DCS-100 from Fernbrook (83 Pine Road, Otto, N.C. 28763; 704-524-6125) is a compact, remote on/off switching system, consisting of three components: a hand-held radio transmitter, a transceiver and a relay module. The hand-held transmitter, or control, sends a signal to the transceiver, which plugs into any 110v outlet in your shop. The transceiver then sends a signal through the house wiring to the relay module in the 220v outlet your dust collector is currently plugged into. The DCS-100 works like a charm from anywhere in the shop. It will even control the dust collector in the basement from a bedroom on the second floor, as I learned when my 6-year-old daughter snuck off with the remote one time.

Installation is a breeze and can be done in less time than it takes to read how. The remote control fits comfortably in a pocket or can be hung with a key chain from a belt loop. The DCS-100 costs $87.50, plus $4.50 for shipping and handling. Custom and three-phase systems are also available from Fernbrook. Call or write for further technical or price information on these specialized systems. *—C.R.*

Clapham's beeswax polish

A finish that smells nice, too. *Clapham's beeswax polish is a quick-drying (about five minutes) polish that's available lavender-scented or unscented. It buffs to a nice, hard sheen and resists fingerprints.*

I first became aware of Clapham's beeswax polish while visiting a furniture-maker in Bellingham, Wash., who had used it on a recently completed china cabinet. I opened the top doors of the cabinet and was pleasantly met by a familiar, though not quite recognizable, fragrance. I asked, "What is this stuff?" I wanted some (see the photo above).

The fragrance I couldn't quite identify

Photos except where noted: Vincent Laurence

Incredible New Power Tool Eliminates Hand Sanding

Now you can sand with a power tool all those areas where you previously had to fold up a piece of paper and "finger sand." You can sand right up to, into and along edges & corners without dulling the edge or altering the profile.

Unlike ordinary sanders, the FEIN "Triangle" Sander oscillates (a rapid side to side movement) at a blurring 20,000 times a minute. This unique action keeps the sander from running away from, or bouncing off of the edge line.

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READER SERVICE NO. 69

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READER SERVICE NO. 41

32mm LINE BORING JIG uses 5mm brad point

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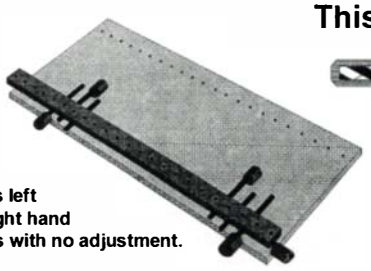

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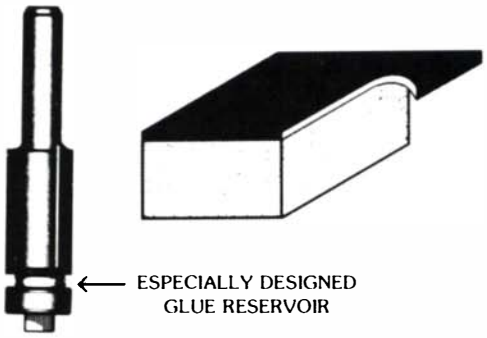

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was lavender, and this great polish is made by Roger Clapham, an entrepreneurial beekeeper from Matsqui, B.C., Canada. Among Clapham's fans are James Krenov and many of his students from the College of the Redwoods.

The polish goes on easily and has a consistency like whipped butter. Raw wood absorbs it like a sponge, so you're best off sealing the wood with a couple of coats of shellac first or using the polish over an oil finish. It's ready to buff out in five minutes, and the finish it leaves is hard enough that it resists fingerprints.

The polish is also available unscented. It costs $10.95 for 8 oz. or $38.85 for a 40-oz. container. The product is available directly from Clapham: Clapham's Beeswax Products Ltd., 324 LeFeuvre Road, Matsqui, B.C. Canada, V4X 1A2; (800) 667-2939.

—Vincent Laurence

Quick-Grip spring clamps

Some tools seem so simple that they couldn't possibly be improved upon. Take the spring clamp: a set of jaws with a spring for tension. How could anyone improve on this old standby? The Quick-Grip division of American Tool has (see the photo at right). High-strength nylon resin makes a lightweight rust-proof body. Serrated, non-slip grips and soft protective pads grip wood better than the slippery plastic pads on other spring clamps. All combine to make these spring clamps the best of their kind. The clamps come in 1-in., 2-in. and 3-in. sizes, and they sell for about $2, $3 and $7 respectively. For more information or for the name of a local supplier, write or call American Tool, 301 South 13th St., Suite 600, Lincoln, Neb. 68508; 402-435-3300. *—V.L.*

A better spring clamp. *The Quick-Grip spring clamp's resin body makes it lighter than steel spring clamps and rust-proof as well. The molded grooves in the handles keep your hand from slipping, and the protective pads at the end of the jaws hold much better than the plastic covers on other spring clamps.*

Planer-knife sharpening jig and diamond stones

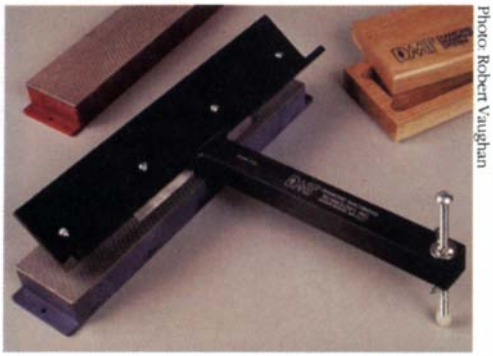

Photo: Robert Vaughan

Sharpening jig handles wide blades. *DMT's new planer-knife sharpening jig allows fast, accurate honing of jointer and planer knives. Alignment of blade to jig isn't fussy, and the threaded adjustment on the end of the jig allows you to seat the bevel at the right angle for honing.*

I've always been skeptical of do-it-yourself jointer/planer sharpening jigs, what with it costing all of $6.30 to have a set of 6-in. jointer knives sharpened professionally. I've tried a lot of these makeshift rigs over the years, but I've never been satisfied with the results.

However, I recently tried another such jig, manufactured by Diamond Machining Technology (DMT), and was pleasantly surprised. I was able to sharpen a set of 6-in. jointer knives easily in 10 to 15 minutes. The jig, along with DMT's 12-in. whetstones, are clearly up to the task.

Using the jig is easy. You just slide a jointer or planer knife into the jig, and tighten down on the wing nuts on the underside of the part of the jig that holds the blade (see the photo above). Alignment isn't critical because the blade itself is the main indexing point. Then all you do is set the all-thread adjustment at the end of the handle to a height that positions the bevel flush on the stone, and begin honing. The plastic tip at the bottom of the all-thread acts much like the wheel on a chisel or handplane-blade sharpening jig, keeping you from rocking forward or backward and rounding over the bevel.

Just the same, I think that if there were nail nicks on the knife edge, I would have had the knife professionally reground. And while 10- or 12-in. blades can be done on this rig, I'd probably send them out, too. Just because it's possible to sharpen long or badly damaged knives with this jig doesn't mean it's the best use of my time.

It's hard to rationalize the cost of the jig ($73) as well as both the medium- and fine-grit whetstones ($115 each) if you are only using them for jointer/planer knife sharpening. But the precision of these stones makes them the reference standard, the best surface for any chisel, plane-, or spokeshave-blade sharpening that needs to be done in a woodshop. As far as I'm concerned, they make all other whetstones obsolete. It took a little getting used to the plus or minus .0005-in. flatness of these steel-reinforced whetstones: With no high or low spots on these stones, blade and stone are in constant contact and resistance was steady. They cut steel faster and better than anything else I've ever used, and they're even capable of honing carbide cutters razor-sharp in just a few minutes.

The only potential inconvenience is that water is the recommended lubricant, which could lead to corrosion, but a quick wipe with a dry rag will take care of that. For more information, contact Diamond Machining Technology Inc., 85 Hayes Memorial Dr., Marlborough, Mass. 01752-1892; (508) 481-5944. *—Robert Vaughan*

Where to find it

Exotic inlay materials

If you're a sucker for descriptions like "very exotic," "intense, fiery colors," "strong washboard figure," and "hammered metal or fleece figure," then Charles Erikson's Duke of Pearl Exotic Inlay Materials catalog may prove your undoing.

Those descriptions, as you may have gathered from the name of the catalog, are not of outrageous woods but rather of various abalones and mothers-of-pearl. Erikson also sells amber, copal (immature amber—no more than a million years old), fossilized mammoth ivory and tagua, or corozo, nuts (which come from a rain forest palm). Most of these materials are available both in their raw, unprocessed state and as ready-to-inlay dots and straight and curved strips.

These materials, though primarily of interest to luthiers, also show up on a good bit of high-end furniture. String inlay around a tabletop, on a drawer front or up the legs of a table will draw attention to that surface. And a couple of dots, used with discretion, can really dress up an otherwise plain piece of furniture.

Erikson's catalog also offers luthier-specific products and services, such as shell truss-rod cover plates and fingerboard fret slotting. The minimum order is $100, but the catalog is free. For a catalog, write or call Duke of Pearl, 18072 Greenhorn Road, Grass Valley, Calif. 95945; (916) 273-4116.

—V.L.

Charley Robinson and Vincent Laurence are associate editors of Fine Woodworking. *Robert Vaughan is a contributing editor to* Fine Woodworking *and a woodworking machinery rehabilitation specialist in Roanoke, Va..*

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The Encyclopedia of Woodworking Techniques by Jeremy Broun. *Running Press Book Publishers, 125 South 22nd St., Philadelphia, Pa. 19103-4399; 1993. $24.95, hardback; 176 pp.*

Jeremy Broun's encyclopedia should be called a visual glossary. The book is long on photos and short on text. It is also short on space: 176 pages isn't enough for all the information an encyclopedia of woodworking ought to contain. What the book does provide is a broad, shallow survey of tools and techniques used in woodworking, cursory instruction and a plethora of good tips from an author who is clearly a practicing woodworker.

The book has three sections: an introduction, a techniques section and a furniture photo section. The introduction has photos of most of the hand and power tools available today and a sampling of woods and sheet goods. For a beginner, this section might be helpful, but for someone who's been woodworking for even a year or two, most of this will be old news.

The middle section presents techniques ranging from abrading to veneering, but the information is almost always superficial. You may gain a passing familiarity with a technique, but you won't be able to accomplish it from the few photos and scant text provided. For instance, the description of plane-blade sharpening neglects to mention flattening the back of the blade, and the instructions for grinding fail to mention the possibility of burning the blade if you don't use a light touch.

Still, there are nuggets of wisdom for the beginner throughout, tips like "locking [your] wrists helps prevent a curved edge from forming" when sharpening, or "An easy way to mark a chamfer is to use the thumb and fingers as a pencil gauge."

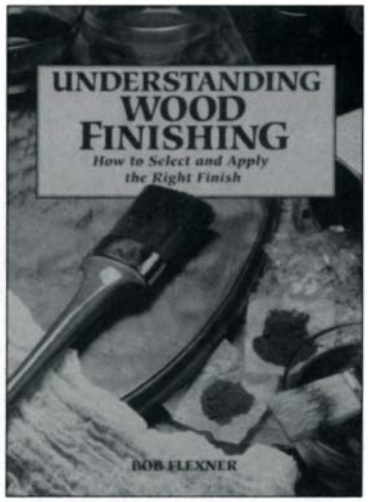
The book's last section is a photo-essay on furniture, turnings and other woodwork. The photos are good, as they are throughout the book, and much of the work is outstanding. There are classics by Michael Thonet, Alvar Aalto and Hans Wegner, as well as wonderful pieces by contemporary makers including Alan Peters, John Makepeace and Michael Fortune.

Despite some serious shortcomings, it's still not a bad book to have for reference. The last section, in particular, had me going back again and again for inspiration. *—Vincent Laurence*

Understanding Wood Finishing: How to Select and Apply the Right Finish by Bob Flexner. *Rodale Press 33 E. Minor Street, Emmaus, Penn. 18098; 1994. $27.95, hardback; 310 pp.*

Okay, I'll admit it, my Achilles' heel as a woodworker has always been finishing. Sure, I've read lots on the subject and done my share of trial-and-error research, but I've never quite grasped the big picture—not until *Understanding Wood Finishing* came along, that is. In it, Bob Flexner takes the mystique out of finishing. He explains the whys of this complex subject, and along the way, debunks myths surrounding finishing. He offers tips to make the process go smoothly, and in a real boon for the bewildered consumer, Flexner names actual brands of finish, describing how specific products differ.

Understanding Wood Finishing opens with a chapter that asks why you should finish wood at all and makes you rethink the goals of finishing. Other chapters cover preparation and tools for finishing. But the heart of the book is in its chapters on oil finishes, stains and film finishes (shellac, lacquer, varnish, water-based finishes, conversion finishes). Flexner does an outstanding job, without getting overly technical, of explaining the chemistry that accounts for the way finishes work. At last, I understand why certain finishes are compatible and others are not, why some finishes are more durable than others, and what makes one finish rub out better than another. Flexner presents the pros and cons of each finish and includes an invaluable chart comparing the different finishes as to appearance, protection, ease of application, rubbing qualities and safety. Solvents are also fully explored.



There is an excellent chapter on finishing different types of woods in which the author not only discusses the peculiarities of the most common woods, but also gives step-by-step instructions for his favorite finishes for each species.

The book's format is well thought-out and attractive, including 32 pages of high-quality photographs of different finishes that really illustrate what the text explains. If you have always thought of finishing as murky and mysterious, *Understanding Wood Finishing* will bring you out of the Dark Ages and plant you squarely in the 20th century. *—Ben Erickson*

VIDEO

Steambending for Woodworkers with Rollin Thurlow *Northwoods Canoe Co., 336 Range Road, Atkinson, Maine, 04426; (207) 564-3667; 1993. $24, VHS; 65 minutes.*

Canoemaking doesn't have much in common with furnituremaking, does it? I didn't think so before I saw this new videotape on bending wood. Everything Rollin Thurlow bends in the tape is meant for a canoe, but practically all the situations he encounters have first cousins in landlocked woodworking.

Thurlow bends a wide range of pieces in the tape, from an 18-ft. coaming to 5-ft. stems to a triangular deck several feet square. To do the work, he has lots of fiendishly simple bending jigs that require very few clamps. He gets by in most cases with a clever system of draw bolts and hammered wedges.

Thurlow has a variety of steamers, too, all of them cheap and low-tech. Each is appropriate for its job. His water-boiler collection starts with a 15-gal. beer keg heated by a gas ring from an old hot water heater and ends with a teakettle on a camp stove. And he has a glut of steamboxes, including the typical wooden long box and various lengths of PVC with rags stuffed in the ends. One PVC box, tucked up in the rafters, is 20 ft. long.

Along the way, Thurlow presents lots of good information, including which woods like to bend and which don't and how bending behavior varies with the cross section of the stock. He also gives a vivid demonstration of what happens to the fibers when wood bends, describing compression and tension and how they can be controlled. The sound and camera work on the tape aren't great, but they don't ruin it. Once Thurlow starts showing you how he does it, you'll be too grateful to worry about video production values. *—Jonathan Binzen*

Vincent Laurence is an associate editor of Fine Woodworking. Ben Erickson is a professional furnituremaker in Eutaw, Ala. Jonathan Binzen is an assistant editor of Fine Woodworking.

Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

***INTERNATIONAL:* Tour**-Tour Europe with George Frank, Oct. 3-13. For more information contact Eva Frank, Horizon Travel, 3530 South Osprey Ave., Sarasota, FL 34239. (813) 955-6567.
Tour-Crafts Study Tour in Switzerland, Oct. 7-16. For more information, contact Drew Langsner, Country Workshops, 90 Mill Creek Road, Marshall, NC 28753. (704) 656-2280.

***ARKANSAS* Meetings**-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m. at Woodworkers Supply Center, 6110 Carnegie, Sherwood, 72117. For more information, call (501) 835-7339.

***CALIFORNIA:* Workshops**-Woodworking for women. Furnituremaking with hand tools using traditional joinery, weekends. San Francisco. Contact: Debey Zito (415) 648-6861.
Workshops-Various workshops including Japanese woodworking, joinery and sharpening. For info, contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.
Lectures-Frame Design in America: 1820-1840, May 10; Recent Discoveries in Philadelphia Furniture, July 12. American Decorative Arts Forum. M.H. de Young Memorial Museum, Golden Gate Park, San Francisco, 94118. (415) 456-8177.
Exhibition-The Fine Woodworking Program of the College of the Redwoods presents the Annual Student Exhibition, May 14-June 6. The Highlight Gallery, 45052 Main St., Mendocino. For more information, call (707) 937-3132.

***COLORADO:* Classes**-Woodworking and related classes, year-round. For info, write Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401, or call (303) 988-6160.
Symposium-Turning Discoveries, June 23-25. The American Association of Woodturners Eighth National Symposium, Colorado State University, Fort Collins. For more information, call (612) 484-9094.

***CONNECTICUT:* Juried Show**-Wadsworth Atheneum craft show, June 10-12, University of Hartford Sports Center, 200 Bloomfield Ave., West Hartford, 06117. For more information, call (203) 523-2666.
Classes-Making rustic furniture, making and using spring pole lathes, toolmaking, making windsor chairs, veneering. May thru June. The Brookfield Craft Center, P.O. Box 122, Brookfield, 06804. (203) 775-4526.

***DELAWARE:* Show**-Turned Wood Sculptures by Dennis Elliott, thru May 28. For more info, contact Creations Gallery, Garrett Snuff Mills, 2890 Creek Road, PO Box 289, Yorklyn, 19736. (302) 234-2350.

***FLORIDA:* Meetings**-Central Florida Woodworkers Guild meets the second Thursday of each month, Winter Park. For more info, call (407) 862-3338.
Meetings-South Florida Woodworking Guild meets every second Monday, 7 p.m. Constantines, 1040 East Oakland Park Blvd., Ft. Lauderdale. For more information, contact Woody McLane (305) 565-2729.

***GEORGIA:* Workshops**-Japanese woodworking by Toshihiro Sahara. One Saturday each month. For more information, contact Sahara Japanese Architectural Woodworks. (404) 355-1976.
Classes-Woodworkers Guild of Georgia, PO Box 8006, Atlanta. For info, contact John Gorrell (404) 460-1224.

***INDIANA:* Classes**-Various woodworking classes and workshops. For info, contact Woodworking Unlimited, 6038 E. 82nd St., Indianapolis, 46250, or call (317) 849-0193.
Classes-Various hands-on woodworking classes woodturning, furniture building, finishing and technique classes. Superior Woodworking Supply, 922 Ft. Wayne Ave., Indianapolis, 46202. (317) 635-5747.

***KENTUCKY:* Workshops**-Woodturning and joinery instruction. For further information, write Jim Hall, Adventures in Wood, 415 Center St., Berea, 40403, or call (606) 986-8083.
Meetings-Kyana Woodcrafters Inc. meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. For info, call (502) 426-2991.
Workshops-Traditional Windsor chairmaking instruction. One-week courses. For further information, contact David Wright (606) 986-7962.
Workshops-Woodturning workshops with Rude Osolnik, May thru Sept. All ability levels welcome. For more information, call (606) 986-4440.

***MAINE:* Workshops**-Two-week basic and intermediate furnituremaking courses. Faculty includes Peter Korn, Skip Benson, John McAlevey, Charles Durfee, Bill Thomas, Scott Hausmann, and Owen Edwards. For more information, contact Center For Furniture Craftsmanship, 125 W. Meadow Road, Rockland, 04841. (207) 594-5611.

***MARYLAND:* Workshops**-Basic chip carving with Wayne Barton, advanced chip carving with Wayne Barton, basic woodturning with Frank Amigo. May thru Sept. Maryland Hall for the Creative Arts in Annapolis. (410) 263-5544.

***MASSACHUSETTS:* Instruction**-Full-time program in fine furniture construction. Complete facilities. Wm. B. Sayre, Inc., One Cottage St., Easthampton, 01027. (413) 527-0202.
Classes-Woodworking classes, throughout most of the year. For information, contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
Fair-24th Annual Craft Fair, May 20-22. Worcester Center for Crafts, 25 Sagamore Road, Worcester, 01605. (508) 753-8183.
Classes-Woodworking classes, thru June. School of Fine Woodworking, One Cottage Street, Easthampton. Contact UMass Division of Continuing Education (413) 545-3653.
Juried show-Out of the Woods: Objects Large and Small, May 26-June 30. Cambridge Artists Cooperative, 59A Church St., Cambridge, 02138. (617) 868-4434.
Workshops-Summer woodworking workshops of one and two weeks. For beginning and advanced students. Dormitory housing available. North Bennet Street School, 39 North Bennet Street, Box SW, Boston, 02113. (617) 227-0155.
Workshops-Various woodworking workshops thru Oct. The Heartwood School, Johnson Hill Road, Washington, 01235. (413) 623-6677.

***MICHIGAN:* Meeting**-Michigan Violin makers Association, July 31. Visitors welcome. Host: Bob Mead, 1661 Heather Wood, Troy, 48098. For info, call (313) 641-5138.

***MINNESOTA:* Classes**-Woodcarving classes year-round. For information, contact the Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.

***MISSISSIPPI:* Classes**-Various woodworking classes. For more info, contact Allison Wells School of Arts & Crafts, Inc. Canton. (800) 489-2787.

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

***NEW HAMPSHIRE:* Classes**-Fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.
Classes-Various woodworking classes. For information, contact The Hand & I, PO Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
Auctions-Antique and craftsman's tool auctions, year-round. Contact: Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723.
Workshops-Week-long Shaker-style furniture and chairmaking workshops, year-round. For more info, contact Mary Sweet, Dana Robes, Wood Craftsmen, Lower Shaker Village, Enfield, 03748. (603) 632-5385.
Workshops-Windsor Chairmaking. For schedules, contact Mike Dunbar, Box 805, Portsmouth, 03802. (603) 431-4676.
Meeting-Guild of New Hampshire Woodworkers Meeting, May 21. Jere Osgood's Shop, Wilton. For information, contact the Guild at 27 Grove St., Dover, 03820. (603)749-1197.

***NEW JERSEY:* Call for entries**-Sugarloaf Craft Festival, May 13-15, Garden State Exhibit Center, Somerset. Contact Deann Verdier, Sugarloaf Mountain Works, 200 Orchard Ridge Drive, #215, Gaithersburg, MD 10878. (301) 990-1400.

***NEW MEXICO:* Classes**-Woodworking classes. North New Mexico Community College, El Rito, 87520. (505) 581-4501.
Classes-Fine woodworking classes. For info, write Santa Fe Community College, Santa Fe 87502, or call (505) 438-1361.

***NEW YORK:* Classes**-Various beginning and advanced woodworking classes. Constantine's, 2050 Eastchester Road, Bronx, 10461. (718) 792-1600.
Classes-Traditional 18th-century woodworking techniques with Mario Rodriguez. Contact Warwick Country Workshops, PO Box 665, Warwick, 10990. (914)-986-6636.
Meetings and classes-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd. St.) New York City. Contact Howard Alalouf (914) 337-0226.
Classes-Various gilding classes for fine furniture, antiques, frames, carvings, restoration. Center for the Gilding Arts, 381 Park Ave. South, New York City. (212) 683-4822.
Show-17th Annual Woodcarving Show May 7-8. Sponsored by the Southtown Woodcarvers, Creative Arts Bldg., Erie County Fairgrounds, Hamburg. For information, contact Ken Kohl, 13067 West Main St., Alden, 14004. (716) 937-3228.

***NORTH CAROLINA:* Meetings**-North Carolina Woodturners, second Saturday of each month. For more information, contact PO Box 1833, Hickory, 28603. (704) 324-5960.
Classes-Carving, turning, toolmaking bowls, vessels, May thru July. For more information, contact the John C. Campbell Folk School, Route 1, Box 14A, Brasstown, 28902. (800)-FOLK SCH.
Classes-Furniture design and construction, carving for furniture and sculpture, joints and joint technology, hand-cutting the dovetail, May thru Aug. For further information, contact the Penland School of Crafts, Penland, 28765-0037. (704) 765-2359.
Workshops-Summer workshops in chairmaking joinery turning boatbuilding, woodworking with kids. For more information, contact Drew Langsner at Country Workshops, 90 Mill Creek Road Marshall, 28753. (704) 656-2280.

***OHIO:* Workshop**-Spray-finishing technology, May 11-13, by sponsored by Bowling Green State University and DeVilbiss Industrial Coating Equipment Co. For more information, contact Dr. Richard A. Kruppa, (419) 372-7560.

***OKLAHOMA:* Show**-Oklahoma Woodworks Expo/Trade Show, May 6-7. Oklahoma City, Fairgrounds Travel and Transport Bldg. For more information, contact Chris Crispin, Route 1, Box 15, Putnam, 73659. (405) 582-6344.

***OREGON*: Meetings**-Cascade Woodturner's Association meets every third Thursday. For information, contact Cascade Woodturners, PO Box 91486, Portland 97291.
Classes-Oregon School of Arts and Crafts, 8245 S.W. Barnes Road, Portland, 97225. (503) 297-5544.

***PENNSYLVANIA:* Classes**-Windsor chairmaking, weekly and weekends. Contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (215) 689-4717.
Festival-Central Pennsylvania Festival of the Arts, July 14-17. State College. For more information, contact Katherine Talcott, Visual Arts Director, PO Box 1023, State College, 16804-1023. (814) 237-3682.
Show-The Furniture Market at Valley Forge, June 11-13. Valley Forge Convention Center, King of Prussia. For further information, call Robert Goodrich (717) 245-9051.
Classes-Woodturning with David Ellsworth. Three-day weekend workshops in private studio. Beginner to intermediate. Limit 4 students, May 6-8 and May 20-22. David Ellsworth, Fox Creek, 1378 Cobbler Road, Quakertown, 18951. (215) 536-5298.
Workshops-Woodcarving seminars, June thru Aug. Sawmill Center for the Arts, PO Box 180, Cooksburg, 16217. For more information, contact Marilyn Karns (814) 677-3707.
Classes-Eli Rios on restoration, Eugene Landon on joinery, and Bob Flexner on woodfinishing, May thru June. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, 17402. (717) 755-8884.
Call for entries-First Wharton Esherick Museum Woodworking Competition/Exhibition. Deadline: July 15. For information and application, send SASE to Wharton Esherick Museum, PO Box 595, Paoli, 19301-0595. (610) 644-5822.

***RHODE ISLAND:* Call for entries**-Chair Fair, June 4. South County Center for the Arts, West Kingston. For info, call David Goss (401) 789-6626.

***TENNESSEE:* Workshops**-Green wood turning, Windsor chairmaking, woodcarving, turning hollow vessels, July 11-15. For more info, contact the Tennessee Technological University, Appalachian Center for Crafts, Box 430, Route 3, Smithville, 37166. (615) 665-0502.

***TEXAS:* Meetings**-North Texas Woodworker's Association meets the third Tuesday of each month. Contact Bruce May. NTWA, PO Box 831567, Richardson, 75083. (214) 271-0125.

***VERMONT:* Courses**-Yestermorrow Design and Building School, Route 1 Box 97-5, Warren, 05674. (802) 496-5545.
Workshops-Craftsmanship, design and shop math, machine setup and use, Japanese hand tools, sharpening, May 7-8 and June 5-6. Contact Trillium School of Woodworking, Route 2, Box 4015, Middlebury, 05753. (802) 545-2266.
Workshops-Lightweight Boatbuilding. One-week intensives on Savage Island, Lake Champlain, June 19-25. Shelburne Craft School, PO Box 52, Harbor Road, Shelburne, 05482. (802) 985-3648.

***VIRGINIA:* Exhibition**-Tools exhibition, thru June. Colonial Williamsburg, PO Box 1776, Williamsburg, 23187-1776. For more information, call 1-800-HISTORY.

***WEST VIRGINIA:* Workshops**-Progressive Windsor chairmaking, July 10-15; twig furniture, July 18-22; basic cabinetry, July 24-29. For more info, contact Crafts Center, Cedar Lakes, Ripley, 25271. (304) 372-7873.

***AUSTRALIA:* Call for entries**-The National Woodturning 1994 Exhibition, May 28-June 12. Melbourne. Deadline: May 13. For more information, contact Peter Robson, 12 Gidgee Court, Forest Hill, VIC 3131 (03) 878-7211.

***CANADA:* Meetings**-West Island Woodturners Club (Montreal, Que.) meets every Tuesday, Sept. thru May. For more information, contact Dennis Brown, 8817 Cure Legault, Lasalle, Que. H8R 2V9. (514) 366-6071.
Workshops-Five days of intensive hands-on Ultra-Lite-Sawmilling in a rain forest on a small N.W. Pacific Island with Will Malloff. The North Island College, Box 320 Sointula, B.C. V0N 3E0. (604) 974-5429.
Workshop-Traditional Windsor chairmaking. Weekly courses. For info or brochure, contact David Goodwin, The Village Chairmaker, Sparta, Ont., N0L 2H0. (519) 775-2751.
Call for entries-The Wood Show, Aug. 5-7. Deadline: June 1. Five categories: chairs, birds, bird houses, turning and miniatures. For application, contact The Wood Show, Box 920, Durham, Ont. N0G 1R0. (519) 369-6902.
Workshop-Birchbark Canoe Building, July 2-July 17 or July 23-Aug. 7. The course is on Lake Superior (Wisconsin). For more information, contact David Gidmark, Box 26, Maniwaki, Que. J9E 3B3.
Workshop-Contemporary Turning and Furniture Design, July 29-Aug. 1. For more information, contact Saskatchewan Craft Council, c/o Michael Hosaluk, 813 Broadway Ave., Saskatoon, Saskatchewan, S7N 1B5. (306) 382-2380.

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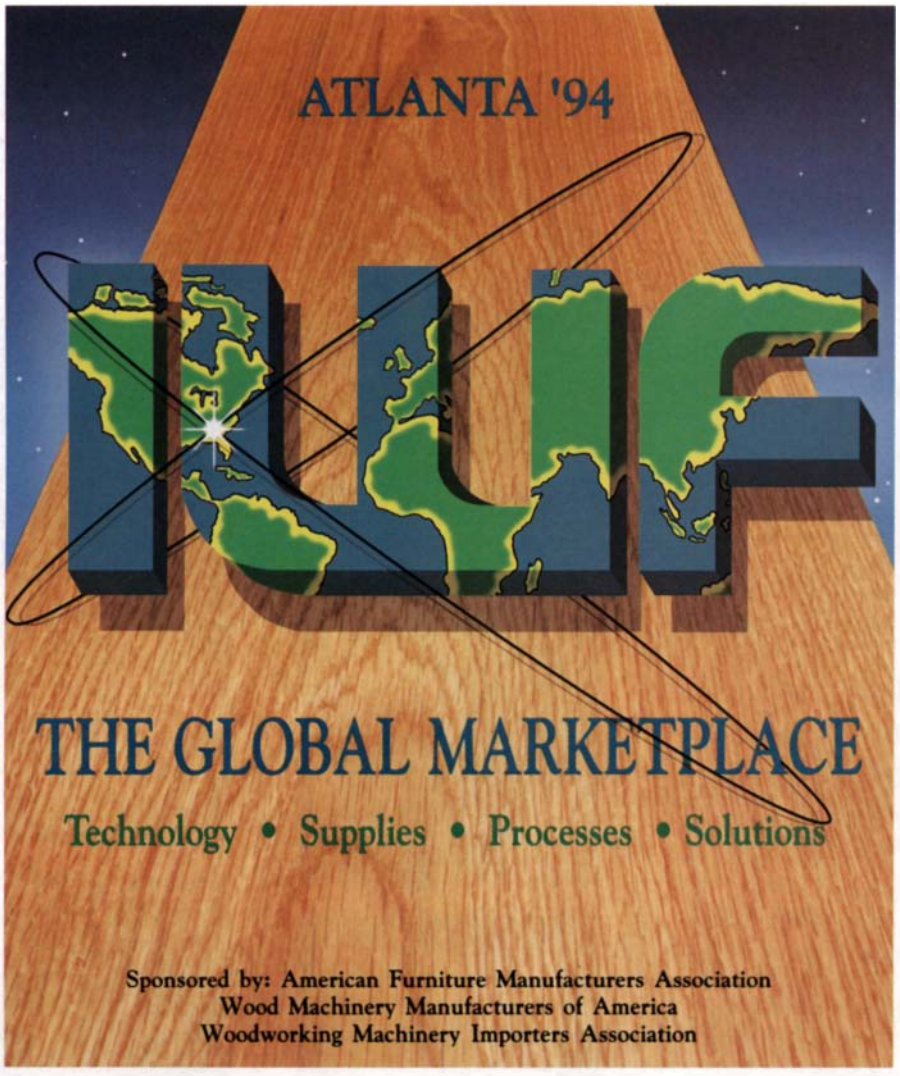

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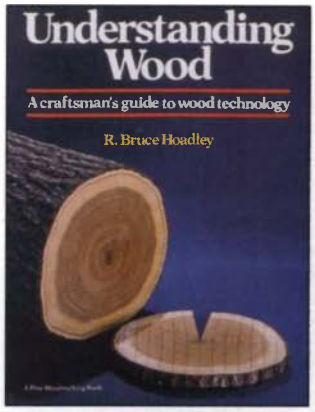

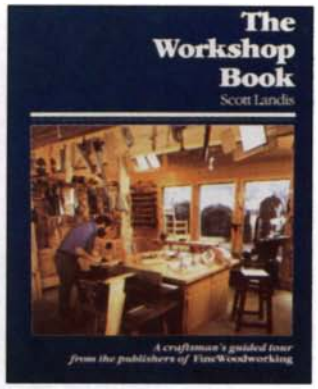

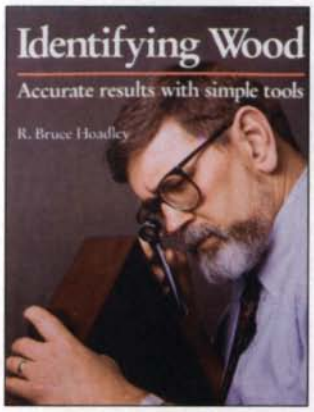

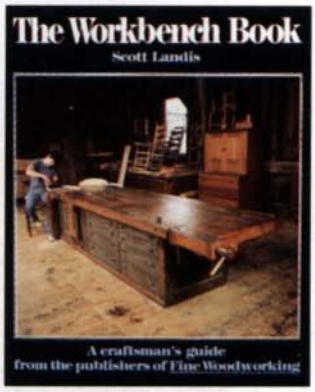

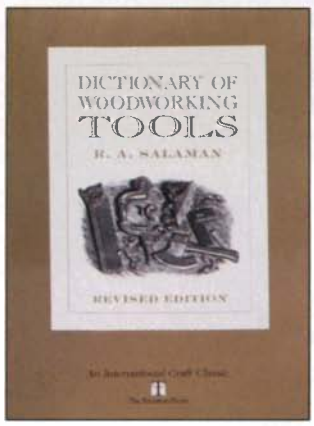

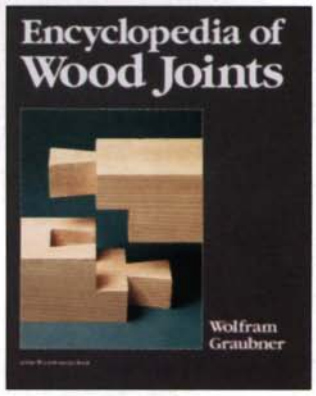

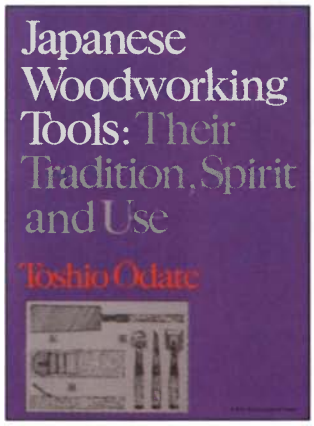

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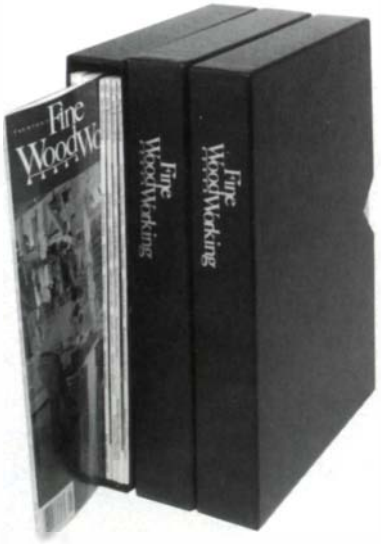

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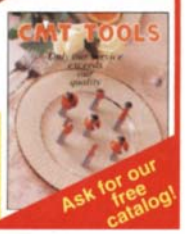

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A craftsman for multiple media

Whether you know anything about knife- and sword-making or not, you'll immediately recognize the high level of craftsmanship and attention to detail in Scott Slobodian's work, as seen in the samurai swords in the photo above and on the back cover. But your estimate of his work is likely to go even higher when you learn that he personally does virtually every facet of the work in his Los Angeles studio. He creates the blades from raw steel, shapes, joins and finishes the wood, wraps the handles, even casts the precious metal jewelry decorations.

Slobodian's creations are unique right down to the individual names he gives each work. Contributing to their originality on the woodworking side is an unusual choice of materials and coloring. Favoring highly figured or spalted woods, Slobodian takes advantage of a process that strengthens the wood and offers a chance to add colors not found naturally. The wood is impregnated completely with polymers, stabilized and then chemically colored. The process is the work of Wild Woods (P.O. Box 104, Monclova, Ohio 43542; 419-866-0435), a firm that sells its treated wood in blanks for knife-makers. Spalted and highly figured domestic woods are transformed into exotics by the process, which offers colors such as gray, green, blue and red, as well as natural.

Pairing those spectacular woods with traditional Japanese blade designs isn't enough for Slobodian, though. Sometimes he branches off into the world of fantasy blades. For the last four years, he has won *Knives Illustrated*'s annual competition for Art Knife of the Year. The winning creation this time, pictured below, was a Klin-

***Dyed figured woods complement these swords** (above) made by Scott Slobodian. Named* Mist, Sand *and* Grass, *their sheaths are made of dyed quilted maple and buffalo horn, and they are displayed on a stand of dyed quilted and striped maple.*

***Earthly woods highlight fantasy creations of another galaxy.** This Klingon weapons "kase" and its contents, all made by Scott Slobodian, earned him Art Knife of the Year honors from* Knives Illustrated *for the fourth year in a row. The case is crafted of quilted flame maple with wenge feet and inlays.*

Photos this page: Scott Slobodian

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6256	TOP HANDLE JIG SAW	148
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DW431	3" X 21" DSTLS BELT SANDER VAR SP	182
DW610	1 1 2 HP ROUTER, 9 AMP	147
DW614	1 1 4 HP PLUNGE ROUTER	143
DW615	1 1 4 HP PLUNGE ROUTER, VAR SP	158
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DW625	3 HP HVY DTY PLUNGE RTR, VAR SP	275
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D10VC	3 8" DRILL VAR SP, REV, 3.2 AMPS	99
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5657	7 1 4" CIRCLE SAW W 6 CARBIDE BLDS	119
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LU84M010	10" X 50T ATB COMBO BLADE	42
LU85M010	10" X 80 T ATB FOR MIRROR FINISH!	58
LU87M010	10" X 24T RIP BLADE THIN KERF	39
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LU98M010	10" X 80 T TCH LAMINATES OR WOOD	67
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TK606	10" X 60T ATB COMPOUND MITER BLD	39
TK806	10" X 80T ATB ULTIMATE CROSSCT BLD	44
TK906	10" X 50T THIN KERF CROSSCUT	30
TK406	10" X 60T THIN KERF FINISHING	34
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3724		24"	8.50	45.50
3730		30"	9.50	51.50
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0626SK	NARROW CROWN 1 4" STAPLER 1 2"-1" WITH CASE & 5000 STAPLES	119
0645S	NARROW CROWN 1 4" STAPLER 3 4" - 1 3 4" CAPACITY	189
8290	STICK FRAMING NAILER - 6 TO 16 PENNY CAPACITY. COMPATIBLE W SENCO OR HITACHI NAILS	319

gon weapons "kase," inspired by the *Star Trek* television series and movies. The ray gun was cast in silver after Slobodian created the pattern from cutting up plastic Japanese toy ray guns and reassembling the parts; the barrel includes a surgical spark plug that was used to blast away kidney stones. The case is made of flame and striped maple from one plank. The feet and dark inlay on the top are African wenge, and the case is lined with lacewood and gray sharkskin.

Surprisingly, although Slobodian's knives and swords are internationally collected and sell for thousands of dollars each, they are not his primary work. When not marrying steel to wood, Slobodian is matching up images to film as an accomplished commercial photographer for corporate reports and advertising. That's all done in the same studio as the knife-making. Machines and wood move aside for lights, models and backdrops.

—William Sampson, editor

Antique tool exhibit at Colonial Williamsburg

An exhibit of antique woodworking tools will be on display at the DeWitt Wallace Decorative Arts Gallery at Colonial Williamsburg in eastern Virginia until June of 1995. The exhibit, which opened this past January, explores all aspects of tool development, manufacture, marketing, acquisition and use in 18th-century America. Of particular interest to 20th-century woodworkers will be the accounts of how craftsmen of the 1700s acquired tools, what was considered a basic kit of tools and how those tools were used.

The exhibition, funded by a National Endowment for the Humanities grant, by the Colonial Williamsburg Foundation and by private gifts, has more than 1,500 18th- and 19th-century woodworking tools and related objects from some of the best collections in this country and from England. Tools on display include many from the Dominy family collection on loan from the Winterthur Museum, from the Samuel Wing collection on loan from Old Sturbridge Village, the Duncan Phyfe tool chest on loan from an anonymous owner, and the Seaton tool chest from the Guildhall Museum in Rochester, Kent, England. The Phyfe and Seaton tool chests, in particular, are wonderful examples of fine craftsmanship circa 1800.

Admission to the exhibit is $8.50; the gallery is open from 10 to 6 daily. For more information, call the gallery's public information line at (804) 220-7724.

A book also has been published in conjunction with the show and is called (as is the show) *Tools: Working Wood in Eighteenth-Century America.* The book is available from Colonial Williamsburg for $19.95. To purchase a copy, write or call Colonial Williamsburg, P.O. Box 3532, Williamsburg, Va. 23187-3532; (800) 446-9240. *—Vincent Laurence, associate editor*

***Chairmaking begins to be a specialty** in this reproduction of a workshop from the mid-19th century. This exhibit at Old Sturbridge Village in Sturbridge, Mass., tracks how the Industrial Revolution changed the way furniture was made in New England.*

***Chronicling changes in how furniture was made**, the exhibit focuses on trends toward mass production, featuring furniture from 1790 to 1850 and three reproductions of period woodshops.*

Early American furnituremaking chronicled

The Industrial Revolution's impact on American furniture production in New England is the focus of an exhibit at Old Sturbridge Village in Sturbridge, Mass.

"Cabinet Furniture & Chairs, Cheap: Making and Selling Furniture in Central New England, 1790-1850" gives insight into not only the kinds of furniture made in the period, but the techniques and tools that made the furniture possible. The display opens with examples of pieces from the period and even has a cutaway chair, revealing upholstery techniques.

But more than the furniture on display, what will draw the attention of woodworkers are the three reproduction woodshops that are part of the exhibit. Covering the chronological spectrum of the exhibit, the three shop displays include an early cabinet shop, a chairmaking shop and a woodturning shop. The turning shop includes an early example of a lathe with cast-iron parts made between 1833 and 1855.

A copy of the curator's inventory list is available at the museum, detailing information about all the tools on display.

Scheduled to be on display through January 1995, the exhibit is only one of the attractions at Old Sturbridge Village. The facility is an authentic re-creation of a rural 1830s New England community with changing activities scheduled year-round. Admission to the village, which includes the museum displays, is $15. For more information about Old Sturbridge Village or the furnituremaking exhibit, write or call Old Sturbridge Village, 1 Old Sturbridge Village Road, Sturbridge, Mass. 01566; (508) 347-3362. *—W.S.*

Photos this page: Thomas Neill, Old Sturbridge Village

INDEX TO ADVERTISERS

Fine work with few tools in Oman

My biggest reservation when I was asked to accept an assignment in the Sultanate of Oman was the prospect of leaving my well-equipped workshop behind in Canada. I began scheming: The power in the Middle East is 240v, 50 Hz. I could get the equipment with universal motors to work if I took along a transformer. But the induction motors would all have to be rewound or replaced. Faced with those expenses, I decided to pack a chest of hand tools. I told myself this would be an opportunity to improve my hand skills. But I found myself wondering how much I could accomplish without the machines I'd come to rely on so heavily.

After I'd been here a while, I met a building consultant who took me to some woodworking shops. The first shop we visited was in an open-air compound in a busy industrial sector filled with East Indian and Pakistani expatriates. I was totally unprepared to see the pieces they were building. The level of work in cabinetry, marquetry and carving was breathtaking. I don't believe you can find examples of workmanship like this in North America or Europe today; the cost of assembling the required large team of highly skilled woodworkers would be prohibitive. But here, in the scalding heat, in roughly equipped shops, craftsmen were producing glorious doorways, furniture, shelves and cabinets. The experience repeated itself in shop after shop.

Most shops had photo albums full of flawless work in styles from around the world and through the centuries. The attitude was consistent from shop to shop: "If you want it, we can make it." If they didn't have a design or copy on hand, no problem. Just bring a photo from a magazine.

In each shop, I would ask to see the craftsmen's tools. Each time I asked, the tool junkie in me faced disappointment. The beautiful inlay, the joinery and the intricate, fluid carving were always done with a small kit of nondescript, beat-up tools. Gouges and chisels were invariably handmade and rough. A plane and an adze or two would be in evidence on the battered bench and perhaps a screwdriver (though rarely any screws). I felt inadequate. They were producing heirloom-quality goods with next to nothing for tools.

I watched a man produce legs for the base of a bed. The plans called for them to be turned and carved. Amazingly, he did the work without a lathe. He marked the blank on both ends and proceeded to waste stock with an adze. Once the majority of excess wood was removed, he handplaned the stock to a smooth cylinder and began to carve. I guessed it would have taken me at least 20 or 30 minutes to set up my lathe, mark the stock, rough out the shape and smooth to final dimensions. This man got the same results in 5 minutes without leaving his bench. He carved with the few chisels and gouges he had. When he needed a special cut, he held his chisels in some of the most awkward positions you can imagine. I would have left my bench and gone downtown to buy the right tool to make the cuts. He compensated for having the wrong tool with his skill.

With every shop I see here my admiration rises. We Western woodworkers have been led to believe that professional tools will save us time and get us professional results. But my experience here leads me to believe that those very tools might be holding us back from gaining the skills we so greatly desire. I have resolved to learn from my new neighbors and to try to do more with less. —*Wayne Harris, Muscat, Sultanate of Oman*

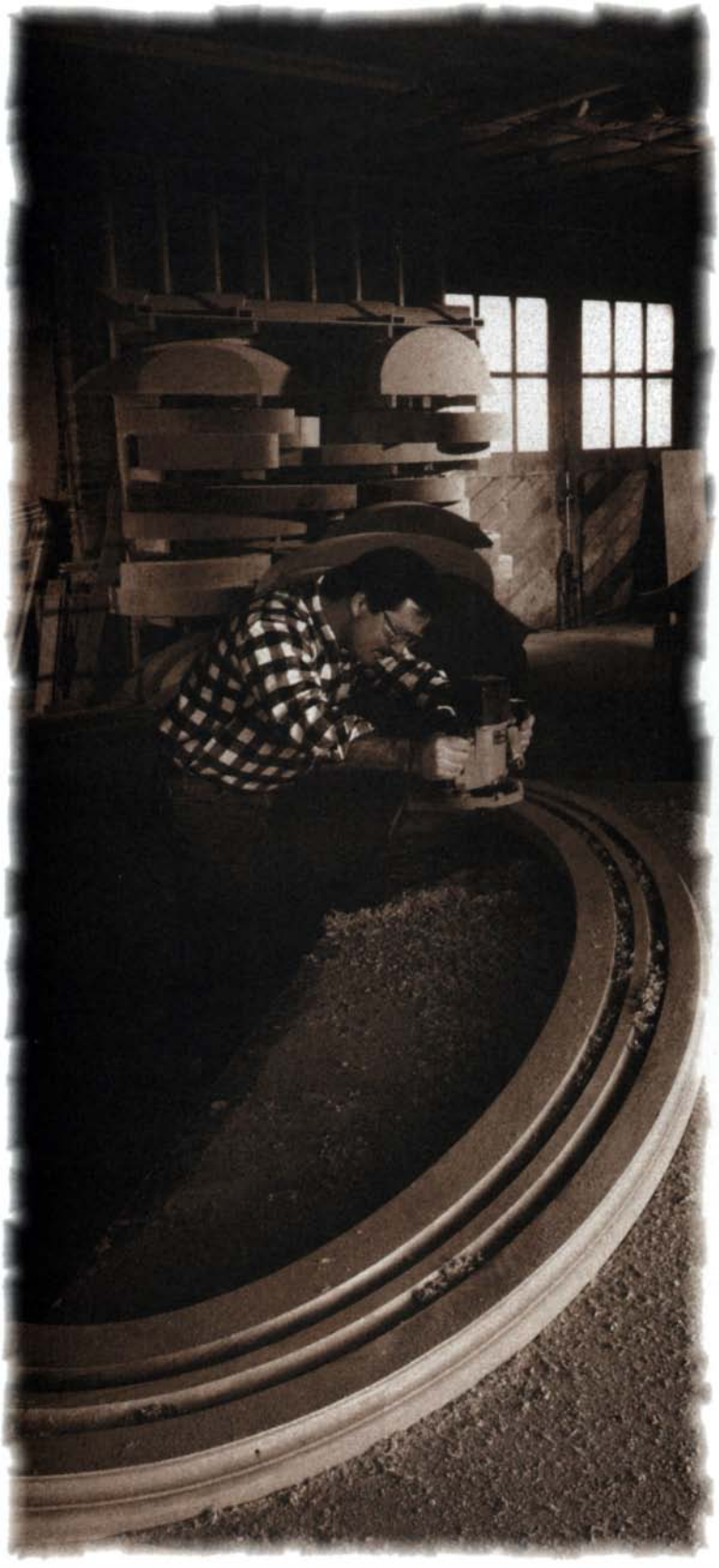
***"Turning" without a lathe**—After adzing a rough billet round, a craftsman in Oman trues up the cylinder for a bed leg with a bench plane.*

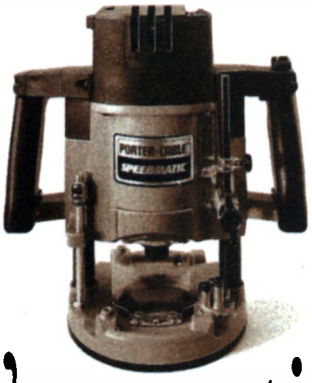
***Run of the mill in the Middle East**—Oman craftsmen working exclusively with hand tools regularly produce even more elaborately carved work than this piece. The carving is seen as an embellishment to add to sales.*

Notes and Comment

Got an idea you'd like to get off your chest? Know about any woodworking shows, events or craftsmen of note? Just finished a great project? If so, we would like to hear about them. How about writing to us? And, if possible, send photos or transparencies to Notes and Comment, Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506.*

Photos this page: Wayne Harris





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UNIQUE WOODS SHEATH FINE BLADES

Scott Slobodian crafts fine Japanese swords and knives, doing everything from grinding and tempering the steel blades (inset right) to making the wooden sheaths and stands. He even casts the jewelry that decorates the handles and sheaths (inset left). "The Japanese method of making an edged weapon is far more comprehensive than the Western approach," he explains. "The handle, sheath, and fittings are also harmonious with the blade. I even name my swords, thus imparting a personality to them." The selection of Japanese *Tantos* shown above all feature handles of spectacularly figured woods dyed and stabilized in a special process. From left, these are made from spalted maple, maple burl dyed blue, quilted maple, spalted pear, redwood burl, spalted wild cherry and dyed spalted swamp maple. For more on Slobodian, his work and the special woods he uses, see p. 114.

Photos: Scott Slobodian