

Fine Woodworking

August 1990, No.83
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Building a Cupboard

Hollow-Chisel Mortising

Veneered Game Cabinet

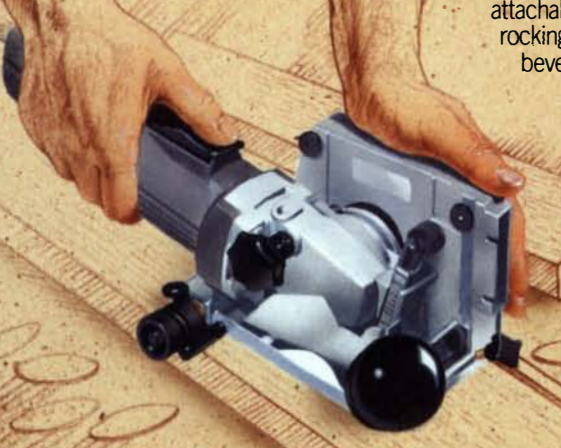
Making a Cradle

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Hollow-chisel mortisers are neat and quick. After roughing out the mortise, the waste is removed with successive passes of the square cutter (article on p. 52). Cover: Peter Naramore, Maui, Hawaii, carves a pineapple on a koa bedpost (article on p. 84).

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Clarification on methylene chloride—We enjoyed reading the article in *Fine Woodworking* #80 by Theodore J. Fink entitled “Chemical Hazards of Woodworking.” We were, however, concerned about several statements made by the author that we felt were misleading.

The author contends that “methylene chloride was recently shown to cause cancer.” This statement could mistakenly lead your readers to believe that methylene chloride causes cancer in humans, when, in fact, human studies of industrial workers show no increased cancer risk attributable to methylene chloride exposure.

In an animal study where laboratory mice and rats were exposed to very high levels of methylene chloride over their lifetimes, the mice showed an increase in spontaneously occurring malignant and benign tumors. The rats did *not* show an increase in cancerous tumors. Based on these results, however, the Consumer Product Safety Commission (CPSC) now requires products that contain methylene chloride to carry a cancer warning label that reads: “Methylene chloride has been shown to cause cancer in certain laboratory animals. Risk to your health depends on level and duration of exposure.”

Several other studies of laboratory animals and methylene chloride did not produce a carcinogenic response. There is also significant data to suggest that the mouse may not be an appropriate model for predicting carcinogenic effects in humans.

Consumers, like your readers, who may prefer to use methylene-chloride-base paint strippers because they are quick and effective, can minimize their exposure to the chemical by following a few important safety rules. These include providing adequate ventilation and wearing protective clothing. Consumers can also obtain the brochure *Stripping Paint From Wood*, which was developed by the Halogenated Solvents Industry Alliance (HSIA) and the National Paint and Coatings Association (NPCA) in cooperation with the CPSC, and which describes these safety procedures in detail. It is distributed to consumers through manufacturers and retailers, or it can be obtained by writing to S. James, Consumer Information Center-N, Box 100, Pueblo, Col. 81002; item #558-W.

In another section, the author referred to TLVs as a measure of toxicity. In the introduction to its *Threshold Limit Values and Biological Exposure Indices for 1989-1990*, the American Conference of Governmental Industrial Hygienists (ACGIH) states that “these limits are not fine lines between safe and dangerous concentration *nor are they a relative index of toxicity.*”

Similarly, methylene chloride is not “known to cause heart attacks,” as stated by the author. Proper use of methylene-chloride-containing products by healthy individuals is not likely to result in an increased risk of heart disease. An individual with a pre-existing heart condition, however, might be wise to consult a physician before using methylene chloride, due to its ability to metabolize to carbon monoxide.

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seminars throughout the United States and we are constantly working with trade publications, placing articles on handling and safety. Copies of Dow's product information can be obtained from distributors or by writing The Dow Chemical Co., 2020 Building, Midland, Mich. 48678.

—Susan Hearn, *Environmental Specialist*
Dow Chemical, Midland, Mich.

More on chemical hazards—I felt that the article by T.J. Fink (“Chemical Hazards . . .”) did your readers a very big disservice. The thrust of the article was to invite readers to try more exotic solvents rather than accept known problems. The most common solvents (water, acetone, methylene chloride, hexane, naphtha and ethanol) are fairly safe substances, which is why they're used in the first place. Far from avoiding them, one should seek to use them instead of more exotic solvents and thereby know the risks. Basic woodworking safety practices will be sufficient for protection. Wear gloves to protect your hands, glasses to protect your eyes and a mask to protect your lungs, and work in a room with proper ventilation.

—Steve Stoessel, *Ph.D., Schenectady, N.Y.*

Machine work is not inferior—A fine magazine, *Fine Woodworking* rightly concerns itself with craftsmanship and with displaying a good balance of hand-tool and machine work. Occasionally, though, “purist” readers suggest machine work is inferior to hand-tool work. The simple truth is, both are acceptable and produce work of equal quality. The missed points are also simple. First, both sides of the craft employ tools, but of different sorts. Second (and this is where the argument probably stems from), machine workers often lack sensitivity, designing pieces around particular machines, instead of finding ways to use machines creatively.

Sure, it gives the professional some satisfaction to tap at a joint and say to a customer, “There—real mortise and tenon.” “Real” usually meaning hand cut. However, as long as the joints are necessary for the job, properly proportioned and well fit, all that matters is the quality of workmanship, and not how it was achieved.

Some workers buy machines to get around a lack of basic skill. Still, if they genuinely feel that using machines is the only way they can get along, okay. They discover soon enough that a machine is only as good as its operator, and they either give up or persevere to become craftsmen, acquiring skills of a different sort. At least they're still working with wood.

In the end, the machine vs. hand argument is redundant, for both approaches count as *craftsmanship*. For purists everywhere, there are few truly handmade objects around—hand-molded pottery and snowballs come to mind! So how many of us use hand-felled, hand-converted timber? Not many I'll wager.

—John Walker, *Birmingham, England*

Craftsmen must care about environment—After having just read the letter from L.R. Pastukiw in *FWW* #81, in which he com-

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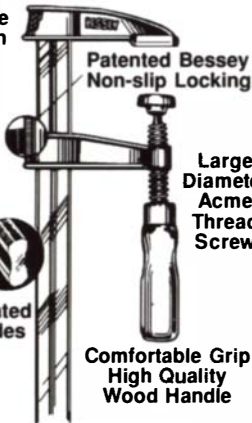
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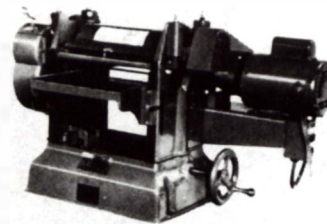
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plains that you are wasting space publishing letters on ecological issues, I must disagree.

It is important that craftsmen become aware of the effects of their choice of materials on the environment. Far from knowing "fully well about the travesty and rape of our planet," most Americans need to learn much more about where particular woods come from, how they are harvested, and whether the species or its ecosystem is genuinely threatened. A good example of this is Jon Arno's reply (in issue #80) to a reader's concern about the destruction of teak forests: he states that teak is now grown largely on plantations. Of course, huge tree plantations are not the ecological equivalent of native rain forests, but they are certainly preferable to the sometimes irreversible deforestation of tropical land.

In short, I feel *Fine Woodworking* is a valuable forum for discussing these questions, and I hope many different viewpoints will continue to be represented. I am sure many readers would even appreciate seeing articles from time to time on such topics as whether the use of particular wood species seriously threatens the ecosystems where they are found.

—Paul C. Gillis, Falls Church, Va.

Earth Day and woodworkers—I have enjoyed *Fine Woodworking* since I started subscribing several months ago. I am writing in reaction to some recent letters that would place the burden of responsibility for saving scarce hardwoods and for preserving the environment on woodworkers. We have just recently experienced another "Earth Day," which no doubt has left some of your readers with feelings of guilt about their craft.

I suggest that we enjoy the woods that are available to us, without apology. The argument that we are individually respon-

sible for saving scarce varieties of wood or that we should feel responsible for the preservation of the rain forest is faulty logic.

As for the depletion of rare species of wood, the law of supply and demand will determine the outcome. When the price becomes excessive, we will find substitutes without having to be admonished to do so by environmentalists. As for the depletion of the rain forest, that is the result of clearing land for cultivation.

Let us enjoy our craft, and if we feel justified in paying the price for scarce hardwoods, then we should do so without suffering feelings of guilt.

—R.J. Wilson, Tipton, Mich.

Oven cleaner as stain—I have found that mahogany can be stained easily and very effectively with ordinary oven cleaner. The foam aerosol type is inexpensive, readily available and easier to apply than other forms of strong alkali, such as ammonia fumes. This method seems to be superior to conventional staining because streaking or uneven application is eliminated. And since the alkali reacts with the natural pigments in the wood, the wood itself is colored rather than simply "painted over."

After sanding the work smooth, I apply a thin layer of foam, let it stand for three to four minutes, and then wipe off the excess with a dry rag. In addition to darkening the wood, this effectively raises the grain, which can then be sanded smooth with 400-grit paper. Since the oven cleaner is a caustic material, gloves and eye protection are, of course, essential.

After the work is thoroughly dry, polyurethane varnish can be used in the normal manner with no apparent alteration of drying time or quality of finish.

—Dr. Dave Tuel, Mobile, Ala.

Cross-grain gluing problems?—I read John Moore's "Student Desks," FWW #81, with interest. His end result is very hand-

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	ST413E	1/2	2	1/2	14.00		CR210	3/8	5/8	1/4	14.00
	ST216	5/8	1	1/4	5.90		CR213	1/2	3/4	1/4	16.00
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 FLUSH TRIM	ST425	1	1 1/8	1/2	8.80	 ROMAN OGEE	CR425	1	1 1/4	1/2	32.00
	FT210	3/8	1	1/4	6.50		RO204	5/32	15/32	1/4	15.00
	FT213	1/2	1	1/4	6.50		RO206	1/4	3/4	1/4	16.00
 DOVETAIL	FT413	1/2	1 1/8	1/2	6.50	 COVE	RO406	1/4	3/4	1/2	16.00
	DV210	3/8	3/8	1/4	4.60		CV203	1/8	3/8	1/4	11.00
	DV213	1/2	1/2	1/4	4.60		CV206	1/4	1/2	1/4	11.00
	DV413	1/2	1/2	1/2	4.60		CV210	3/8	9/16	1/4	12.00
	DV419	3/4	7/8	1/2	6.50		CV213	1/2	5/8	1/4	13.00
 CORE BOX	DV425	1	7/8	1/2	7.50	 CLASSICAL	CV419	3/4	3/4	1/2	25.00
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	CB210	3/8	5/16	1/4	9.00		CS406	1/4	5/8	1/2	19.00
	CB213	1/2	3/8	1/4	11.00		ORDER#	CUT DIA	CUT L	SH DIA	PRICE
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some; however, one design technique is questionable. His method of gluing desk sides with cross-grain members over the entirety is a future problem waiting to happen. Mr. Moore indicates that his wood is always well dried, but that only means it is in equilibrium with the environment it is stored in. It may be adequate if the desk is never moved more than 50 miles from where it was built; however, many people move pieces farther than that in this country. For example, I have had desks moved from Pennsylvania to Colorado to Texas and back to Colorado. The desks needed adjustment after each move because of the local humidity change. This was also true for a desk built in the summer in Pennsylvania that was moved to a steam-heated unhumidified office in Philadelphia. Any glued cross-grain joints would have simply self-destructed.

—Kenneth L. Baumert, Emmaus, Pa.

More safety fixtures—I think "Tablesaw Safety Devices," *FWW* #81 by Charley Robinson, was interesting, but missed a very important point. Tablesaws are inherently unsafe when you rip without a runout table or conveyor regardless of the guard, hold-down device or push-stick design. While I have tried all types of schemes over 35 years, I have never felt comfortable using the tablesaw until I installed a conveyor runout attached to it. Once I install the runout, the problems of kick-back, binding, etc. no longer plague me. I discovered that the safety problem with a tablesaw is that too many things are happening at the same time. A runout table eliminates the stock from moving unpredictably and makes the process of using a tablesaw considerably safer. I highly recommend that tablesaw users install an adequate runout table or conveyor as a first priority. After this, simple push sticks should handle most oth-

er situations, assuming that the push stick avoids contact with the blade. Also eye protection is a must.

—Theodore W. Coffey, Green Spring, W.V.

Praise for Moore chairs—I am writing to express my appreciation for presenting the work of Terry Moore in *FWW* #81. I felt his chairs were quite beautiful and the plans very helpful.

I would encourage you to also publish an article on Mr. Moore's table, as shown in the photo on p. 40 in that issue. I think this would make a complementary article to his chairs.

—Michael Schultz, Kernersville, N.C.

Keeping rust off—Anyone owning a piece of equipment with a cast-iron top understands the problem of keeping the rust on top of the table under control. There are many ways to remove the rust, but here is one way to keep the rust to a minimum.

After the surface has been cleaned thoroughly, sprinkle an ample amount of baby powder on top of it. Rub in the powder just as you would an oil finish on a piece of furniture. Once you're satisfied that the entire surface is covered, wipe off the excess with a rag.

Baby powder displaces much of the moisture that may come into contact with the tabletop. And baby powder will not leave any residue on the workpiece. It also serves as a good lubricant between the workpiece and tabletop.

Routine maintenance every month or when those rusty fingerprints appear will keep tabletops clean and smooth.

—Ronald Capodagli, The Colony, Tex.

Wooden hygrometers are ancient—The wooden hygrometer article in issue #81 is a good example of the unique little tidbits

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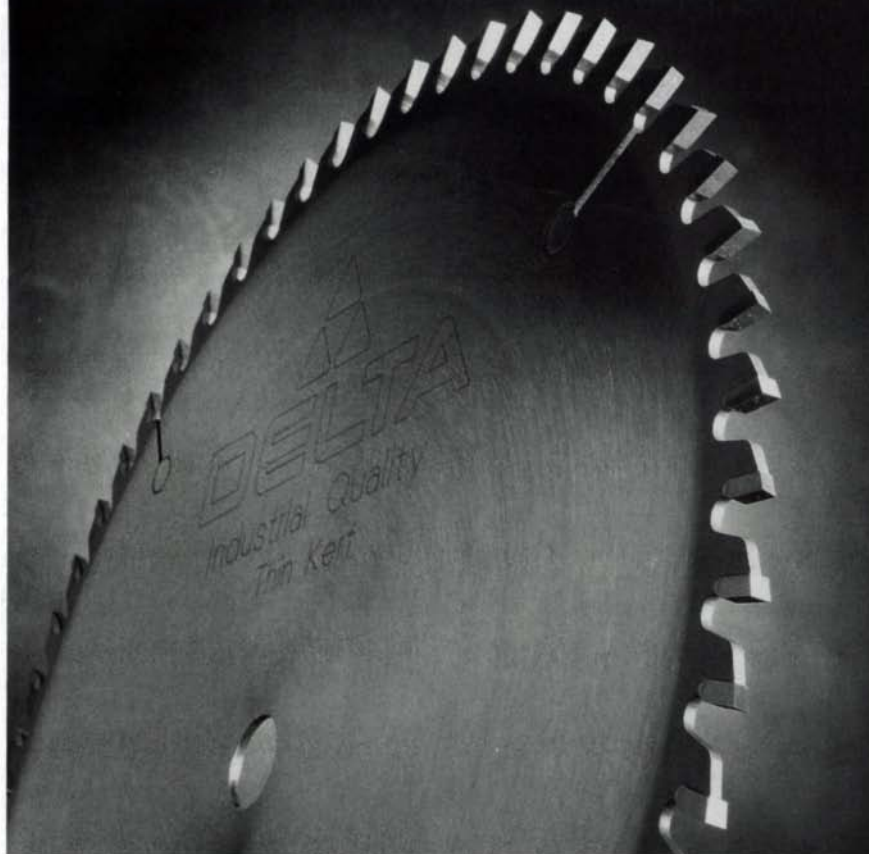
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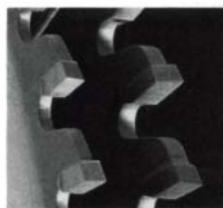
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of information that make *Fine Woodworking* so interesting to read. However, in the interest of historical facts, it should be noted that this device has been around for quite sometime—at least since the days of Thomas Jefferson. In the book, *The Woodwrights Workbook*, you will find a reference to this device on pp. 141-143. Here its invention is credited to David Rittenhouse, and its description is presented in the form of a letter with diagrams by Thomas Jefferson to Benjamin Vaughan.

—Timothy J. Dale, Deal Island, Md.

Dehumidifier wood kiln—After reading *FWW on Wood and How to Dry it*, I decided to build a dry kiln for 500 bd. ft. I love to select my own trees in the woods and then make them into finished projects.

I made my dryer very simply. After constructing a box with an inside diameter of 4x4x11 ft., I insulated it well and built a side loading door into it. Then I set a household dehumidifier in one end and two small squirrel cage fans for circulation under the lumber.

When in operation, the temperature goes to between 108°F and 110°F. This keeps the chamber filled with steam, and the 2-gal. tank has to be emptied twice a day. I am about to build a second one and will add a drain hole into the ground to eliminate the chore of emptying the tank.

I have dried green lumber (walnut, ash, red oak and cherry) to 8% to 9% in three weeks, and the quality of the lumber was good and there was no end checking. My stripping is done with 1x1 lumber with the stack 8 in. off the floor. The mechanics of this dryer are very simple and something more people should build. You should try one.

—Bert H. Winger, Ottertail, Minn.

Need for quality tools—In response to Woody Pistrich's letter about antique tools becoming unavailable or prohibitively priced because they have become "collectibles" (*FWW* #82), woodworking is not the only craft that is being handicapped.

In addition to my interest in woodworking with hand tools, I am a hand bookbinder and restorer. The price of a used nipping press, not to mention the more esoteric items, has gone out of sight. Even sets of gilding tools are being dispersed, destroying their usefulness.

Then, too, many old bookbinding tools languish forgotten in libraries, either left over from years ago when in-house repairs were made, or having been donated by the families of deceased bookbinders as memorials and/or tax deductions.

What we all need is a cooperative of talented iron and brass founders, machinists, engravers and woodwrights who will work with each other and who believe in quality. It might help if they didn't mind being poor!

—F.E. Warner, Belfast, Maine

Call for metrics—I'd like to put in another plea for adopting the metric system in woodworking. I read all your fine articles about how to build something, but I find all the dimensions are in those awkward fractions of an inch. Let me rehearse a few of the arguments for metric once again.

The United States and one or two most backward countries are the only ones still using the archaic English system. We are not in the main swim at all. Our automobiles, even in this country, are largely built in metric. Our liquor is supplied in liter bottles. There are even some signs on the highways with both English and metric mileage indications, and I believe most speedometers today carry both measures of velocity, although I suspect few of us depend on the metric to test

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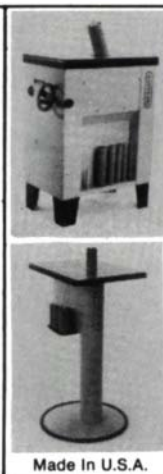
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whether we are over the speed limit. A speed of 100 kilometers per hour is 62 mph. That's neat because it divides the speeders from the conservatives right at the 100 mark in metric! Metric is inevitable.

In the woodworking field, there are already several changes. One that we have all noticed is that $\frac{1}{4}$ plywood is really not $\frac{1}{4}$ in., but is 6mm—some even 5mm—because so much of it is not made in the United States. And the panels are really 122mm by 244mm, not 4 ft. by 8 ft. The wood screw is still made in inches, but the designation of length is metric in Europe.

Perhaps the most telling advantage of using metric measurements to me as a woodworker is that I can work to a slightly greater accuracy. At my age and with the degree of refraction I enjoy, $\frac{1}{32}$ in. is a little difficult to resolve. And $\frac{1}{16}$ in. is a bit coarse. A millimeter is $\frac{1}{25}$ in. I can read a millimeter easily. So I work more closely than I would in inches. Furthermore, it is a great deal easier to remember as you cross the shop from one place to another such numbers as 235 and 416 rather than $9\frac{1}{4}$ in. and $16\frac{3}{8}$ in.

But even more, when laying things out and computing the spacing between two points or adding the total thickness of several pieces of wood together—even computing the center point of a chair leg or tabletop—the old metric system with a simple hand calculator sings with simplicity.

Our suppliers can have great influence in this matter. I find it difficult, for example, to find a new metric tape measure. Usually I carry a “bilingual” tape, on which the metric measure is along one side. I use the other edge to speak with the natives. Some suppliers do manufacture metric scales, but they are not usually stocked in the hardware stores because no one buys them. *Fine Woodworking* can help by offering the great drawings you pub-

lish with alternate metric dimensions, or better yet, why not publish at least one such project per month with only metric dimensions? Maybe some of us would be encouraged to try it.

—Joseph Chapline, Newbury, N.H.

Centering biscuit joints—In *Fine Woodworking* #81, Randall Grace suggests that plates used in the joinery of tabletops be set below center to avoid what he called “biscuit draw” in the finished product.

I suggest that the plates be kept in the center of the work, just the same as dowels, for structural reasons, and that the crafts-person wait for the wood to stabilize before sanding.

The moisture from Mr. Grace's glue raised the grain and he sanded the top while the grain was raised. Then he removed material so that when the cells of the wood returned to normal moisture content and shrunk, the location of the plates was then observable. The glueline of each board was probably also depressed, which is common if the work is finished too quickly.

—Rod Goettelmann, Southampton Township, N.J.

About your safety:

Working wood is inherently dangerous. Using hand or power tools improperly or neglecting standard safety practices can lead to permanent injury or death. So don't try to perform operations you learn about here (or elsewhere) *until you're certain that they are safe for you and your shop situation*. We want you to enjoy your craft and to find satisfaction in the doing, as well as in the finished work. So please keep safety foremost in your mind whenever you're in the shop.

—John Lively, publisher

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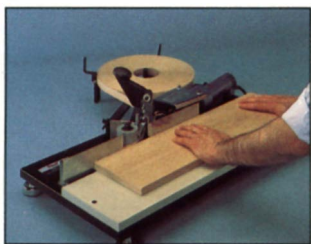
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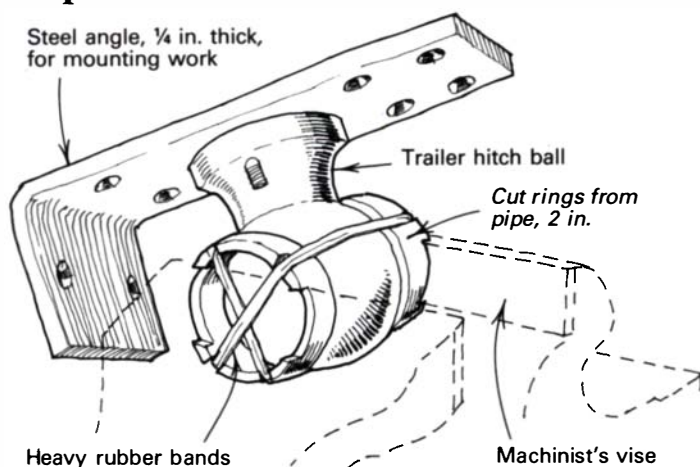
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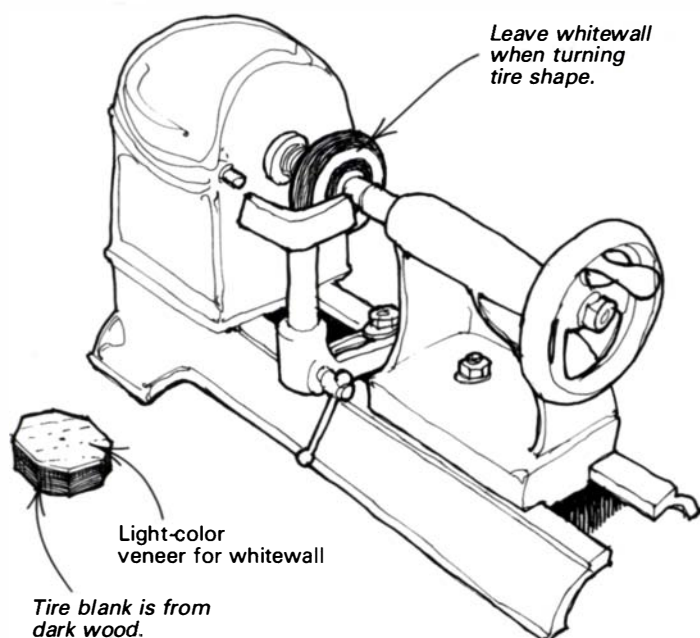
To make the device, cut the stud off the trailer ball, and then drill and tap two or three holes in the ball's flange to fasten it to the steel angle. Chamfer the inside diameter of the pipe rings where they hit the ball, and grind or file a channel in each ring to fit over your vise jaws. This keeps the rings from slipping out of place when you loosen the vise. In addition, file or grind shallow notches in the rings for heavy rubber bands to hold the assembly together snugly while mounting it in the vise or for storage.

—E. Kawecki, Franklin, Mich.

Quick tip: When the blade slot on my radial-arm saw table gets too wide, I fill it in with a paste made from talcum powder and epoxy glue. When this tough filler has cured, I block-sand it flush and make a fresh cut.

—Richard Rubasch, Viroqua, Wisc.

Turning whitewall tires for toy cars



Here is a fast, easy way to make small whitewall tires for toy cars. Start by choosing a dark wood, like mahogany or walnut. Plane

the stock to the final thickness of the wheel, and then rip and crosscut as many square wheel blanks from the stock as you will need. Next, glue a piece of light-color veneer to the face of each blank. The veneer will later become the whitewall on the tire, and so it should contrast with the darker wood. After the glue has set, trim the corners off each blank to form a rough octagon, and drill a 1/8-in. or smaller hole through the center of each blank to locate the lathe's centers. Bore this hole with a drill press or drill guide to ensure that the hole is perpendicular to the wheel's face.

Mount a blank between lathe centers, veneer-side out, and turn the wheel in a conventional manner. As you shape the tire, you will expose the darker wood and leave the white veneer on the fattest part of the tire and in the middle. Work carefully—it's easy to make the whitewall too narrow. I usually turn only the outside face because in most cases, the other side doesn't show. The live center marks on the back will be hidden, and the ring left by the dead center on the front doesn't hurt the design's effect.

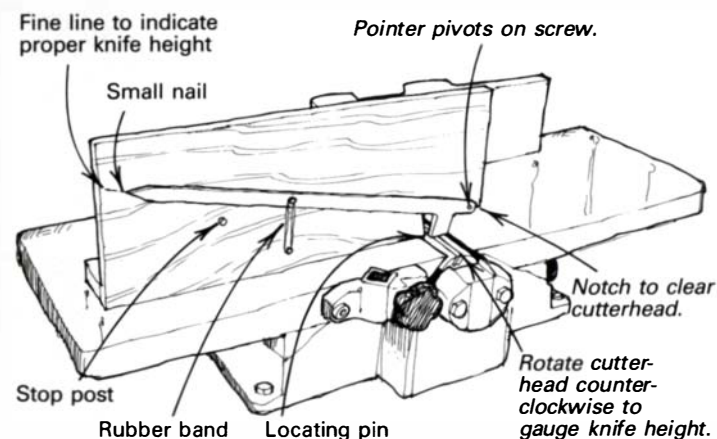
To give the effect of a tire tread, apply a metal-lathe knurling tool to the edge of the wheel after sanding and while the lathe is running at a slow speed. When the wheel is finished, redrill the alignment hole to the size needed for the axle.

—E.D. Groves, Starkville, Miss.

Quick tip: Boric acid powder is an excellent dry lubricant for sticky drawers, saw tables, jigs and the like. Simply sprinkle the powder right on the surface. Boric acid is a common non-prescription anti-bacterial agent, available in any drug store.

—Bill Hayman, Annapolis, Md.

Installing jointer knives accurately

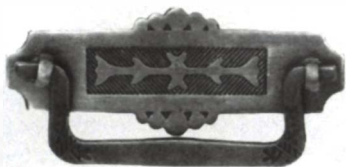


I finally got fed up with spending one hour carefully installing jointer knives and still having one knife get dull before the others because it was set higher. So I made the gadget shown in the drawing above to help. It's basically a simple gauge that, once calibrated to proper knife height, can be used to quickly and accurately set the knives.

Join two pieces of plywood at right angles so the wider board will stand on edge on the jointer's outfeed table. Notch the lower right end of this construction where it overhangs the cutterhead. Then insert a small dowel or screw in the bottom edge of the upright just behind this notch to act as a locating pin. This pin registers the position of the gauge against the end of the outfeed table. Screw the pointer to the lower right corner of the upright board, above the notch, so it will pivot when the knife to be set pushes up on the short lever that extends down from the attached end of the pointer. Use Plexiglas or hardwood for the pointer's lever, and insert a small nail in the other end for a more precise reading. The longer the pointer, the more the vertical movement of the knives is amplified; a 20-in.-long pointer will magnify the movement about 40 times.

To calibrate the gauge, you must first establish the proper

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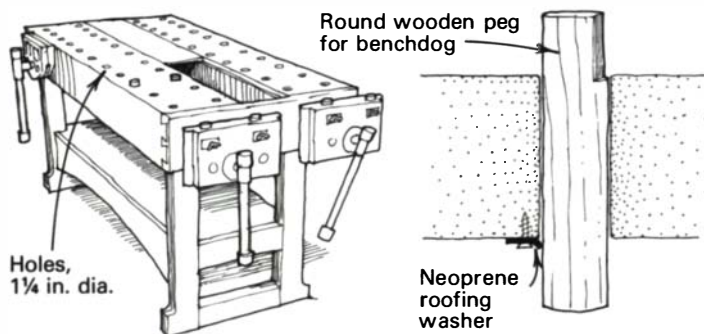
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height for the knives. To do so, place a wooden straightedge on the outfeed table and raise one end of one of the knives until it grabs and moves the straightedge horizontally about $\frac{1}{8}$ in. to $\frac{3}{16}$ in. when the cutterhead is rotated clockwise.

Next, record this knife height by standing the gauge in position on the outfeed table with its lever over the knife you just set, as shown in the drawing on the previous page. Rotate the cutterhead counterclockwise and mark a fine line on the gauge's backboard at the highest spot the pointer reaches. Set the other knives by raising or lowering them until the pointer hits the same high spot when the cutterhead is turned counterclockwise.

—David Marshall, Gwynedd, Wales, Great Britain

Improved benchdog



The European rectangular benchdog has two faults. First, it loses friction as the tapered spring is compressed, making the dog drop flush with the benchtop just when you would like it to remain up. Second, it can't be rotated for curved work.

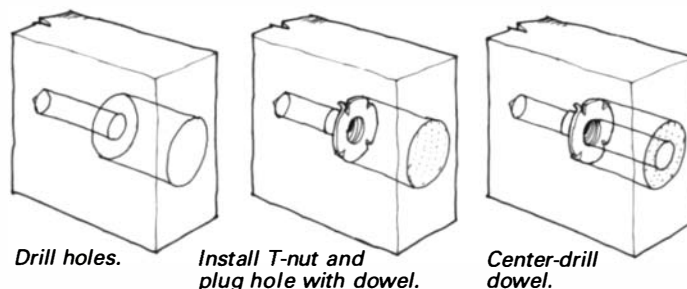
My round benchdogs solve both these problems. To accommodate the dogs, drill a series of $1\frac{1}{4}$ -in.-dia. holes in your benchtop. Then, flip the bench over and screw a neoprene roofing washer alongside each hole so that the washer overlaps the hole a little; the more overlap the firmer the dog. Now, turn a length of dowel to a scant $1\frac{1}{4}$ in. dia. and crosscut it into suitable lengths for pegs. Sand or file a small flat on one end of each peg and presto—you have a peg that holds firm and rotates 360° .

—Jonathan Davies, Maleny, Queensland, Australia

Quick tip: After changing jointer or planer knives, write the date on a piece of masking tape and stick it to the base of the machine as a reminder to regularly attend to this necessary job.

—Robert Vaughan, Roanoke, Va.

Another captured nut technique



Here's another method for installing a captured nut in a wood member for knock-down furniture. First, drill a flat-bottom hole in the end of the member with a Forstner bit, which has a diameter slightly larger than a T-nut flange. Drill a second hole centered in



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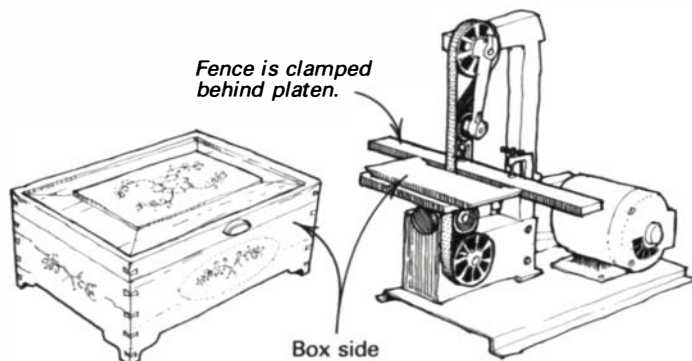
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the first using a bit the same size as the T-nut barrel. The second hole must be deep enough for the end of the bolt that will extend beyond the nut when the joint is tightened. After driving the T-nut firmly into the larger hole, plug the hole with a glued-in dowel. Be sure the dowel butts hard on the nut, and don't use any more glue than necessary because excess glue will be forced into the threads of the nut. When the glue has set, center-drill the dowel with the smaller bit you used before and stop when you reach the T-nut. Go slow near the end so you will feel when your bit just touches the T-nut. —John Burns, Pensacola, Fla.

Sanding stepped edges



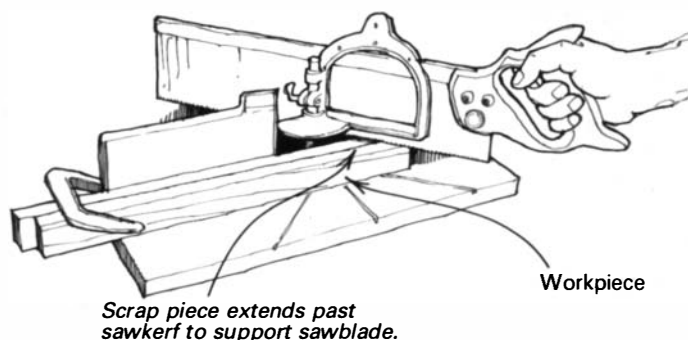
A while back, I ran into a problem while building a small jewelry chest. My design called for feet that were cut with a jigsaw right from the sides of the box. But no matter how carefully I sawed the straight part between the box's feet, the inevitable waverings ruined the look of what should have been a perfectly straight edge.

I solved the problem by clamping a wood fence on the table of my 1-in. belt sander behind the platen. I left about 1/16 in. when I cut the bottom profile on the box sides, and I sanded the straight section of the edge by pressing it against the belt and moving the piece back and forth until the feet touched the fence. With the fence clamped at just the right distance behind the sanding belt and parallel to the platen, the result is a nicely sanded straight line that needs only to be cleaned up with 220-grit paper.

—John M. Colombini, Pittsburgh, Pa.

Quick tip: I got a couple of adjustable folding ironing boards at a flea market. When topped with laminate-covered plywood, they make great adjustable outfeed tables and also double as large folding sawhorses. —James Fielding, Shawnigan Lake, B.C., Canada

Trimming in a miter box



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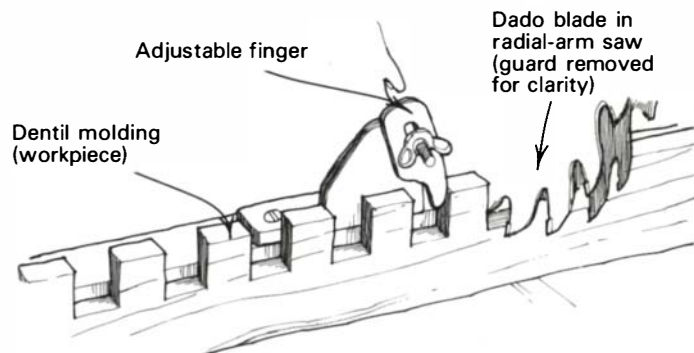
size with repeated fine cuts in my miter box. However, when trimming less than a kerf's width, the sawblade will almost always deflect off the trim line. This problem can be eliminated by backing the piece being trimmed with a scrap of about the same dimensions. Clamp both pieces to the miter box with the scrap piece extending well past the sawkerf to support the blade behind the cut. This will ensure a perfect, no-deflection cut on the workpiece.

—Joseph Franchina, Coventry, R.I.

Quick tip: The filtering capabilities of a dust-collector bag can be easily improved by spraying the inside of the bag with no-stick cooking spray. This treatment will stop the finer dust with no loss in system efficiency.

—Robert Brandt, Ft. Worth, Tex.

Making dentil molding on a radial-arm saw

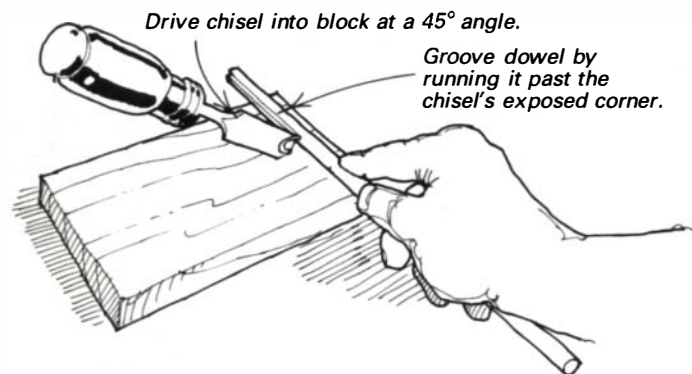


I needed several sticks of dentil molding for some bookcases I was building. My first inclination was to measure and mark each dentil and make the cuts freehand on the tablesaw, but this would be

time-consuming with no guarantee of accuracy. By using a dado blade on my radial-arm saw with an indexing finger attached to the fence, as shown below, left, I found I could cut the molding quickly and accurately. Adjusting the dado blade up or down determines the depth of the cutout, and the location of the adjustable finger determines the cutout's width. In the drawing, the blade guard has been removed for clarity, but don't attempt this operation without replacing the guard.

—Jack F. Sewert, Marion, N.Y.

Grooving a dowel



Grooved dowels are superior for doweled glue joints because they allow the glue to escape back along the sides of the dowel as it's inserted. An ungrooved dowel will push most of the glue into the bottom of the hole. Grooved dowels are commercially available, but here's a tip I often use to groove my own. Tap a 3/4-in. chisel into a block of wood at a 45° angle as shown above. The upper corner of the chisel should hit the centerline of the dowel. Now,

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23-880 6" bench grinder 1/4 H.P.	81	75
23-880 6" bench grinder 1/2 H.P.	136	115
23-980 10" bench grinder 1 H.P.	246	235
11-950 8" drill press	164	135
14-040 14" drill press	313	309
40-150 15" hobby scroll saw	178	139
28-160 10" hobby band saw	189	144
31-050 1" belt sander 2.0 amp.	93	78
31-460 4" belt/disc sander	178	139
31-340 NEW 1" belt/8" disc sander	226	175

Model	List	Sale
NEW TOOLS BY DELTA		
40-560 16" 2 spd scroll saw	266	185
23-580 5" bench grinder 1/5HP	60	54
11-990 12" Bench Drill Press	266	185

Model	List	Sale
DELTA STATIONARY		
34-761 10" unisaw 1-1/2 H.P.	1715	1399
34-740 Super 10" mtrdr. tbl. saw	690	399
33-960 16" Band Saw	503	399
23-590 10" radial arm saw	727	569
11-072 32" radial drill press	487	409
37-280 6" motorized jointer	440	379
50-179 3/4 HP 2 stg. dust coll.	435	339
50-180 1 H.P. dust collector	535	439
50-181 2 H.P. dust collector	760	599
22-667 13" planer w/2 HP motor.		
w/stand & ext. wings	1750	1089
33-050 NEW 8-1/4" Sawbuck	742	545
34-330 NEW 8-1/4" Tbl Saw	1321	209
34-670 10" mtrdr table saw	437	365
34-985 1/6 H.P. stock feeder	698	599
32-100 NEW station plate joint.	645	599
36-400 NEW 8-1/4" compd mitre	216	155
34-897 50" Delta uniface	500	338

Model	List	Sale
MILWAUKEE TOOLS		
0399-1 NEW 12V cdslss var/spd drill		
w/batt. charger & case	280	159
0395-1 9.6V cdslss. drill w/cse	264	149
0219-1 9.6V cdslss. drill w/cse	177	165
0385-1 7.2V cdslss. drill w/cse	174	105
0224-1 3/8" drill 4.5A magnum	189	110
0234-1 1/2" drill 4.5A magnum	850	600
0244-1 1/2" drill 4.5A magnum	850	600
0222-1 3/8" drill 3.5A 0-1000 rpm	174	99
0228-1 3/8" drill 3.5A 0-1000 rpm	164	97
0375-1 3/8" close quarter drill	208	119
0379-1 1/2" close quarter drill	243	149
0539-1 Cdis. scdrv. 190 rpm	154	89
0540-1 Cdis. scdrv. w/bts&cse	154	89
0546-1 Cdis. scdrv. 2008-400rpm	120	75
3102-1 Plmbrs r t angle drill kit	330	189
3102-1 Electricians r t angle drill kit	320	185
5399 1/2" D-hdle ham drill kit	304	175
1676-1 H.D. Hole Hawg w/cs	415	229
6511 2-sp SawZall w/case	214	125
6405 8-1/4" circle saw	219	129
6750-1 Drywall gun 0-4000 4.5A	154	95
6507 TSC SawZall w/case	229	129
6170 14" chop saw	430	259
6012 Orb.sand 3-5/8"x7-3/8"	189	115
6014 Orb.sand 4.5"x9.25"	199	118
6305 6" cdsls. circle saw	299	175
8977 Var. temp heat gun	114	75
5397-1 3/8" v/sp ham. drill kit	232	137
5371-1 1/2" v/sp ham. drill kit	318	185
3107-1 1/2" v/sp r t angle drill kit	340	195
6754-1 Drywall gun 0-4000 4.5A	154	95
6747-1 Drywall driver 0-2500	154	95
0230-1 3/8" drill 0-1700 rpm	179	105
3300-1 1/2" v/sp mtr gr t angle kt	299	179
5620 Router 1 H.P.	289	175
5660 Router 1-1/2 H.P. -10A	299	185
5680 Router 2 H.P. -12A	350	225
5455 7/8" polisher 1500rpm	209	129
6235 16" chain saw	280	169
8975 Heat gun	89	59
6365 7-1/4" circular saw	195	114
6366 7-1/4" circular saw w/fnce&bld	204	119
6368 7-1/4" circular saw w/fnce		
blade & case	233	129
0216-1 2 spd cdsls drill Hi-torque	222	129
0235-1 1/2" drill klys. chuck mag	209	119
6016 14" sheet pad sander	79	49
6145 4.5" grinder 10,000 rpm	154	95
6142 6145 w/cse & access	192	119
6749-1 Drywall gun 0-2500 4.5A	189	125
6377 7-1/4" worm drive saw	295	165
6378 8-1/2" worm drive saw	316	189

Model	List	Sale
DAVID WHITE Instruments		
LP6-20 Level Package	300	198
LT8-300 Level-Transit	640	465
LT8300P Level-Trans w/opt. plum	755	509
LT6-900 Level-Transit	380	239

Model	List	Sale
BOSTITCH AIR NAILERS		
N80C-1 Utility coil nailer	795	399
N80S-1 Stick nailer	795	399
T36-50 Sheath & decking stapler	595	334
N12B-1 Coil roofing nailer	795	399
N60FN-2 Finishing nailer	625	335
T31 Brad nailer	245	149

Model	List	Sale
PANASONIC CORLESS		
EY6205B NEW v/spd. 12 volt drill		
w/15 minute charger	390	219
EY6200B NEW 2 spd. 12 volt drill 0-hdle		
w/15 minute charger	350	195
EY6281B NEW v/spd. 9.6 volt drill		
w/15 minute charger	350	198
EY571B V/spd. 9.6 volt drill	239	135

Model	List	Sale
MAKITA CORLESS		
6070DW 3/8" v/sp rev. drill, 7.2v	130	78
6071DW 3/8" v/sp rev. drill		
w/removable batt, 7.2v	199	115
5090DW 3-3/8" saw kit, 9.6v	256	139
6010DW 3/8" cdsls drill kit, 7.2v	164	95
6010SDW 3/8" cdsls drill, 7.2v	99	65
0A3000DW 3/8" angle drill, 7.2v	251	139
8400DW Hammer drill kit, 9.6v	272	149
4390DW 9.6v cdsls. recip saw kit	230	128
4300DW Jig saw kit comp., 9.6v	232	129
6012H0W 2 spd. driver drill		
w/clutch & cse 9.6v	236	119
6092DW V/sp drill, kit comp	250	125
6093DW V/sp drill w/clutch comp	261	127
6891DW Drywall gun 0-1400 9.6v	237	135
63200T 49.6 volt battery	48	30
63200T 47.2 volt battery	40	28
5007NB 7-1/4" saw w/elec. brake	233	128
5008NB 8-1/4" saw w/elec. brake	284	158
BD4510 1/4 sheet pad sander	85	54
9900B 3"x21" belt sander w/bag	268	149
9924DB 3"x24" belt sander w/bag	282	149
9045N 1/2 sht fin. sand. w/bag	231	129
4200N 4-3/8" circ. saw 7.5A	225	127
4301BV Orb. v/sp jig saw 3.5A	289	155
JR3000V Vs. recip saw w/cse	227	129
LS1020 New 10" miter saw	463	245
9820-2 Blade sharpener	373	199
1900BW 3-3/4" planer w/cse	209	115
1911B 4-3/8" planer 7.5A	240	139
1100 3-1/4" planer w/case	401	219
9207SPC 7" sander-polisher	276	155
3601B 1-3/8 H.P. router	255	139
3700B 1/2 H.P. trimmer	190	109
9501BZ 4" grinder, 3.5 amp	126	75
BD4550 6" round sander	101	59
BD4550 1/4 sht pad sand w/bag	86	55
0A3000R 3/8" angle drill	270	148
6302 3/8" v/sp 5.2Amp drill	209	119
HP2010N 3/4" v/sp hmr. drill w/cs	300	165
2708W 8-1/4" tablesaw	504	259
2711 10" tablesaw w/brake	841	489
2030N 12" planer/jointer	1320	1775
2040 15-5/8" planer	2595	1475
1805B 6-1/8" planer kit/case	679	359
5005BA 5-1/2" circular saw	223	135
6404 3/8" drill 0-2100 rpm 2A	104	65
6510LVR 3/8" drill rev. 0-1050 rpm	145	79
6103BR 1/2" drill rev. 6Amp	241	139
5402A 16" circular saw-12Amp	636	349
3612BR 3 H.P. plunge router	377	189
9401 4"x24" belt sander w/bg	318	169
7620 1-1/4 H.P. plunge router	192	109
4302C V spd. orb. jig saw	302	159
5077B 7-1/4" Hypoid saw	252	145
LS1440 14" Miter saw	721	435
2414 1/4 cut-off saw AC/DC	351	199
5007NB 7-1/4" circ saw 13A	209	114
3612B 3 HP plunge rout sq/bs	377	189

Model	List	Sale
SENCO AIR NAILERS		
Model		
SFN1 Finishing nailer 1"-2"	377	269
SFN2 Fin. nailer 1.5"-2.5"	571	395
SN325 Nailier 1-7/8"-3-1/4"	665	445
M2 Gen'l purpose 1-3/8"-2"	475	345
SN4 Gen'l purpose 2"-3-1/2"	685	469
LS2 Pinner 5/8"-1"	351	249
SKS Stapler 5/8"-1-1/2"	351	249
LS5 Pinner 1"-1-1/2"	399	285
Model	List	Sale
SKILL SIZLERS		
6850-02 NEW 1/2" EMH hammer		
drill w/case 4 amp	255	129
(5515) 1-1/2" circ saw	112	105
(5526) 6-1/2" circ saw	175	129
(5537) 7-1/4" circ saw	132	125
(8077) 7-1/4" circ-dr ft	198	145
5750 (810) 10-1/4" circ - dr ft	400	275
5825 (367) 6-1/2" worm saw	229	155
5865 (825) 8-1/4" worm saw	250	164
4580 Vari - orbit jig saw w/cse	144	105
3810 10" Miter saw	263	225
3810S 3810 w/60 tooth carb bid.	239	
7575 1/4" palm sander	52	49
77 7-1/4" worm drive saw	230	145
5350 2-1/2 HP circ. saw	80.99	77
5250 2-1/4 HP circ. saw	68.99	66
2735-04 12v v/spd cordless drill		
complete w/cse. & 2 batt	210	144

Model	List	Sale
LEIGH DOVETAIL JIGS		
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Model	List	Sale
MMT 500NEW 24" multiple mortise & tenon jig	509	399
MMT 12" multiple mort. & tenon attachment for D1258-1269	219	
MMT 24" multiple mort. & tenon attachment for D1258-24299	239	

Model	List	Sale
HITACHI TOOLS		
TR8 Plunge router, 1-1/2 H.P.	219	119
M12V NEW 3H.P. v/sp router	437	249
TR12 Plunge router, 3 H.P.	354	178
C10FA 10" dx. mitre saw	490	275
C12FA NEW 12" mitre saw	586	339
C8FB 8-1/2" side compd saw	859	469
FREUD LU91M008 8.5" c/bld 48 tooth	48	
C15FB 15" miter saw	745	409
FREUD LU85M015 15" c/bld 108 tooth	181	115

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w/1-1/2 H.P. motor & stand	619.00	

Model	List	Sale
34-445—34-444 Table Saw		
complete w/30" Unifence	799.00	

Model	List	Sale
37-154 DJ15 6" Jointer		
w/3/4 H.P. motor	1029.00	

Model	List	Sale
28-28314" Band Saw		
w/enclosed stand		
3/4 H.P. motor	699.00	

Model	List	Sale
70-200 NEW 20" Drill Press		
	709.00	

Model	List	Sale
17-90016-1/2" Floor Orill		
Press	385.00	

Model	List	Sale
DELTA #34-080		
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73-756	6-1/2	36	30.45	16.85
73-717	7-1/4	18	13.90	7.99
73-737	7-1/4	24	17.20	9.29
73-757	7-1/4	40	31.30	16.79
73-758	8	40	43.80	24.85
73-759	8-1/4	40	44.65	24.99
73-719	8-1/4	22	19.65	11.95
73-739	9	30	32.35	16.79
73-769	9	60	68.35	35.99
73-715	5-1/2	16	13.70	7.99
73-704	7-1/4	18	20.20	12.85

Model #	Dia. #	Teeth	List	Sale
73-740	10	32	33.20	15.95
73-770	10	60	61.46	29.95
73-711	10	50	65.08	29.95

Model	Size	List	Sale
JORGENSEN			
7224	24"	27.11	17.55
7236	36"	29.10	18.65
7248	48"	31.96	19.75
7260	60"	35.60	23.55
7272	72"	37.30	25.29

Item #	Jaw Length	Open Length	Cap	List	Sale	Box of 6
#3/8	6"	3"	15.57	8.89	49.98	
#2/0	7"	3-1/2"	16.74	9.95	53.55	
#0	8"	4-1/2"	18.63	11.95	62.95	
#1	10"	6"	21.30	12.99	71.49	
#2	12"	8-1/2"	24.45	15.95	81.89	
#3	14"	10"	31.01	18.95	104.95	
#4	16"	12"	40.30	24.89	146.85	

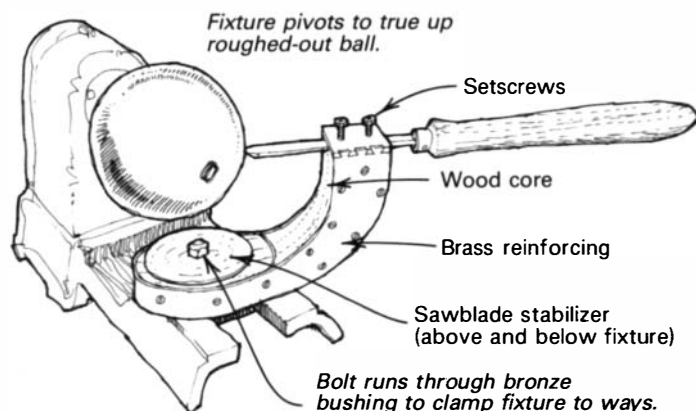
draw the dowel past the corner to form a series of grooves.

—John A. Graydon, Islington, Ont., Canada

Quick tip: A simple adjustment mechanism for benchdogs is to staple a 1-in.-wide strip of inner tube to the underside of your bench so that the rubber covers one-half of the benchdog hole. The rubber holds the dog at any height and allows the dog to be replaced quickly.

—Barrie Graham, Arundel, Que., Canada

Sphere-turning lathe attachment



In 1946, a friend described a ball-turning device his machinist had made to fit an Atlas lathe. Unfortunately, I never got a chance to look at it. I've tried to design and make an attachment ever since, and recently I succeeded. Although the machinist had made the fixture entirely of metal, I used wood for the fixture's core and reinforced it on the sides with sheet brass.

The fixture bolts to the lathe's bed and holds a gouge at a height that's on line with the lathe's centers. Then, with the lathe running, the fixture is pivoted to make the final cleanup passes on a previously roughed-out ball. The final diameter of the sphere is determined by the projection of the gouge's tip from the block.

To make the fixture, I bandsawed the wooden core from an old bridge beam and machined the top and bottom of the base flat with a rotary planer in a drill press. Then, I drilled a 5/8-in.-dia. hole through the base to take a bronze bushing. The bushing's length is critical; it must extend from the tool-rest attachment bracket below the ways that I use for bolting the fixture to the lathe bed, up through the base of the fixture and 1/64 in. above the upper steel plate. If the bushing is shorter, the fixture will be clamped tightly to the lathe and won't rotate; any longer and there will be too much slop as the fixture pivots. The steel plates are actually sawblade stabilizers from Sears (part no. 94952). They have a 7/8-in. hole, just right for the bushing, and act as large washers that the fixture's arm pivots between. Following a cardboard pattern, I cut out the 3/2-in.-thick hard sheet brass that surrounds the wood core, and drilled and countersunk it for screws. I used 1/8-in.-thick brass for the cap, which I dovetailed into the brass sides and tapped for the setscrews that hold the gouge.

The gouge sits in a groove cut into the top of the core under the brass cap. It's critical that the gouge's cutting edge be the same height as the lathe's center, so adjust the depth of the groove for the gouge you're using.

—Ralph M. Luman, Virginia Beach, Va.

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

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696	Router table - fits all P-C routers	117.00
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7334	New! Random orbit sander	118.00
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7538	New! 3-1/4 HP Plunge router	245.00

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EY6200B	12v., 15 min. charge, 1/2" drill	189.00
EY6281B	9.6v., 15 min. charge, 3/8" drill, kl. ck., V.S.R., electric brake	185.00
EY571B	9.6v., 1 hr. charge, 3/8" drill, kl. ck., V.S.R. clutch	129.00
EY561B	7.2v., 2-speed, 1 hr. charge, 3/8" drill	99.00
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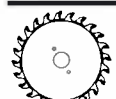
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6016	Finishing sander, 1/4 sheet	45.00
6236	2-speed AG/DC deep cut band saw	259.00
6256	Top handle jig saw	121.00

HITACHI

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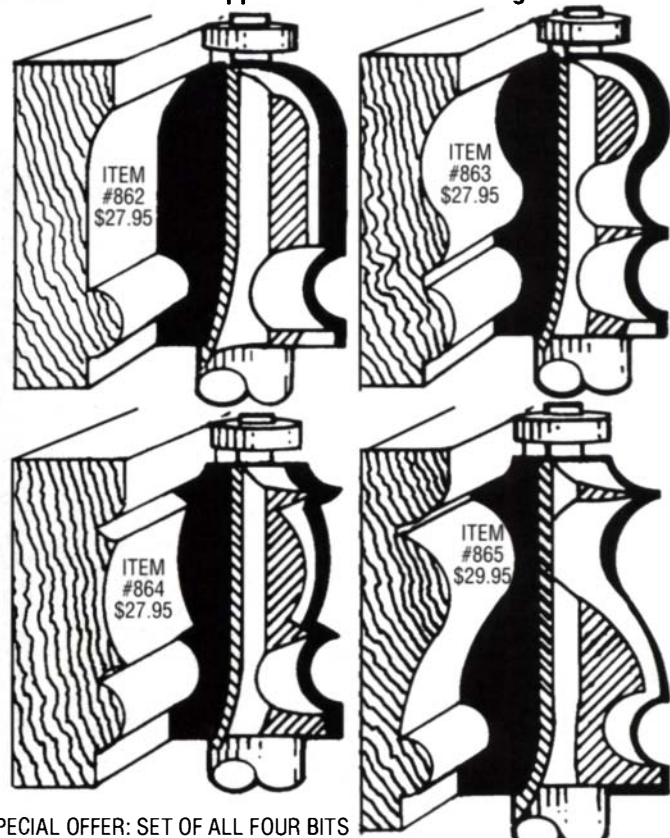


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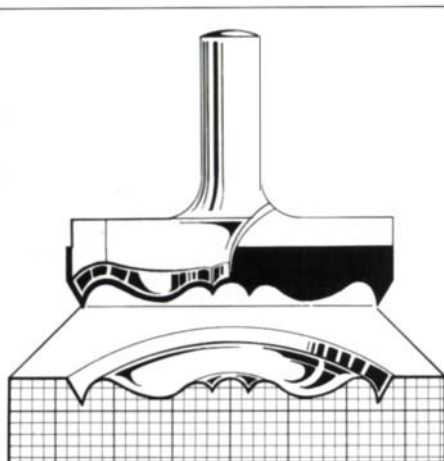
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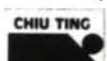
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READER SERVICE NO. 20

Solutions to mixing dyes

I run a small antique-furniture restoration and conservation business, and I prefer water-base dyes because of their transparent qualities, affordability and lightfastness. However, I'm wondering about the various possibilities of mixing these dyes: I've heard that water-base dyes can be mixed with other solvents to create solutions that supposedly make the dye both lightfast and non-grain-raising. Is this true, and if so, which are the best mixtures?

—Thomas Darby, Vancouver, Wash.

Chris Minick replies: The temptation to improve the properties of finishing materials by altering the solvent exists in all of us. Generally speaking, varnishes and lacquers are tolerant of minor solvent changes, but aniline dyes definitely are not. Changing the recommended solvent for an aniline dye can cause several interesting yet often undesirable effects. For example, a water-soluble aniline dye that produces a rich reddish-brown walnut stain on pine will produce an ugly yellow stain if dissolved in ethyl cellosolve. The same dye dissolved in methyl alcohol produces a purplish-gray stain on pine. Alcohol-soluble aniline dyes will likewise change colors if mixed in alternate solvents. A solvent change as seemingly minor as substituting butyl alcohol for methyl alcohol will cause a clear dark-brown walnut stain to become a muddy green brown; if mixed in water, a brilliant orange stain is produced.

The best way to ensure consistent color and color density with any aniline dye is to use the manufacturer's recommended solvent. However, simple experimentation on scrapwood will show the effect of solvent substitution with any particular aniline dye you choose, and you may wish to make up a sample board showing the various possibilities.



The pine sample board shown above was stained with a walnut-color aniline, with both water- and alcohol-soluble dyes mixed with various solvents. Top row, left to right is alcohol-soluble dye mixed with methyl alcohol, butyl alcohol, cellosolve, water; bottom row, left to right is water-soluble dye mixed with water, methyl alcohol, cellosolve, cellosolve/water mix.

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

Titanium-nitride-coated router bits

Recently, several router-bit manufacturers have started selling special bits treated with titanium nitride. The cutting edges and surfaces of these bits have a characteristic golden color. How does the coating affect the cutting properties of the bit, and since these bits are expensive, are they a cost-effective alternative to carbide bits?

—Charles R. Draney, Seattle, Wash.

Mark Duginske replies: Titanium nitride is commonly used in a coating process for metal-cutting tools and has become available for router bits, shaper cutters and industrial-quality woodworking cutting tools. The primary advantage of such a coating is to increase the lubricity of the cutter, which makes chips and sawdust less likely to accumulate. This helps the cutting edge to run cooler, thus increasing the usable life of the edge before resharpener is necessary. Some manufacturers claim the coating increases edge life 5 to 10 times more than a non-coated high-speed-steel edge.

Most titanium-nitride-coated bit users that I've spoken to agree that the coating does increase edge life considerably; therefore, I think the coating is probably worth the added expense, especially on bits that are hard to sharpen because of their complex profile (intricate molding cutters, for example), or on bits used for router mortising, which tend to dull quickly in heavy use. However, in a production shop where a cutter is used all day long, it would probably be best to stick with carbide-tip or solid-carbide bits and cutters, which stay sharp longer than titanium-nitride-coated bits.

[Mark Duginske is a woodworker, teacher and author who lives in Wausau, Wisc.]

Shaping curved raised-panel doors

I am planning to build a set of kitchen cabinets that have frame-and-raised-panel doors that are curved at the top. Although I've made lots of regular raised-panel doors, I don't know how to go about shaping the curved rails and panels. Could you please help me out?

—Carl C. Steinmetz, Mercerville, N.J.

Steve Tipton replies: Creating raised-panel doors with curves requires more time and effort than making straight cuts, but the end result looks far more impressive and allows greater flexibility for creating a visually interesting kitchen. While the basic frame-and-panel construction remains the same, the curved top rails and panels require template-guided cutting on the shaper. The same shaper cutters used for cutting the cope, the bead or rabbet (on the back of the frame) and for raising the panels are used for the curved work, but with a special roller-bearing collar fitted on the spindle beneath the cutter. A hardboard template is tacked to the underside of the workpiece, and this rubs against the roller bearing and guides the cut.

When you're ready to begin the curved shaper work, all straight edges on panels, rails and stiles should already be done. The table fence, used to guide the work on straight cuts, is removed and the rub collar and cutter are installed. The next step is to make the template for the desired curve from 1/4-in. hardboard, tempered Masonite or other thin stock. You'll need to make three templates: one each for the inner and outer curves on the top rails and one for the top edge of the panel. The template will ensure uniformity and a proper fit for all the door parts. After drawing the desired contour for each template, bandsaw the hardboard to within 1/16 in. outside the line, and carefully sand off the remaining material down to the line. I then use a 3-in.-dia. drum sander chucked in my drill press to follow the contours. This gives a smooth surface for the guide bearing to follow.

After the template is tacked onto the part, the work is carefully eased, freehand, into the cutter until the template contacts the guide bearing. To make this job safer, many shapers have a threaded hole in the tabletop to accept a small metal guide pin. This pin is used to stabilize the work as it is fed against the rotation of the cutters. Note that freehand shaping is an inherently dangerous operation—especially when using a large-diameter raised-panel cutter. Further, hold-down devices cannot be used with this setup, making the workpiece harder to control and more subject to dangerous kickback. Therefore, be sure to use extra caution when making freehand cuts, take light passes, use a guard over the spindle and cutter (shopmade, if necessary) and remember to *always* feed the stock *against* the rotation of the cutter.

[Steve Tipton is a woodworker in Calera, Ala.]

Motor capacity and shop wiring

I installed several 220v, single-phase electrical circuits in my new shop: five 20-amp circuits using no. 12 wire, and two 30-amp circuits using no. 10 wire. These are all one-receptacle-per-breaker circuits from a new feeder panel in



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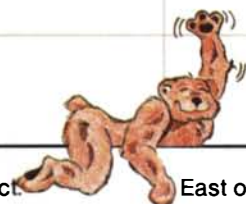


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my shop. However, the National Electric Code (NEC) says that the capacity of electrical circuits must be derated by 80%, which I interpret to mean that the largest allowable loads on my new circuits would be only 16 amps and 24 amps, respectively. Would I be in trouble plugging a 3-HP table saw, with a motor nameplate rated at 17 amps, into one of my 20-amp circuits? Am I interpreting the NEC correctly or am I being too conservative?

—Stephen R. Mosier, Greensboro, N.C.

Edward Cowern replies: Article 430 of the National Electric Code applies specifically to circuits for electric motors. It is quite true that the NEC does require conductors for motors to be oversize to the extent of 25% above the full-load nameplate current of the motors. This is equivalent to derating the wire to 80% of its normal capacity. Therefore, following the NEC to the letter, the wires for your table saw circuit *are not* adequate.

As a practical matter in a light-duty workshop, you would probably not experience any problems with the installation as it is. This is due to the character of woodworking operations. For example, the 3-HP motor would probably be under only a light load much of the time (depending on the material being cut). Under light-load conditions, the current used by the motor would be a good deal less than the amps stated on the nameplate. Also, cutting operations are not apt to last more than a few minutes at a time. For example, ripping a sheet of plywood from end to end might only take a minute to complete. Thus, the period of load is relatively small compared to the unloaded time. Also, you have the wires properly protected by the circuit breakers you've chosen.

The only time that you might experience difficulty is when you start up your table saw; the inrush of electrical current to the

motor is a good deal higher than the 20-amp circuit breaker. Since the circuit breakers are probably of a thermal type, they would probably "ride through" the inrush of starting current without problems, but they may trip occasionally. If you do experience this problem, you could probably solve it by changing the circuit breaker to a larger size (up to 150%), which is allowed by the NEC for motor circuits of your existing wire rating. [Ed Cowern is an electrical engineer and president of EMS, a company that distributes Baldor electric motors.]

Finishing the inside of a cedar chest

Our shop has built several cedar chests, each constructed of solid aromatic cedar and finished with two coats of clear shellac, followed by one coat of sealer and a finish coat of polyurethane varnish. Unfortunately, we are having problems with what appears to be sap bleeding through the finish. I've seen numerous solid-cedar gift items with a finish that seems to seal in the natural oils found in aromatic cedar. Are these finishes a trade secret, and if so, how should we be finishing our cedar chests?

—David L. Stewart, Gillett, Pa.

Jon Arno replies: I am somewhat puzzled that the method you have been using didn't work. The shellac base coat is the key, and provided that the subsequent material will bond to shellac without softening it, your method should have been successful. However, if the wood was not thoroughly dry, it is conceivable that escaping moisture may have breached the shellac barrier and allowed the wood's oils to migrate into the varnish topcoat. Shellac will not hold up to moisture, and the wood's oils, which contain anti-oxidants, will raise havoc with some polymer-base varnishes.

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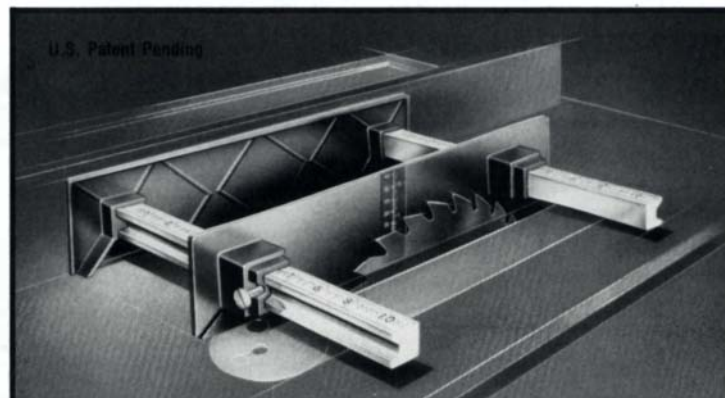
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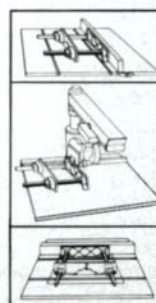
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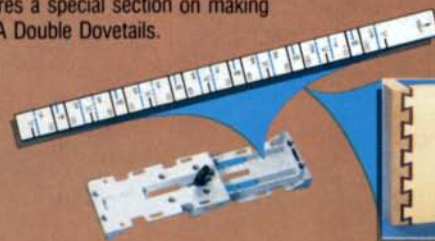
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For production reasons, the furniture manufacturer has recently substituted a new, proprietary vinyl precoat, which dries almost instantaneously, instead of the shellac. While the company won't let on to the composition of its secret vinyl sealer, I was assured that the shellac-base process described served well for more than 40 years. The company would still be using it if it didn't tie up its production line for 24 hours while the shellac cured bone dry.

As for the lacquer, the only caution is that it should be one which is formulated for application on wood so that it's flexible enough to allow expansion and contraction without cracking. Spray application of the lacquer produces the best results with the minimum number of coats.

[Jon Arno is a woodworker and amateur wood technologist in Schaumburg, Ill.]

Color-matching teak furniture

I made a breakfast table out of koa, and bought four chairs made of lacquered teak that matched the color of the koa reasonably well. However, when I oiled the koa table, it turned a reddish-brown color, destroying the match. Is there anything I can do to redden the teak or make the koa more brown?

—Mike Witkowski, Banks, Oreg.

Michael Dresdner replies: It is not easy to make one wood look like another, and although it is frequently done in commer-

cial finishing shops, it's often at the expense of some of the natural depth of the wood being altered. As a rule, it's easier to make wood darker than lighter. If the finish on the teak chairs is a regular nitrocellulose lacquer, I'd suggest stripping them and coloring them with a reddish-brown stain, to bring them into line with the table. When you are happy with the color match, relacquer them, or oil them as you did the table. However, you should test the oil finish on an inconspicuous spot before finishing all the chairs, as the oil may unfavorably change the color of the wood, as you discovered previously. Unfortunately, if the teak chairs have been commercially produced, the most likely finish is catalyzed lacquer. This common commercial finish is notoriously difficult to remove, and you must get down to raw wood before staining.

On the other hand, while it is easier to refinish one table than four chairs, many oils are also quite difficult to remove. If you used a drying oil, such as linseed or tung oil, you'll probably have to use stripper to get it off. (For more on oil finishing, see *FWW* #75, pp. 45-47.) When the wood is clean and free of the oil, check the color by wetting it with naphtha or alcohol. This will give the wood the appearance it will assume under a clear finish. If it is acceptable, use a water-white lacquer or varnish to avoid adding any other color. If it is still too red, but not too dark, you can often mitigate red with a light-greenish-yellow stain. Of course, if the koa is too dark, your only recourse is to bleach it.

[Michael Dresdner is a Contributing Editor for *FWW* and an instrumentmaker and finishing consultant in Perkasi, Pa.]

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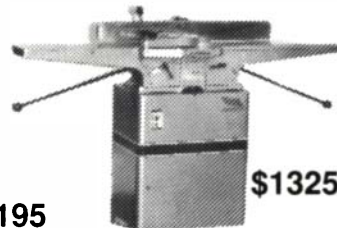


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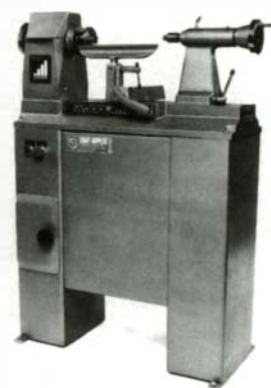
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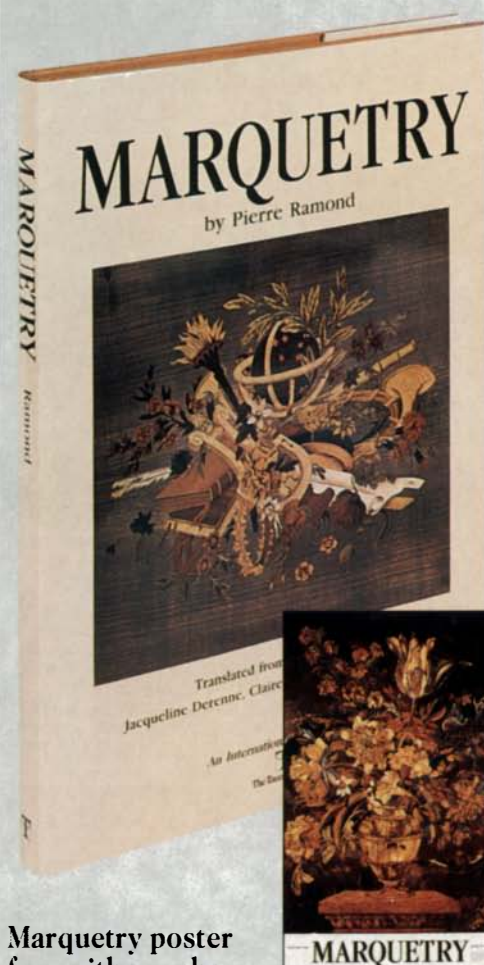
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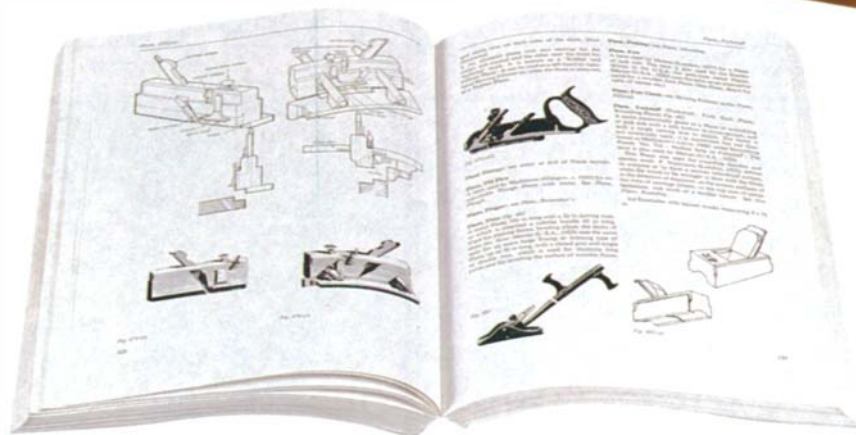
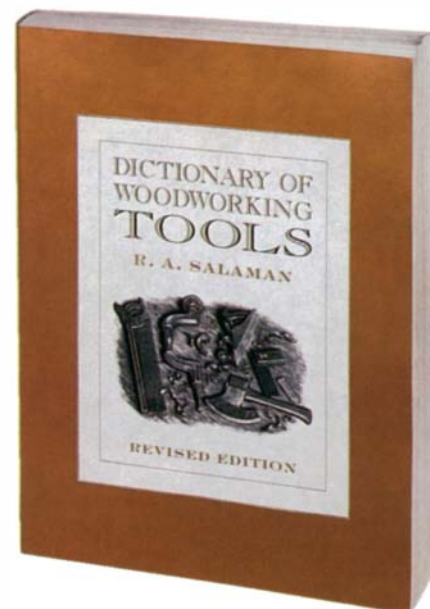
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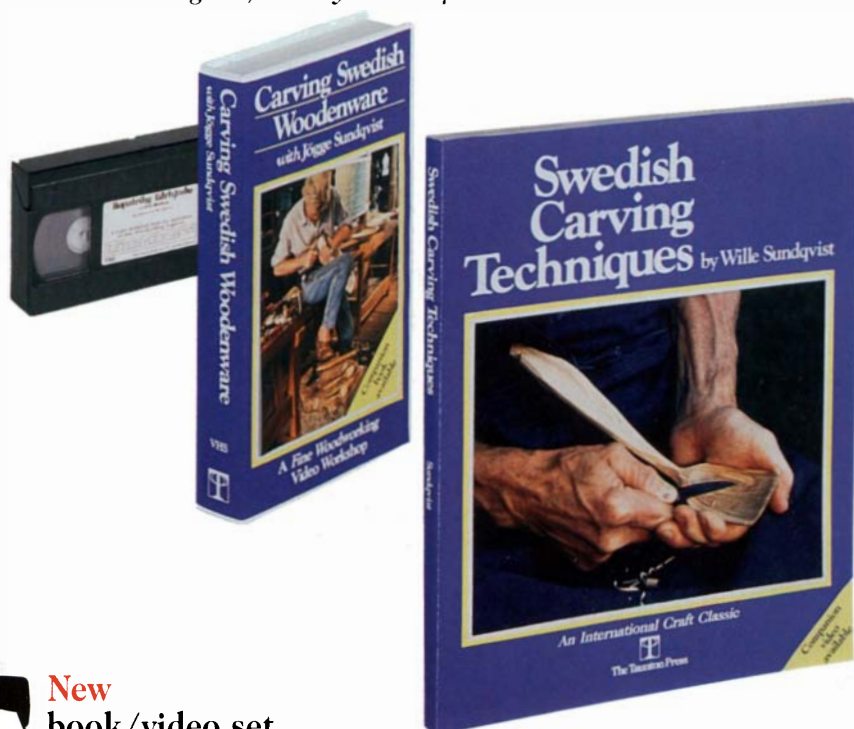
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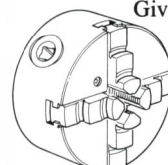
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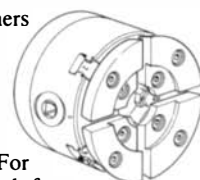
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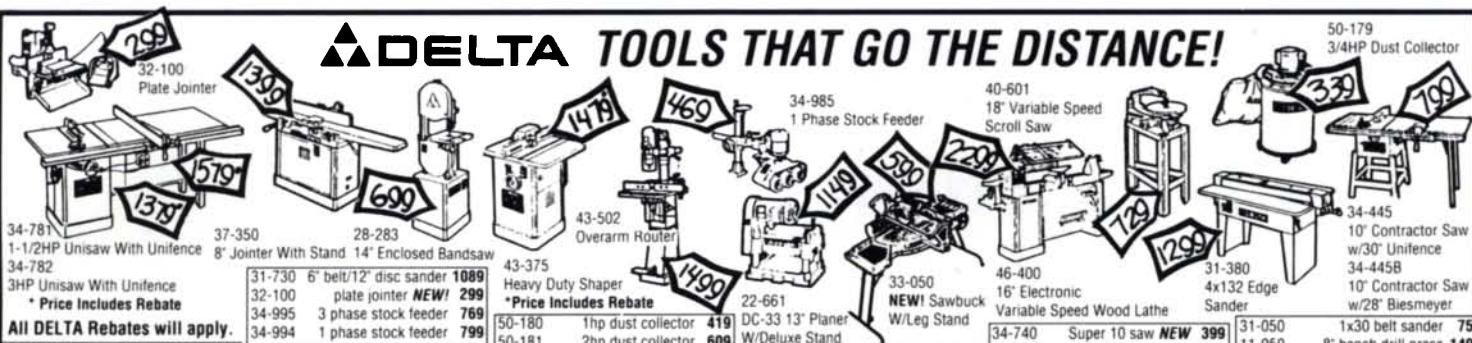


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Building a Tinware Cupboard

Flush panels modify a Shaker design

by Christian Becksvoort



The author's Shaker-inspired tinware cupboard is a functional piece that fits well in almost any room. The cupboard on the right is cherry with an oil finish. The other is birch, which Becksvoort ebonized on the outside and left natural on the inside. Adding to the beauty of each is a frame-and-panel back, shown on the cherry cupboard.

This Shaker tinware cupboard is a fascinating piece because it breaks all rules of proportion. The golden rectangle, a proportional principle used since ancient Greek civilizations, maintains that a height-to-width ratio of 1.6-to-1 is most harmonious, and other proportions create conflict. Yet this cupboard's size is what makes it one of the most versatile pieces I build. It is equally suitable in a hallway, bedroom, bath, kitchen or living room—anywhere space is at a premium—to store crystal, linens, clothes, camera equipment, papers, books, canned goods or even stereo components. My adaptation of the tinware cupboard is based on a Shaker original I saw at the Renwick Gallery of the Smithsonian Institution, Washington, D.C., in 1973. Built in New Lebanon, N.Y., the dark red painted pine piece was probably used in a kitchen or pantry.

The first few cupboards I built were faithful reproductions, scaled from a photo. Since then I have made a few minor changes, such as lighter stock and movable shelves. I usually make the carcass from $\frac{5}{8}$ -in.-thick edge glued cherry and use $\frac{3}{4}$ -in.-thick stock for the face frame and doors. The top and sides are rabbeted to receive the back and are dovetailed together, while the fixed middle shelf and the bottom are dadoed into the sides. The bottom is also screwed to the sides through glue blocks. Visually and structurally, the most important changes were to replace both the slab back and raised-panel doors with frames and flat-flush panels, as shown here, which give the piece a distinctive look while accommodating the natural expansion and contraction of the solid-wood doors and back panels. The face frame and flat-flush back panel are mortised and tenoned, and then glued to the carcass, resulting in an extremely rigid piece. Because five of the shelves are adjustable, rather than fixed as in the original, the cabinet is adaptable to a variety of storage requirements. And, instead of exterior spinners and a lock, I use interior spinners operated by the doorknobs.

While I usually prefer an oil finish on natural cherry pieces, I was intrigued by John McAlevey's article on ebonizing wood (FWW #76, pp. 47-49), a process that chemically dyes the stock, yet lets the grain show through. The Shakers often ebonized their chair frames, and so I thought why not an entire case? I experimented with one of my cupboards, making the carcass out of birch and leaving the interior natural to contrast with the dark ebonized exterior. When the doors are opened, the light, bright interior is a bit of a surprise, as you can see here.

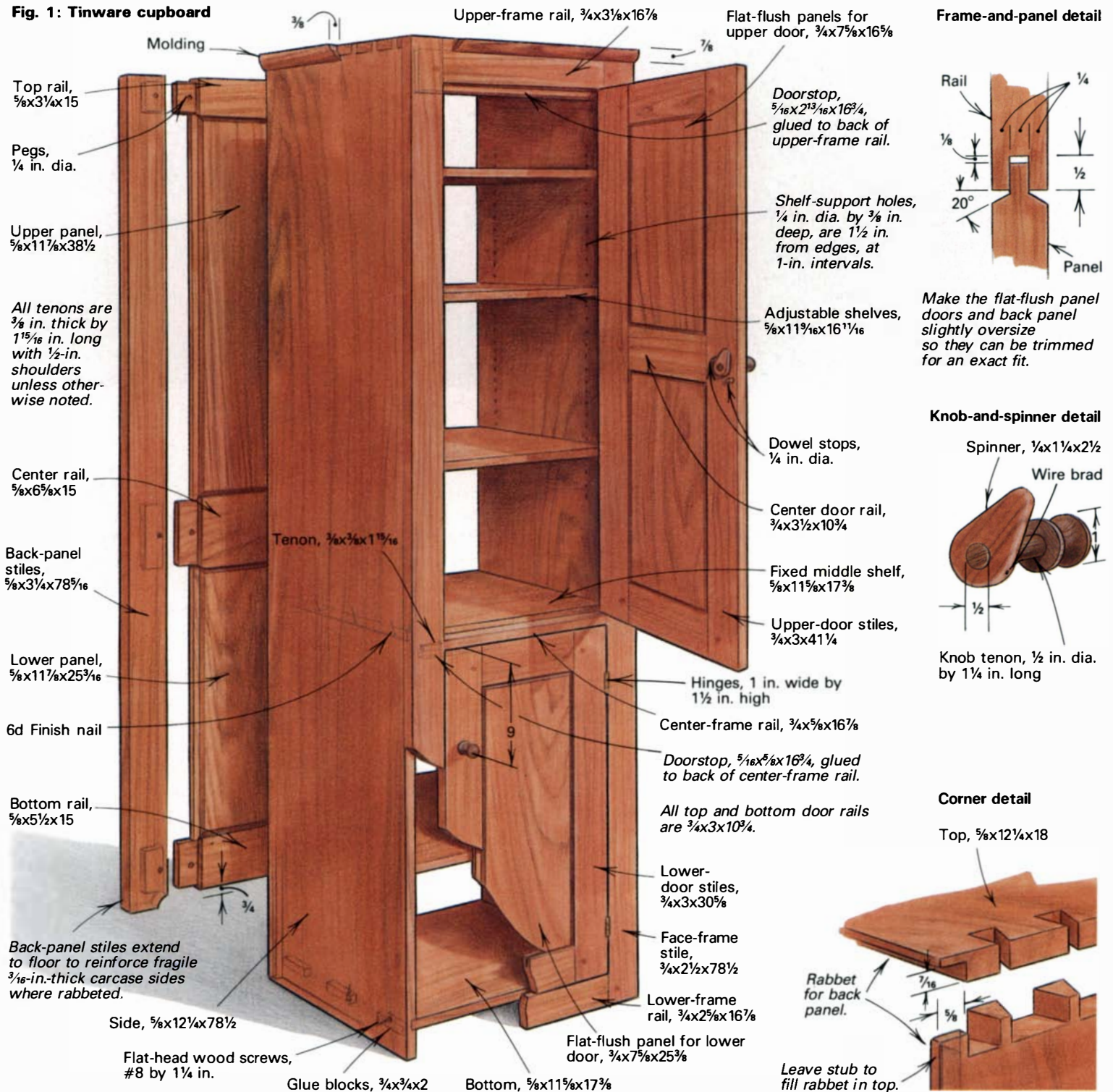
Carcass construction—To build this cupboard, you will need about 60 bd. ft. of cherry or birch, most of which gets glued up into four slightly oversize panels. Two panels, $\frac{3}{4}$ x12 $\frac{1}{2}$ x80, will make the sides, and two more, $\frac{3}{4}$ x12 $\frac{1}{2}$ x70, will be cut into the top and bottom, the fixed middle shelf and five adjustable shelves. After planing these panels to $\frac{5}{8}$ in. thick, cut the individual pieces

to the correct lengths and widths given in figure 1 below. On the tablesaw, rip a $\frac{5}{16}$ -in.-wide by $\frac{7}{16}$ -in.-deep rabbet along the inside back edges of the two sides and top to receive the back panel. To dovetail the sides to the top, begin by laying out and cutting the tails on the top. The tails at the front and back edges are half-tails, and the tail at the back edge is positioned so the pin on the side does not interfere with the back-panel rabbet. Six more tails are equally spaced between the front and back tails. Now, secure the top to the sides with a 90° angle clamp, and lay out the pins by scribing the sides with a knife. Because I'm used to cutting pins for dovetails in a vertical position, I clamp the sides to the stringer of my open stairway and stand on the stairs to cut the pins. You may find it easier to lay the sides on sawhorses to cut the pins. When cutting away the waste for the pins, leave a stub at the back of the

sides to fill in the gap left by the back-panel rabbet cut in the top, as shown in the detail in figure 1. Before assembling the top to the sides, rout the dados for the bottom and the fixed middle shelf, guided by the dual-fence router jig shown in the top, left photo on the next page. These dados can also be cut on the tablesaw guided by the miter gauge, but I find this operation unwieldy with long side panels. After sanding the interior surfaces, beginning with 120-grit paper and working up to 220-grit, I assemble the top to the sides. When clamping the dovetails, a spacer about a foot below the top keeps the sides from pulling together as the clamps are tightened (see the photo at right on the next page).

While the glue dries, sand the middle shelf and bottom as before, working up to 220-grit sandpaper. Slide the middle shelf into the dados and toenail it from underneath with three 6d finish

Fig. 1: Tinware cupboard





Left: This dual-fence jig guides the router from both sides, minimizing any possibility of miscutting the dado, and it is long enough to rout both side panels at once. The batten clamped beside the jig aligns the panels.

Right: To hold the sides in position for installing the top, the author clamps them to the workbench and a sawhorse. A spacer wedged between the sides prevents the clamps from bowing the sides during glue-up.

Below: This shopmade drill guide automatically spaces holes for movable shelf brackets and locates them 1½ in. from the carcass edge. A ½-in. dowel on the drill bit controls the depth of cut.



nails per side. You could glue the shelf in place, but it isn't really necessary because the rear panel and face frame will prevent the sides of the carcass from spreading. The bottom is assembled the same way, but for extra support, I prefer to add three ¾x¾x2 glue blocks to each side and screw up into the shelf, as well as into the sides (see figure 1). Using three separate blocks, rather than a single cleat, allows the solid-wood sides and bottom to move as moisture conditions change. While you are working on this end of the carcass, lightly chamfer the bottom edges of the sides. This makes it easier to move the cupboard across the floor.

Now that the case is fairly rigid, but before the back goes on, I drill the ¼-in.-dia. by ¾-in.-deep shelf-support holes using the shopmade drill guide shown in the bottom photo. I made several of these ¾-in. by 4-in. hard-maple guides in different lengths for use in a variety of cabinet interiors. To make a guide, clamp a fence to the drill-press table and bore a row of holes 1½ in. from the edge of the drill guide at 1-in. intervals along the entire length.

To use the guide, label one end "down" on both sides. Butt this end against either the bottom or the middle shelf, and clamp the guide so that the holes are 1½ in. from the carcass edge. To get the cleanest holes, I use a brad-point bit chucked in my hand drill. A section of ½-in. dowel, drilled lengthwise and left on the bit, serves as a positive stop to prevent drilling through the cabinet sides. Determine the length of the stop by subtracting 1⅛ in. (¾ in. for the drill guide and ⅜ in. for the depth of the shelf-support hole) from the exposed length of the drill bit. Now, carefully insert the bit into the guide until it hits the cabinet side and drill until the dowel stop bottoms out. Repeat this process for all eight rows of holes, sanding the "fuzz" around the holes with 220-grit paper.

Making the face frame—When made as a single mortised-and-tenoned unit, the face frame strengthens the carcass greatly and prevents the sides from spreading or compressing. I use the assembled carcass as a reference for measuring the stiles and rails and for laying out the mortises and tenons. This reduces measurement errors and ensures the face frame will fit properly. The carcass is easier to work on if laid flat across two sawhorses. Measure the diagonals to be sure the carcass is square, and sight from top to bottom, across a pair of winding sticks, to check flatness. Clamp from opposing corners to correct squareness, and shim as necessary to remove any twist.

I cut the frame stiles and rails ⅛ in. larger than the dimensions in figure 1 so I can plane the installed face frame to fit the carcass exactly. Place the stiles in position on the carcass, and lay the frame rails in position over the stiles. The center and bottom rails should be laid out so they cover only the bottom half of the middle shelf and the bottom. The exposed upper half of the shelf thickness acts as a door-stop. Mark the position of the rails on the stiles and then lay out the mortises, leaving at least ½ in. to the ends of the stiles. I have a horizontal boring machine for cutting the ¾-in.-wide by 2-in.-deep mortises in the stiles, but you can also use a router or drill press, or chop them out with a chisel and mallet. I cut my mortises first so that I can test the adjustment of my tablesaw when crosscutting the tenons. I set up the saw so the fence acts as a stop for the tenon, and I hold the stock against the miter gauge as I make multiple cuts on each face of the rail to form the tenon.

After cutting the tenons, assemble the face frame and sand it as before, working up to 220-grit. Dry-fit the frame onto the case so you can check for side-to-side fit, length and squareness. If the case sides are perfectly straight, you can joint the face frame's ⅛-in. overhang

Hanging flush cabinet doors

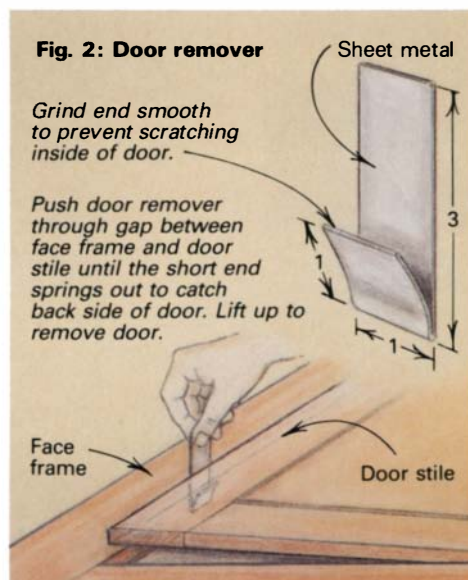
Everyone develops their own methods and routines for hanging doors. But I like to keep things as simple as possible, with a minimum of measuring. The tinware cupboard described in the main article is a good project for practicing door hanging because the carcass can be laid flat on its back and gravity will hold the doors as you adjust and position them for a perfect fit. Although it's easiest to install doors with the case on its back, these techniques will also work on vertical installations.

Fitting the door: I make my doors slightly oversize and then saw or joint the lock stile to fit, taking the dimensions directly from the opening. Leave the door relatively tight in the opening; you can always shave off more later. To mark the door bottom for trimming, first place the door in its opening as tight to the bottom as possible, and then draw a line on the door, parallel with and as close to the frame rail as possible. Saw or joint to this line. The door should now fit on three sides. With the door placed back in its opening, mark the top for cutting by drawing a line a full $\frac{1}{8}$ in. below and parallel to the top frame rail. Saw or joint to this line and retest the fit.

A flush door sitting in its opening is extremely difficult to remove. You can put a screw where the nob will go, predrill the knob hole to provide a fingertip grip or make a sheet-metal "door remover," as shown in figure 2 above, but don't try to pry the door out with a screwdriver or chisel.

Selecting the appropriate hinge depends on the size of the piece and the weight and width of the door. Generally, the larger the piece, the bigger and heavier the door will be and the larger the hinge needs to be. Also, the wider the door, the greater the leverage it exerts on the hinges. I've found that $1\frac{1}{2}$ -in. or 2-in. hinges work on 90% of the case goods I build, but for larger pieces, like an armoire, I'll use $2\frac{1}{2}$ -in. or 3-in. hinges. For smaller projects, such as jewelry boxes, aesthetics become more important than strength, and so much smaller hinges can be used.

The exact gap needed around the door is determined by the hinge type, the season of the year and the moisture content of the wood. As a very rough rule, I like to leave about $\frac{1}{16}$ in. plus on the two sides and the top, and a bit more on the bottom. Age, wear and gravity conspire to move doors down, never up. While the gap on the hinge side is predetermined by the hinge, it is not unchangeable. The gap on the lock side should be bigger if it is winter



For best fit, hinge mortises must be accurately laid out. Here the author uses a knife to trace the hinge outline to the door stile.



With the door positioned, Becksvoort uses a knife to transfer the hinge location to the face frame. For accuracy, you must not move the door when making these marks.

and the wood is dry because next summer's humidity will cause the stiles to swell. Leave the gaps a bit bigger all around if the cabinet is to be painted. On the other hand, if it is mid-summer and the moisture content of the wood is 11% to 12%, the gap can be quite small. Remember that the hinge-side gap will remain constant; so all the wood movement of the door frame will be apparent on the lock side. Also, I usually bevel the edge of the lock stile a few degrees for greater swing clearance.

Hinge layout: Butt hinges are usually set at the intersections of the door rails and stiles: the top hinge even with the top of the panel and the bottom hinge even with the bottom of the panel. Setting the hinge as close as possible to the rail is not only structurally sound, but also aesthetically pleasing, forming a sight line between rails and hinges. Also, I set hinges with the barrel fully revealed, which provides clearance when the door is opened 180° .

To set the hinges, first place the door in a vise, hinge-side up. Using a square, locate one end of the hinge by transferring the rail-stile intersection to the edge of the stile. Turn the hinge upside down and press the barrel against the outside face of the door, as shown in the top photo, aligning the top or bottom with the mark. With a knife, scribe the stile carefully for all three sides of the hinge. Then set your marking gauge to the thickness of the leaf and scribe the outside face of the door between the knife marks. Rout or chisel the hinge mortise as marked. For hinges with tapered leaves, chisel upward to the back of the mortise, matching the bevel of the hinge leaf. Repeat for the other hinge. Mount the hinges with screws in just the center holes so you have the option of persuading the hinge into a better position later, should that be necessary.

Now, carefully place the door in its opening with the desired gap left at the top and bottom. With a knife or razor, mark the tops and bottoms of the hinges where they touch the cabinet frame, as shown in the bottom photo, being careful not to shift the door. Remove the door and one of the hinges. Place the hinge barrel between the marks on the frame so that the barrel sits on the frame and the leaf hangs down along the inside frame edge. Then, scribe the hinge location with a knife and marking gauge and chisel out the waste as before. Test the fit by remounting the hinges with one screw per leaf, and make any necessary adjustments before installing the other screws. —C.B.



During glue-up, clamping strips are used to protect the face frame and the rabbet on the back edge. The large number of clamps ensures a good bond. The wedges and batten help secure the center-frame rail, where clamps won't reach. Wedges under the feet of the sawhorse remove twist from the carcass.

or you can wait until the face frame is attached to the carcass and then plane the overhang for an exact fit. Before gluing the frame in place, get all your clamps ready; I use 20 or more, as well as protective strips for the face frame and the fragile rabbet along the back edge. Then, spread the glue, position the face frame and clamp it to the carcass, as shown above. Two $\frac{3}{16}$ -in.-thick boards, glued and clamped to the back side of the center-frame rail and the top-frame rail, as shown in figure 1, serve as the top doorstops. These stops extend the full width of the cupboard's interior, butt against the top and the middle shelf, and extend $\frac{1}{16}$ in. below the frame rails, balancing the $\frac{3}{16}$ -in. exposed edge of the middle shelf and bottom.

Building frames and panels—I like double-sided, flat-flush frames and panels for the doors and back panel instead of the raised-panel doors and the single-board back on the original cupboard. The $\frac{3}{4}$ -in.-thick doors and the $\frac{3}{8}$ -in.-thick back are slightly oversize so they can be trimmed to fit. Mortise the stiles $\frac{3}{8}$ in. wide by 2 in. deep, as previously described, and then tenon the rails to fit. Dado $\frac{1}{4}$ -in.-wide by $\frac{1}{2}$ -in.-deep stopped grooves on the stiles, and dado through grooves on the rails for the panels. By stopping the stile's groove, you eliminate the need to cut a haunched tenon on the rail without leaving a visible groove at the ends of the stiles. The $\frac{1}{4}$ -in.-thick by $\frac{1}{2}$ -in.-wide panel tongues are cut with only two tablesaw setups. Although the shoulder cut can be vertical, I like a slight bevel, as shown in figure 1 on p. 39. The first setup cuts the face of the tongue. Set the blade $\frac{1}{2}$ in. above the table and add a high auxiliary fence to support the panel on edge. Adjust the fence to leave a $\frac{1}{4}$ -in.-wide center section, which will form the tongue. Cut the panel by running it over the blade vertically on all four edges, referencing for the first cut from the face of the panel and for the second cut from the back of the panel. Then, tilt the blade 20° to 25° and set the fence $\frac{1}{2}$ in. from the side of the blade farthest from the fence. With the panel flat on the table, cut the waste from the tongue, which now forms the beveled shoulder. Sand the tongue and bevel carefully to remove sawmarks.

Dry-fit the doors and back panel, making adjustments for a snug but not-too-tight fit, and then glue and clamp the frames around the floating panels. In keeping with Shaker tradition, I peg the doors' mortise-and-tenon joints and the back panel. To save time and to free up clamps, I drill for the $\frac{1}{4}$ -in. pegs right away, pound them through and then remove the clamps. Excess peg length is sawed off both sides. Although you can plane and hand-sand the doors and back panel to final dimensions, I rely on the wide belt sander at a local mill shop to save me hours of labor. I have the panels sanded to 180-grit, which leaves barely perceptible cross-grain scratches on the rails. I easily remove these scratches with a vibrating sander.

To install the back panel, turn the carcass facedown on the horses and fit the back snugly into its rabbets. The bottom rail on the back will be $\frac{3}{4}$ in. from the bottom of the carcass, but the stiles continue to the floor to reinforce the fragile $\frac{3}{16}$ -in.-thick carcass sides where rabbeted. Beveling the inside corners of the back panel makes it easier to slide into its rabbets, as well as provides space for excess glue. Get the clamps and clamp sticks ready, apply the glue and clamp everything together. The back should be clamped front to back, as well as side to side, to fully seat it in the rabbets. If you don't have enough clamps, 6d finishing nails help hold things together while the glue dries. Countersink the nails deeply, and plug the holes by gluing in wooden pegs and chiseling them flush to the back panel.

The top molding shown in figure 1 is one of my favorites. While the glue is drying, I shape the molding stock with a cutter in a molding head on my tablesaw. Since you only need 46 in. of molding, however, it can be roughed and shaped easily with a block plane in 10 to 15 minutes. Start with a piece of $\frac{7}{8}$ -in.-thick stock that is 4 in. to 6 in. wide by 50 in. long. Draw the profile on each end, mark off $\frac{3}{8}$ in. (the total thickness of the molding), clamp the stock in a vise and plane the stock to shape. When it looks just right, rip the $\frac{3}{8}$ -in. molding on the tablesaw and finish-sand it.

Before applying the molding, I sand the carcass, starting with 150-grit paper in a belt sander and working up to 180-, 220- and 320-grit paper in a palm sander; finish up by hand-sanding with 320- and 600-grit. Now, miter the front molding and glue it in place. To keep the molding from slipping while clamped, I drive two small brads into the carcass at the molding location, snip off their heads and force the molding onto the pins. Glue the miters and the first 2 in. of the side molding, and then nail the rest in place with countersunk and filled 6d finish nails, which allow for seasonal movement of the carcass side. Now, sand the top, following the same sequence as before, and touch up the molding as needed. Be careful not to leave cross-grain scratches on the case sides.

The details—I fit and hang the doors as described in the sidebar on the previous page, and then I install the door bumpers, knobs and spinners as shown in figure 1. Shopmade $\frac{3}{8}$ -in.-dia. leather pads, glued to the lock side of the upper and lower doorstops, make for quiet closings and convey quality construction. I turn the knobs from a $1\frac{1}{4} \times 1\frac{1}{4} \times 2\frac{1}{2}$ block on the lathe after shaping the knob tenon with a $\frac{1}{2}$ -in. plug cutter on the drill press. Drill the knob holes with a $\frac{3}{16}$ -in.-dia. bit, which will allow the knobs to turn easily in the doors, as shown in figure 1.

The spinner, a $\frac{1}{4} \times 1\frac{1}{4} \times 2\frac{1}{2}$ scrap with a $\frac{1}{2}$ -in.-dia. hole, is cut to a pointed oval shape so that it protrudes about $\frac{3}{8}$ in. beyond the door frame. The spinner's placement on the tenon is critical: too loose and it feels sloppy, but too tight and the knob won't turn. I carefully hammer the spinner into place until it feels just right, and then drill a pilot hole and drive a brad through the spinner and tenon to lock them together. Cut off the excess tenon and install the $\frac{1}{4}$ -in.-dia. dowels that stop the spinner in the open and closed positions.

A final sanding and the finish of your choice completes the cupboard. I normally use Watco oil on my cherry cupboards, but I ebonized my birch cupboard following the process in McAuley's article. I applied two coats of the steel wool/vinegar ebonizing mixture, sanding lightly between coats. Some experimenting with ebonized scraps showed oil does not give very satisfactory results, but a sprayed lacquer finish brings out a rich ebony color and provides a satin sheen. Don't polish the lacquer. Remember, this is a Shaker cupboard, not a grand piano. □

Christian H. Becksvoort builds custom furniture in New Gloucester, Maine, and is a Contributing Editor to FWW.

Edgebanding

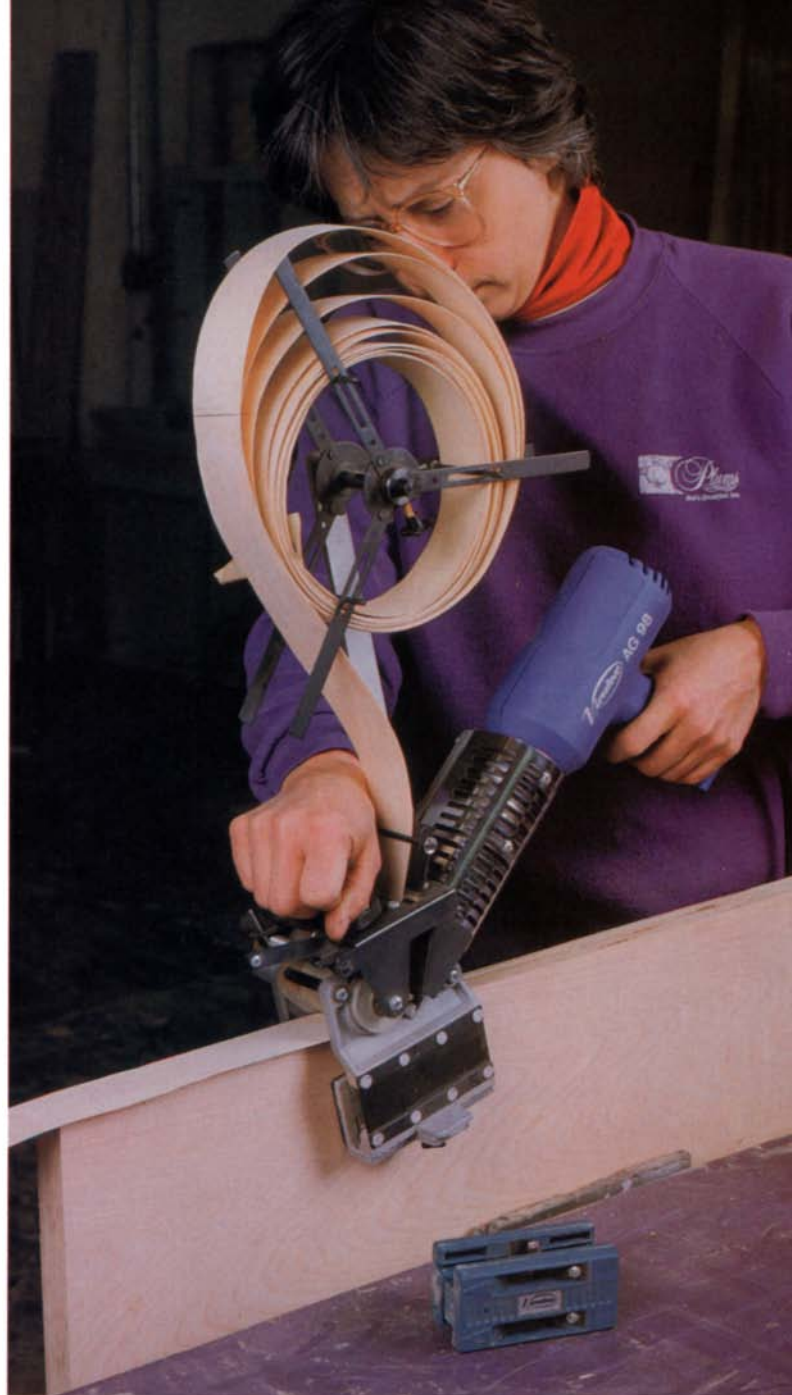
Tools and materials for hiding a panel's edges

by Jack Gavin

Plywood, fiberboard and particleboard have been a great boon to the modern woodworker. These panel products are solid, easy to handle and relatively inexpensive. They are dimensionally stable and, if stored properly, perfectly flat. Eighteenth-century cabinetmakers would have been ecstatic if they had the opportunity to buy great slabs of material that were jointed, thickened, squared, veneered and ready to be cut to any shape. But despite their virtues, panel products all have ugly edges.

Several solutions are possible, but I think edgebanding, a glue-on veneer, is the best. A solid hardwood edge looks great, but making and installing it is very time-consuming. Plastic T-moldings and aluminum edge strips are strictly utilitarian. And nail-on edge moldings have to be filled and sanded. Edgebanding tape, although not a perfect edge treatment, has many advantages. It is faster to apply than any other method of edging, with the possible exception of T-molding. Edgebanding tape is inexpensive, tool outlay to install it can be minimal, and it's available in a great assortment of attractive wood species, as well as in colored plastics and metallics.

You should be aware of several drawbacks to all edgebanding tape. First, it is only as thick as heavy paper and doesn't offer any protection to an edge, as does solid wood. So high-abuse areas should have a heavier, more durable edging. Second, both pressure-sensitive and hot-melt adhesives can be adversely affected by solvents in finishing products. Even though tapes have a solvent-resistant, resin-coated paper backing, solvents can seep into the glue at the tape's joints. You should prime edgebanded panels with a sealer coat of finish, not allowing it to accumulate at the tape's joints. A heavy coat could penetrate and delaminate the tape. Another problem is that you can't do much with a veneered edge but leave it square. You can wrap tape around a bull-nose edge, but it seems to me this would be as much work as using solid wood.



The Virutex edgebander uses hot air to melt the glue on preglued tape. With it, you can apply veneer to panels of almost any size because you move the tool and not the panel. The hand-held Virutex, which costs about \$300, can also apply tape to curved edges.

Edgebanding tapes—Tapes are available in several standard widths, $\frac{1}{16}$ in. being the most popular since it is used with $\frac{3}{4}$ -in.-thick material. Other common widths include $1\frac{5}{8}$ in., 2 in. and 3 in., but widths up to 12 in. can be ordered from some manufacturers. Wooden edgebanding tape is made by selecting flitches of $\frac{1}{40}$ -in.-thick veneer and cutting out imperfections to produce matched 12-in.-wide sheets. These sheets are color matched, spliced into rolls with finger joints and then backed with a resin-impregnated paper before they're sanded. Then the 12-in.-wide roll is slit into narrower widths. To produce pregled tape, hot glue, which is a high-viscosity vinyl-acetate plastic, is applied to the back. Depending on the wood species, pregled veneer tapes cost about 10 cents to 13 cents per foot, and polyvinyl chloride (PVC) tapes cost several cents less.

Depending on the method of application, three different types of edgebanding tape are available. Pressure-sensitive tape, like adhesive tape, is simply pressed on without special tools; pregled



Left: It's simple to apply preglued edgebanding tape with a hot iron that melts the glue. Keep the iron moving and press the tape down with the rounded edge of a piece of wood. Above: After ironing on the tape, it is trimmed with a single-edge razor blade and the corners are lightly sanded.

tape, which has a thin layer of hot glue on the back, is laminated to the edge with a hot iron or edgebander; and non-glued tape is usually applied with an automatic edgebander, which spreads hot glue on the panel edge before it presses on the tape (and some fully automatic machines then trim excess tape from the panel's edges and ends). In each case, it is important that the panel's edge be clean and freshly cut, since dirt or dust on the surface will prevent the tape from sticking properly.

Pressure-sensitive edgebanding tape is the simplest and fastest to apply. You simply peel off its protective backing strip, and then align and rub the tape on the panel edge using the blunted corner of a piece of wood. To finish the corners of the panel, trim the excess tape with a handplane or router and then sand lightly. The tape has an adhesive similar to but stronger than the adhesive on duct tape. Pressure-sensitive tapes have been around longer than preglued tapes, and although the quality of adhesive may vary, the better tapes adhere almost as well as tapes applied with hot glue. The disadvantage of pressure-sensitive tapes is that they cost at least twice as much as preglued or non-glued tapes.

Preglued wood-veneer edgebanding is the most popular type for small shops and non-professionals because it's easy to apply—

Sources of supply

Edgebanding tape is available from:

Canplast Inc., 4797 Couture Blvd., Montreal, Que., Canada H1R 3H7; (514) 327-9555.

Edgemate Division, Westvaco Corp., 333 Closfon Road, Roaring Springs, PA 16673; (800) 458-3761.

Edging Plus, Inc., 103-K Creek Ridge Road, Greensboro, NC 27406; (919) 273-4210.

Flexible Materials, Inc., 11209 Electron Drive, Louisville, KY 40299; (502) 267-7717.

Therm O Web, 112 W. Carpenter Ave., Wheeling, IL 60090; (708) 520-5200.

Woodtape Inc., 11403 120th Ave. N.E., Kirkland, WA 98033; (800) 426-6362.

Edgebanding tools are available from:

Freud, 218 Feld Ave., High Point, NC 27264; (919) 434-3171.

Edgemate Division, Westvaco Corp., 333 Closfon Road, Roaring Springs, PA 16673; (800) 458-3761.

Holz Machinery Corp., 45 Halladay St., Jersey City, NJ 07304; (201) 433-3800.

The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514; (612) 428-2199.

an excellent job can be done with an electric hot iron and a razor blade (for trimming), as shown in the photos above. Tape usually comes on 250-ft. rolls, and it's available in natural birch, walnut, cherry, mahogany, red and white oak, maple, teak, white ash, pecan and pine. Rolls of flexible plastic edgebanding tape are available in white, almond, gray and black PVC. Some manufacturers will custom make tapes in any wood species or PVC color.

Non-glued tape is designed for automatic edgebanding machines, which have a built-in glue applicator. Without one of these machines, non-glued tapes can be applied with contact cement, hot glue or yellow glue and clamps, but this defeats the purpose of edgebanding. It is supposed to be a simple, fast way to cover panel edges. Non-glued tapes cost about the same as preglued tapes and they come in as many species, colors and sizes, but they are about 1/16 in. wider.

Applying preglued tape with a hot iron—Although you can apply edgebanding with a variety of equipment, the simplest method is with a hot iron, as shown in the left photo. Turn the iron on “high,” place the tape glue-side down on the panel edge and press it on. Allow enough time to melt the glue, several seconds at the most, but don't let the iron linger over any one spot: You can burn the veneer as easily as you can burn a shirt. To adhere the tape to the edge once the glue has melted, use the slightly radiused corner of a wood block and rub the veneer back and forth several times with moderate pressure. If you find any bubbles, simply reheat the veneer with the iron and rub the bubbles out.

After several seconds, the glue will cool and harden. When the glue has cooled, I slice off any excess tape with a single-edge razor blade, as shown in the photo at right, but some people prefer to remove it with a file. Then the corners should be lightly sanded with 120-grit paper. You can use a router with a flush-trimming bit to do the job faster, but the tape may fray and chip when its grain isn't parallel to the edge. I have also seen edgebanding trimmed with a belt sander, but this requires a deft hand to keep from sanding through the veneer on the face of the panel.

The Freud and Virutex edgebanders—Between the hot iron and fully automatic edgebanders are several edgebanding machines, each a little more automated than the next, each a little bit faster and each a bit more expensive. I reviewed two that are somewhat more convenient than but not much faster than a hot iron: the

Freud, shown in the top photo, and the Virutex, shown in the photo on p. 43. The manufacturer's list price for both machines is about \$370, although I found them discounted at about \$300, and both were easy to set up right from the box. I had to file down the Freud's tape guide, since it scraped glue from the tape before the tape reached the panel's edge. Other than that, both machines worked well once I learned to use them.

And both machines took little time to learn. After several hundred feet of tape I felt comfortable with them, but I still don't consider myself an expert. You must get a "feel" for feed rate, which depends on the heat setting, which in turn depends on your expertise. Applying tape, I averaged 1 ft. in four to six seconds.

I was skeptical that hot air could melt the glue sufficiently. However, the heat in both the Freud and Virutex edgebanders is supplied from adapted Steinel brand adjustable heat guns, which are commonly used to remove paint. And both edgebanders get very hot. In fact, if you linger on one area, you will scorch the veneer. I had to use the Virutex on the lowest setting until I was familiar with it.

The Freud is a stationary machine, mounted on a tabletop, while the Virutex is hand held. Both require preglued tape and have a built-in cutter that trims the tape to length when you finish gluing it to an edge. The Freud works best for panels up to about 2 ft. wide by 3 ft. long. Larger panels are difficult to wrestle through the machine without auxiliary tables to support the weight. Although the Virutex is a bit cumbersome with small pieces, it handles larger panels easily, since you must clamp the panels in a vise and move the machine over the edge. The disadvantage to the Virutex is that the operator must stop and reclamp the panel to tape each edge. This gives the Freud a decided advantage in speed when edging smaller panels. However, an added advantage of the Virutex is its ability to apply tape to curved edges; the Freud can only tape straight edges.

Neither the Freud nor the Virutex automatically trims the excess tape flush with the panel's surfaces, but the Virutex comes with a trimming tool with blades that cut both sides of the tape at once, as shown in the center photo. The idea is good, but the tool tended to tear and chip the tape where the grain wasn't parallel to the tape's edge. Freud doesn't supply a trimming tool.

A fully automatic edgebander—I bought a fully automatic Holz-IDM edgebander for my five-man cabinet shop. The machine is 10 ft. long, weighs 2,500 lbs. and costs almost \$20,000. Besides veneer and PVC tapes, this automatic edgebander applies plastic laminate and solid-wood edging up to 1/2 in. thick. As you feed panels onto a conveyor belt, the machine automatically coats their edges with melted glue before it applies edging material, which is fed from a roll or from a magazine. Then, two saws flush-trim both ends of the edging and two routers cut excess edging flush with the top and bottom panel surfaces. All of this takes about five seconds and the machine edges as fast as I can feed panels into it, all day long.

Now I can apply plastic laminates, as shown in the bottom photo, much faster than with any other method, and I no longer have to wait for contact cement to dry. But the Holz-IDM really earns its keep when thicker wood edging is applied. On a recent job, we built many doors with mahogany veneer on fiberboard cores that were edged with 1/8-in.-thick mahogany on all four edges. It would have taken two men at least four days using yellow glue—clamping, cleaning up squeeze-out, planing, trimming and scraping. The job took three hours with the edgebander, including set-up time. □

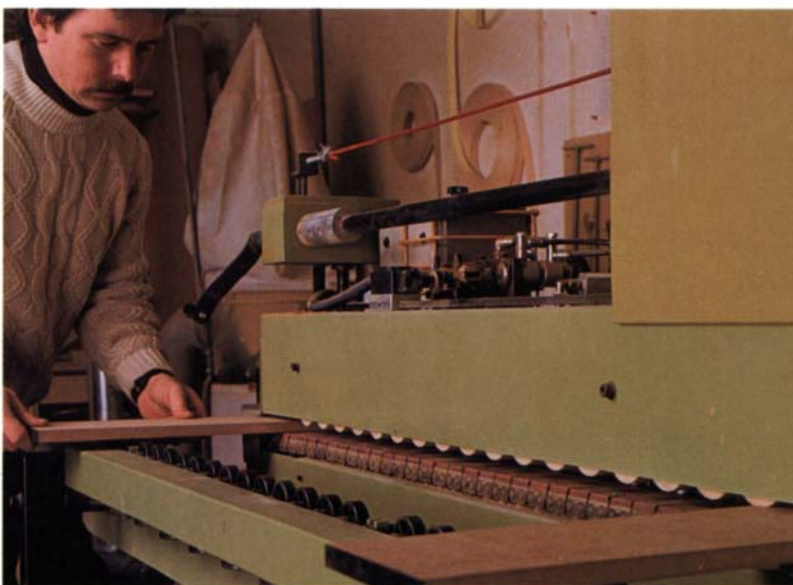
Jack Gavin, who owns and operates Gavin Construction in Brooklyn, N.Y., builds custom cabinets and furniture.



The Freud edgebander can apply preglued tape to panels up to 2 ft. wide by 3 ft. long without table extensions. It melts the tape's glue, automatically applies the tape and has a cutter to trim the tape to length. It sells for about \$300.



The Virutex edgebander comes with this trimming tool that cuts both sides of the tape at the same time.



The Holz-IDM is a fully automatic edgebander. It applies hot glue to the panel's edge, presses on either rolled tape or up to 1/2-in.-thick plastic or wood, saws the banding flush to length and routs it flush with the panel's surface. It sells for about \$20,000.

Multiple-Segment Turnings

Designing with structure and color

by Janelle Lenser



In Neil Munson's segmented turnings, design and structure are interdependent. Clockwise from upper left, "Ovals," named for the grain pattern of the segments in the center bands; "Thermos," a double-wall vessel with a walnut bowl in an oak outer shell; "Jewel Case," a walnut box assembled from two separate turnings; "Chimney," end-grain oak segments glued up on a tapered, Philippine mahogany block; and "Skyline," a lidded cherry bowl with a handle that represents a city skyline.

Segmented construction is not new to woodturning. By gluing up various precut wood segments, a woodworker can create a turning blank that is greater than the sum of its parts, the same way that a composer arranges notes into complex and unique compositions. But just as a piece of music can be either monotonous or moving, so too can segmented turnings be boring or appealing. Neil Munson of Lincoln, Neb., knows the difference. His turnings, a few of which are shown in the photo above, demonstrate some of the possibilities if a segmented turning is well planned and constructed with carefully selected segments.

Munson, who recently retired after 41 years as an industrial-education instructor at the University of Nebraska, has been experimenting with segmented turnings for the last 15 years. His responsibilities as a teacher left little free time for his own woodworking, and so he's only produced three or four pieces a year. With this low output, he hasn't worried about sales; nevertheless, his turnings have been purchased as gifts for a governor of Nebraska and a retiring dean at the university.

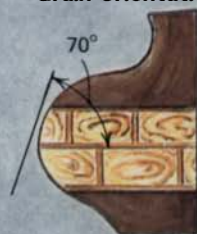
With most laminated turnings, the contrast between the colors of the parts is the first thing to catch your eye. But Munson is much more interested in the overall structure of the finished turning than he is in just making colorful bowls with contrasting woods. His turnings are carefully thought-out experiments where design and structure go hand in hand. He works out all the details of each turning at the drawing board, beginning with two or three different views of the final shape. The drawings help him determine the number, shape and size of the segments that make up the turning blank. Visualizing the finished turning in this way also guides his selection of wood for each segment, which is based not only on the species or color of wood, but also on the precise grain orientation. This con-

cern with structural details is the thread that runs through all of Munson's work. Each of the turnings shown here represents a unique combination of some of the basic structural elements in Munson's design vocabulary. An abridged dictionary of this vocabulary follows.

Grain orientation—In experimenting with segmented construction, Munson discovered that he could produce patterns and color schemes in the finished work by carefully orienting the grain of the segments. For example, in his turning called "Ovals," far left in the photo above, each of the Douglas fir segments in the two center bands has an oval grain pattern, hence the name. But the ovals did not happen by chance. Referring to his drawing, Munson measured the angle that the surface of the segments would have on the finished turning and then "went hunting" through his stock for just the right grain that would result in an oval when turned (see detail A in the drawing). In "Chimney," front right in the photo above, he cut segments with similar end-grain patterns and centered each segment on the most vertical medullary ray to add an even subtler uniformity (see detail B in the drawing).

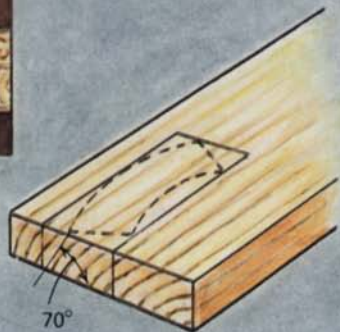
The turning that Munson calls "Thermos" (because of its double-wall construction), center in the photo above, illustrates a different way that grain can produce a pattern. Detail C in the drawing shows how Munson glued-up the original three-part oak sections that form the vessel's outer shell. The color difference between the endgrain and the side grain reverses depending on the angle of light reflection; dark areas turn light and vice versa. To make sure the visual effect was uniform, Munson cut all the pieces with the annual rings running straight through the endgrain, thereby also ensuring that the medullary rays ran squarely through each piece.

Grain orientation of segments



A. Ovals

Cutting segments from stock where the annual rings are at the same angle as a line tangent to the finished contour, results in a uniform oval grain pattern on each segment. (Slow-growth Douglas fir works well.)



Annual rings

Medullary rays

B. Chimney

To orient all the medullary rays similarly on the finished turning, the endgrain segments are cut to center on a radius line extending from the pith.



C. Thermos

Two types of three-piece segments are glued-up, bandsawn into wedges and glued together alternately to form the outer shell of the vessel. The medullary rays are aligned squarely through each block for uniformity.

A color difference results from endgrain contrasting with side grain at each joint. The colors reverse, depending on the angle of light reflection.



Left: To create the tilted plane for the turning "Chimney," Munson mounted a solid block of mabogany at an angle between two pieces of plywood and ran it over the dado blade, repeatedly adjusting the fence until the whole block was tapered. Right: The tapered block becomes the foundation for layers of segments. Using the jig shown in the photo at left, each layer is tapered in the opposite direction from the original block until the blank is once again of equal thickness. The blank is then bandsawn round and turned on the lathe. The small pieces of plywood on the sides of the mabogany block are spacers for the jig.



Mortar around the brick—"Chimney" and "Ovals" share another of Munson's structural experiments: surrounding each segment with a thin band of a contrasting wood, a technique he calls "mortar around the brick." The "mortar" wood can be glued around each individual segment, but whenever possible, the segment stock is selected and glued, surface to surface, onto an 18-in.- to 24-in.-long piece of the mortar wood before each segment is cut out. Then the ends of the segments are disc-sanded to fit the adjacent segments, and a small piece of mortar is glued to one end of each segment (see the right photo above). Because the curvature of the bowl will affect the thickness of the horizontal layers of mortar, it may be necessary to reduce the thickness of a layer if all the layers are to be of equal width after turning.

Removing and replacing segments—In the turning that Munson calls "Skyline," front left in the photo on the facing page, he left certain segments unglued when he assembled the blank, and then removed them before turning the outside shape. When the outside was complete, he shaped and sanded the missing walnut segments and glued them in place so they protruded slightly. Then, he finished turning the inside of the bowl so the reinserted segments were flush on the inside. The handle, which forms the skyline for which the vessel is named, was glued up as a unit from individual blocks and the pieces that form the lid were cut to fit around it.

In "Jewel Case," upper right in the photo on the facing page, removing segments has a functional purpose. The segments for mounting the hinges were fitted but not glued during assembly. The hinge blocks were then glued in place after the outside of the glued-up hollow form was turned. Segments can also be effective

by their absence; leaving them out completely or filling them with other materials, such as stained glass, can add a special effect.

Segments on a tilted plane—"Chimney" is one of Munson's most striking pieces because of the tilted plane of the segments. The left photo above shows how he begins with a solid block mounted on a faceplate, and then tapers it with a jig and a dado blade on the table saw. From there he glues the segments onto the block and tapers each layer in the reverse direction from the block so that the last layer of segments brings the blank back to equal thickness (see the photo above right).

Cutting turnings to reveal the shape—Munson thinks that "Cutting a completed turning exposes and verifies its dimensional features, its total shape, in the same way a mechanical drawing examines the sections of objects." The top of "Ovals," sliced to reveal a section view, ultimately provides a glimpse of the shape of the entire piece. Sometimes a turning is cut apart and then reassembled to give it a completely new form, or as with "Jewel Case," to give it a function. But even then, cutting the piece reveals its structure: When the doors of "Jewel Case" are open, they reveal a circular shelf (its edge is visible as the thin lamination just below the pulls in the photo on the facing page), which Munson inserted between the pretuned shallow bowls that he glued together to create the hollow form of the finished case. □

Janelle Lenser is Features Editor for the Fremont Tribune in Fremont, Neb., and a former student of Mr. Munson. Since retiring from teaching, Neil Munson has continued to experiment with segmented turnings in Lincoln, Neb.

Building a Cradle

Slab construction and heart-shaped dovetails

by Jacques Berger

My good friend was expecting a baby and I decided to build a cradle for the new arrival. The cradle I designed and built, shown below, is basically an open box made with simple slab construction, using flat boards sawn to shape. The cradle's corner joints needed to be strong, and since I had been experimenting with unusual variations of dovetails (see the sidebar on p. 51), I decided it would be fun to come up with a special joint for the piece. Because a new baby is such a sweet thing, I designed special heart-shaped dovetails that I call "lovetails." Further, I thought these exposed corner joints enhanced the look of the simple cradle so well that I decided to develop the lines of the cradle around this theme. Before I get into how I constructed the cradle and cut the lovetails, I'll tell you more about how my design evolved.

The design—Although I wanted my cradle to be a precious piece of furniture to be kept as a family heirloom after the baby has

grown, I also wanted the design to allow simple construction. My cradle is basically a box with trapezoid-shaped ends, which have sawn rockers on the bottom. I made the cradle rather small, so it wouldn't be too heavy and unmanageable. As you can see in figure 1 on the facing page, the cradle is 36 in. long, with the ends tapering from 19 in. wide at the top to 16 in. at the bottom of the joined sides. These dimensions allowed me to make the cradle 13 in. deep, enough to prevent an active baby from falling out and to allow the cradle to be used safely until the baby starts sitting up and needs a full-size crib.

One of the most important design parameters for the cradle is the radius of the rockers and their location in relation to the box. If the box is too high, it becomes too tippy; if it is too low, it doesn't look right. I found that 5 in. between the bottom of the rockers and the bottom of the box is just right, both for appearance and stability. The radius of the rockers must also be planned carefully to allow the cradle to rock gently, without tipping. If the rocker's radius is too long, the cradle comes to rest very quickly; if it's too short, the cradle becomes tippy. After a little experimentation, I settled for a radius of 25 in. I also added a slight knob on the rocker ends, for a little extra protection against tipping too far.

Once the rocker dimensions were established, I drew out the cradle's basic outline so that it had smooth, continuously flowing curves. To emphasize the heart motif in the lovetails, I designed a heart-shaped cutout on the headboard and echoed that shape with half-hearts on each end of the sides. I made the design consistent with the softness of the future resident by rounding the edges of the headboard and footboard and curving the sides slightly. And since I wanted the cutout heart on the headboard to be part of the curve, I extended the cutout to the edge, rather than just making it a hole in the board.

When sketching the cradle, I drew half of each curve freehand and then used tracing paper to draw the other half symmetrically. While lines drawn in this fashion are not as perfect as those made using a French curve, I find that working freehand gives me more freedom in creating shapes and in blending different curves—like those at the bottom of the cradle's ends—in one single movement. In the same way that you sight down a board to see if it is straight, I "eyeball" my curves from a low angle. This lets me see any irregularities, which I then correct by smoothing out the lines.

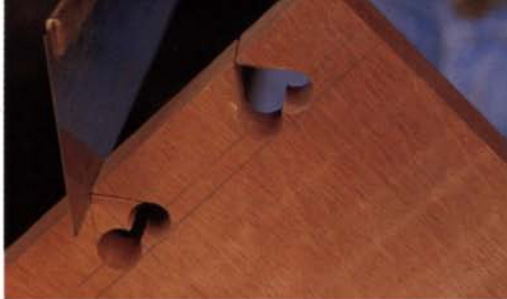
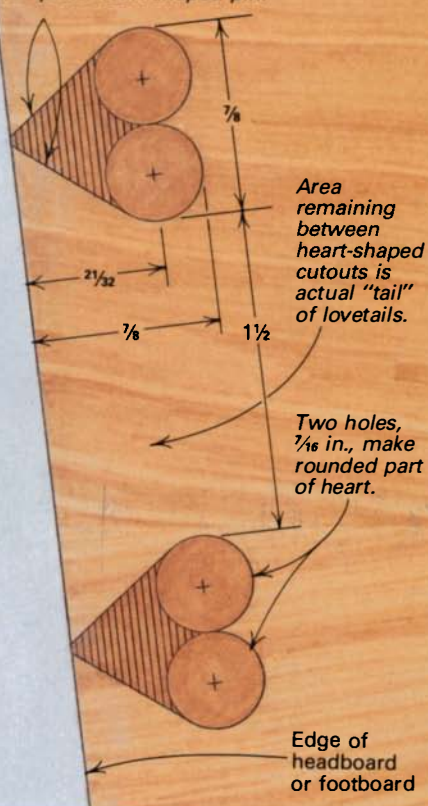
Preparing the stock—I chose Brazilian mahogany for this project, but any stock dense enough to hold detail and make strong dovetails will do. While the wood I chose was nicely figured, I found it slightly too dark after oil finishing, and I would choose a lighter wood, say oak or maple, if I made another cradle. I planed my rough $\frac{3}{4}$ stock down to $\frac{7}{8}$ in., which kept the cradle fairly



Built from Brazilian mahogany with slab sides joined together by unique heart-shaped "lovetails," the author's cradle is an attractive, simple-to-build project for any woodworker who knows someone expecting a visit from the stork.

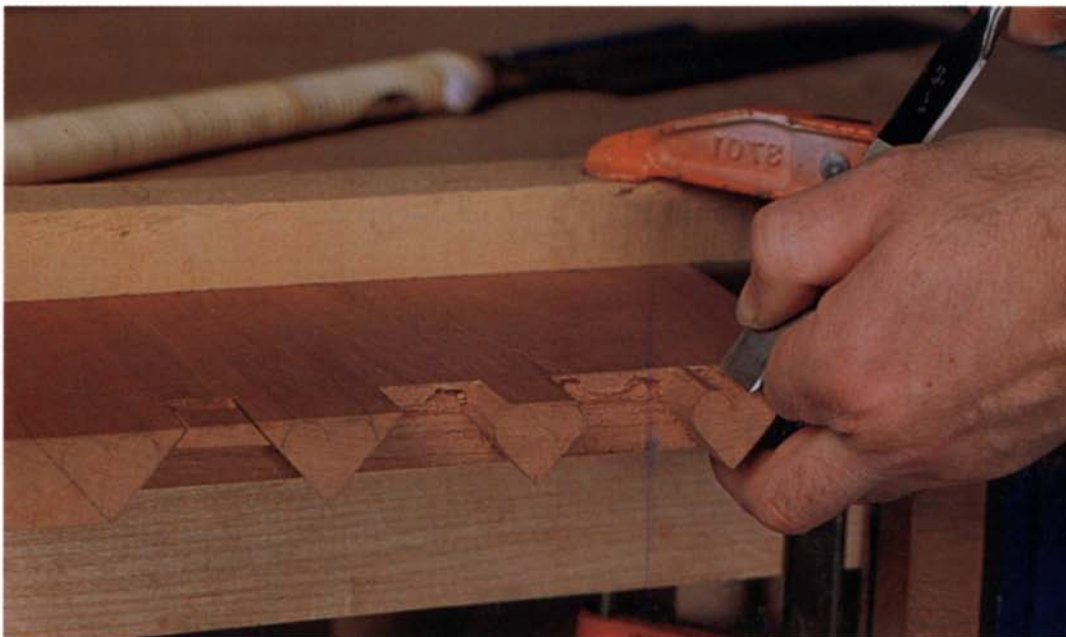
Fig. 2: Lovetails

Two sawcuts remove waste to complete heart-shaped pin.



Left: After laying out the tails and boring two holes for the rounded top of each heart, cut the straight lines of the pins with a thin-bladed Japanese saw.

Below: A wide chisel is used to shape the rounded top of the heart-shaped pins.



the holes to finish the hearts. The Japanese saw, with its thin blade that cuts on the pull stroke, is great for such fine-line sawing jobs because it can be controlled precisely and the resulting cuts are extremely clean. I draw the lines guiding the sawcuts after the holes are drilled rather than before, in case the holes end up slightly out of line. Once the tails are done, I don't touch them again; the fit of the joint will be adjusted by trimming the pins later.

The next step is to trace each row of heart-shaped holes onto the end of the corresponding cradle side to create the pins, as you would if you were cutting regular dovetails. I traced the pins by placing the tail side on the end of the board in what would be its actual position. To ensure that the lines would be as close as possible to the original heart shape, I used a pencil that I sharpened often. I marked the depth of the pins by striking a line across the edge of each board. After marking out, all I have to do is cut accurately to the lines, minimizing final-trimming. With the board clamped to the side of the bench, I then cut the straight parts of the pins, again using the Japanese saw (see the top photo above). After the first cut, I chiseled out the waste between the pins in the traditional fashion, going halfway through the stock thickness on each side and hollowing the bottom slightly to allow the joint to slide together more easily. Finally, I rounded the final shape of the top of each pin heart using a wide, sharp chisel and file (see the bottom photo above), and then I started the fitting process.

Generally, if the pins are cut with care, the joint will go together partially on the first try. The pins should slide in place to a depth of about $1/16$ in. to $1/8$ in. This is excellent, as far as I am concerned, as I much prefer to have a joint that is too tight rather than too loose at this stage. Then I filed and chiseled each pin, a little at a time, for a good fit. I know where to remove excess wood by the friction marks the tails left on the pins at each fitting. This can be a long painstaking process, but I always follow the rule that it's better to remove too little than too much. When all four corner joints fit snugly, I dry-assembled the cradle and enjoyed a first look at it.

With the four sides assembled, I checked to make sure the surfaces of the joints were all flush and I did some touch-up planing and sanding where needed. Finally, I rounded over all the edges of the pins and tails slightly by sanding them lightly across the ends. I have two reasons for doing this: First, it makes the joints look softer, and second, the rounded edges help camouflage any imperfections in the fit. Without rounding, I find it nearly impossible to make this unusual type of dovetail fit perfectly without the hint of a gap between the pins and tails.

Final assembly—All that remains is to cut out the bottom, assemble the cradle and finish it. The bottom is a piece of $1/4$ -in. mahogany plywood that is inserted in the groove cut earlier. The final assembly of any project is always a tense period for me; so I always recruit my wife as a helper (and for moral support). Before beginning, I resand each part down to 280-grit. It was clear that I could not assemble the entire cradle in one operation; with 24 pins to paint with glue and four sides to assemble around a bottom piece using clamps and protective pads, I decided to assemble one end at a time. I glued the footboard to the sides first, leaving the headboard in place dry to align the sides. After the glue had set a few hours later, I slid the bottom piece into its groove and final-assembled the headboard.

After cleaning up a little glue squeeze-out and giving the entire surface of the cradle the once-over with #000 steel wool, I finished the cradle with three coats of Watco Danish oil. Some people may worry about the baby chewing on the wood and getting sick from the finish; fortunately, most oil finishes are non-toxic when they're completely cured (about six weeks or so). You still should check with the manufacturer of the finish you choose, just to be on the safe side. □

Jacques Berger is an amateur woodworker and language instructor at Laurentian University in Sudbury, Ont., Canada.

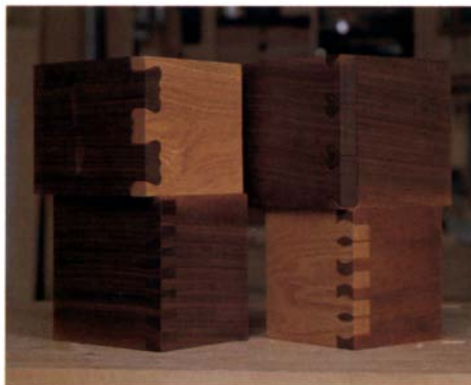
The dovetail revisited

A dovetail joint on a piece of furniture or cabinetry is usually the hallmark of conscientious workmanship. In addition to its prestige, the handmade dovetail is a very strong joint: The two halves lock two boards together and create an ideal joint for heavily used furniture components, such as drawers, which take a lot of stress and strain. Finally, the dovetail is aesthetically pleasing—so much so that many craftsmen employ dovetails throughout their work to show off their skill on drawer fronts or the edges of a carcass.

But as strong and beautiful as the dovetail is, is it really the perfect joint? After you've cut hundreds of dovetails and explored all the possible variations on the basic theme—varying the angle of the dovetails, changing the distance between the pins, cutting the pins tiny or wide—you may end up feeling that a dovetail is a dovetail. When I investigate a piece of furniture, I'm always thrilled to discover something unusual or special in the joinery; a little hidden treasure that reassures me of the piece's quality.

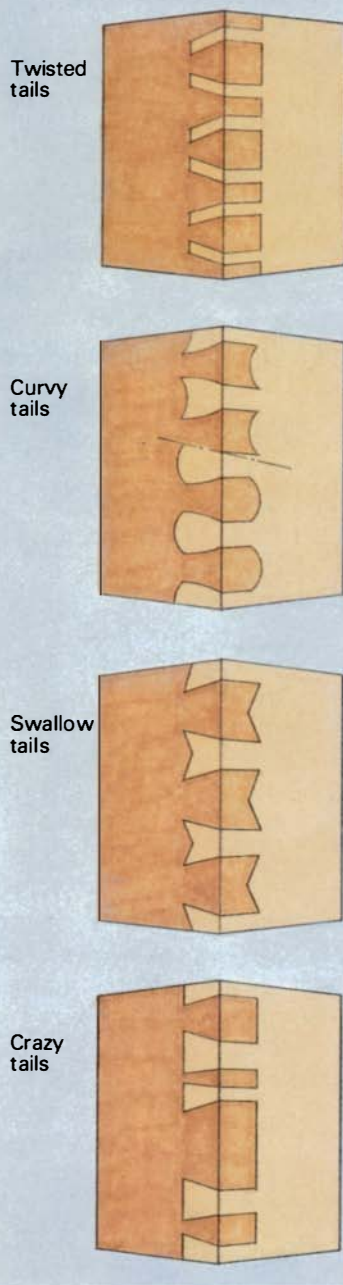
That's the feeling that got me thinking about what could be done to spruce up the design of the good old standard dovetail, but without changing the basic principle of the joint: two halves that lock together. The fruits of some of my joint-designing experiments are shown in the photo above and figure 3 at right. The "twisted tails," my first try, were easy to cut, and different from anything I'd seen before, but the design isn't very bold. Although my next attempt, "swallow tails," also resembled regular dovetails, the pins and tails were almost the same and showed on both sides of the joint.

My next try was an experiment in changing angles; when I realized that there was nothing forcing me to keep the same angles throughout the entire joint, I came up with the "crazy tails." I was still not satisfied, however. To me, the resulting joints looked too typical, too humdrum. I thought, why not try curves? By rounding off one edge of both the tails and pins, I ended up with the "curvy tails." The mating parts create an undulation of concave and convex lines. Then, I thought, the regular dovetail's locking effect produced by complementary angles could also be created by conflicting curves, as shown in the bottom, left test joint in the photo above. Even though the joint wasn't very strong because of its curved pins, I liked its appearance. In fact, most of my fancy joints probably lack the strength of the regular dovetail. They are, however, at least as strong as finger joints



Experiments in joinery: Berger makes up pattern boards in his quest for unique alternatives to the standard dovetail.

Fig. 3: Dovetail variations



and their slight loss of strength is counterbalanced by the pleasing design.

If you're willing to experiment, there's no limit to the possibilities for unusual joints. The principle of the dovetail, not the dovetail itself, becomes the guideline: complementary angles and/or curves will create a locking joint. While unusual joints can be effective in any piece of furniture or cabinetry, you probably won't want them in situations where you have lots of joints to cut because they're usually too time-consuming. Rather, use them as a decoration or for a prominent feature on the piece. This is how I've used the dovetails to join the sides on my cradle, shown in the photo on p. 48.

Construction: To those who have mastered regular dovetails, my fancy joints may seem unrealistic or just too much trouble to cut. But, aside from a few tricks, the main ingredients in producing these joints are patience and good skill with a handsaw, chisel and mallet. Here are a few tricks that may help you cut the joints pictured or any others you may wish to design yourself.

On dovetails that involve rounded parts, start by cutting the tails first. Then, cut the pins and trim them till they fit snugly with the tails. This is contrary to the way many people cut regular dovetails, but it seems to work well for the unusual joints. In some designs, determining which part is a pin and which is a tail may be difficult; I usually choose the half with the more convex shape as the pin, since this is easier to chisel, file or rasp when trimming to fit.

With some of my joints, as with regular dovetails, the bottom of the spaces between tails and pins is flat. In this case, the depth of the joint is a straight line that's laid out as far from the corner as the joining stock is thick. When bottoms of the spaces aren't flat, as with the swallow tails, chisel out the pattern on the bottom first. Then, transfer it to the end-grain of the other half and chisel it out to match, undercutting it slightly if needed. In some cases, as with the dovetails, I create round patterns by simply boring on the drill press. The shape of the concavity can be completed by sawing, chiseling or filing after drilling. Some designs have pins that can be cut directly on the bandsaw, such as the twisted tails. Unless you are a hand-tool purist, the router used with a template can be indispensable for creating curved or irregular joints, like the example shown on the top right in the photo above.

—J.B.

Fig. 1: Hollow-chisel mortising attachment on a drill press

Hollow-Chisel Mortising

Boring square holes on the drill press

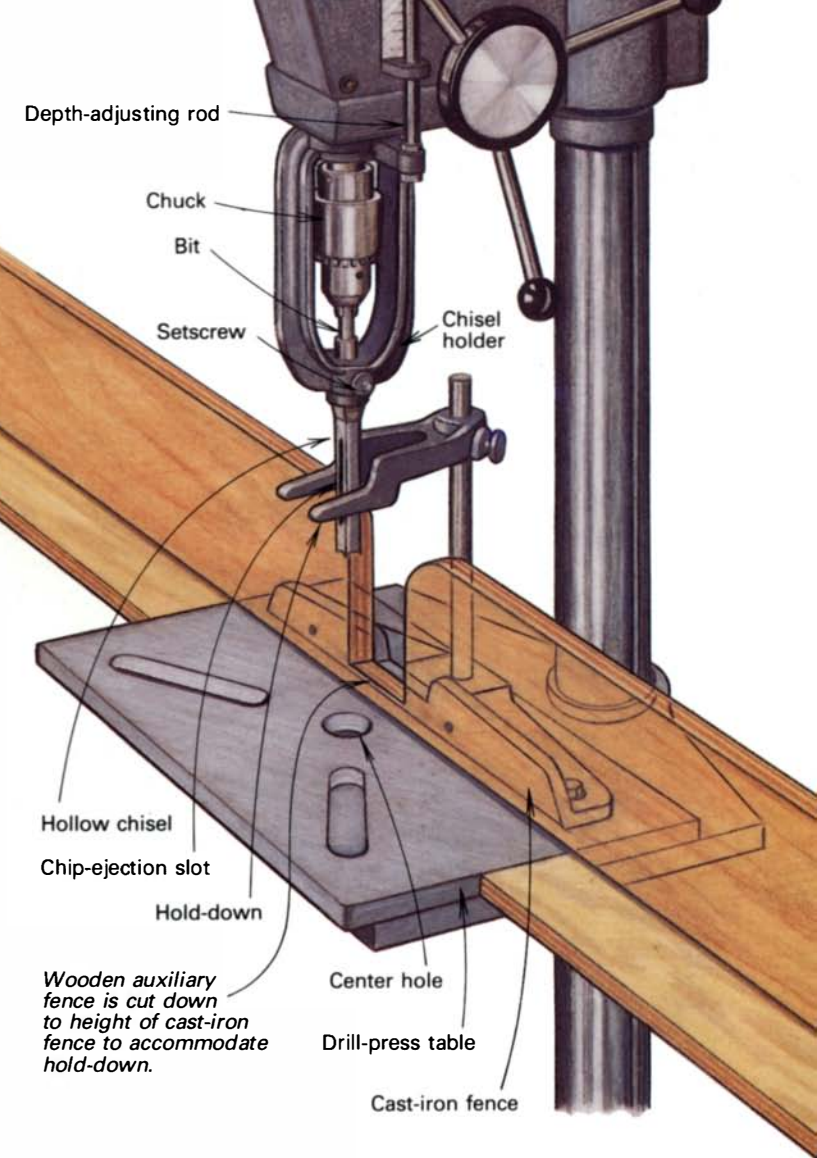
by Ben Erickson

My first major mortising project was in 1980, when I was reconstructing our antebellum home. I made four exterior frame-and-panel doors, each of which required 10 through mortises. Because the door stiles were 5½ in. wide, the mortises had to be cut from both sides of each stile, and so I felt like I was cutting 20 mortises in each door. Using a marking gauge, a set of mortising chisels and a mallet, I went to work; fourteen hours and a sore arm later, I finished and vowed that I'd find a better solution next time.

Since then, I've been using a hollow-chisel mortiser on my drill press, shown at left on the facing page. Mortising this way has cut my time from 10 minutes per mortise to 1 minute. This method has its shortcomings though. The tool has a tendency to overheat, and a lot of pressure is required to make the cut. But you don't have to mark out each joint. Instead, you can set up a fence and stop blocks and cut identical mortises accurately and repeatedly in a series.

Besides your drill press, the mortising attachments you need consist of a square, hollow chisel with an auger bit inside (see figure 1 above). The chisel is secured in a holder that is attached to the drill-press quill; the bit's cutting edges are in line with the chisel's cutting edges, and its shank is fixed in and turned by the chuck. As you plunge the chisel into the wood, its cutting edges shear a square hole as the auger simultaneously bores out the center. Chips are ejected through a slot in one side of the chisel.

You can make mortises of any length with repeated plunge cuts, and you can set the depth with your drill-press depth-adjusting rod. Maximum mortise depth depends on the effective cutting length of the chisel, which can be from 1⅞ in. long to 3¾ in. long. Through mortises, however, can be almost twice as deep as the chisel's length if you cut them by entering the workpiece from



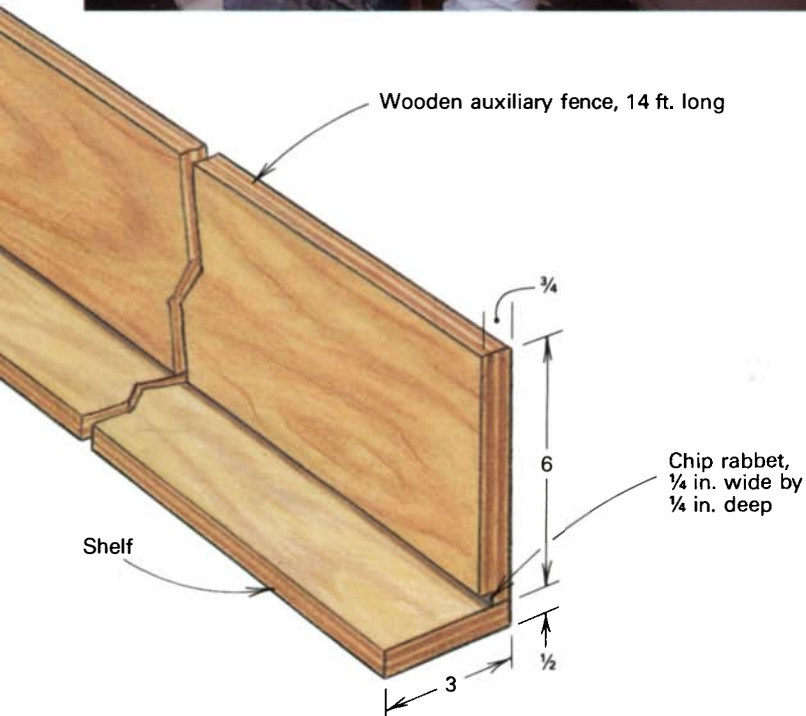
both sides. This also limits tearout, compensates for drift and ensures that the mortise is centered on each side. I also use the mortiser to cut small square holes for muntin or kumiko on window frames and for *shoji* screens (see "Making *Shoji* by Machine," *FWW* #78). Additionally, this system is indispensable for large millwork jobs, such as the 50 exterior louvered shutters I completed recently.

Installing a hollow chisel on a drill press—A mortiser's accuracy depends on the drill press you use. I have had no problems using it on my middle-of-the-line Sears drill press. Horsepower is not a factor since most of the effort is in manually pressing the chisel into the hole and not in the drilling. Because you must use both hands here, the addition of a foot pedal (see the sidebar on p. 55) would free them to perform other operations. There shouldn't be any play in the drill-press quill or you won't be able to locate mortises repetitively and accurately. Although slight run-out (worn bearings) on the spindle should not affect the cut, it may cause the chisel and bit to wear prematurely. Mortiser manufacturers recommend that drill-press chuck speed be 2,300 RPM for hard woods and 4,250 RPM for soft woods. I keep mine at 2,300 for all types of wood, because I don't think higher speeds offer any advantages. Although the mortiser works best on less dense woods such as redwood, poplar and mahogany, I have had good results on harder woods like walnut.

To set up the mortiser, first ensure that the table and quill are perpendicular to one another—the quill must be 90° to the table surface. Then, on most drill presses, you must remove the chuck and stop collar. Replace the stop collar with the chisel holder (attach the depth-adjusting rod, if your press is equipped with one, to the chisel holder) and reattach the chuck. Removing and replacing



Above: After the chisel holder and chuck are installed, the chisel is inserted in the holder and advanced until it extends through the table's center hole. Then the chisel's front face is aligned parallel to the front edge of the table. Left: As the author uses a hollow-chisel mortising attachment on his drill press, a dust collector vacuums up debris. The stop block clamped to the auxiliary fence positions the workpiece so he can cut one end of a mortise.



the chisel holder is time-consuming, and so I leave mine on as much as possible. Although depth of cut will be reduced significantly during normal, round-hole boring, most regular-length drill bits can be inserted up through the holder into the chuck. Then you can operate in the usual way, as shown in "Antebellum Shutters," *FWW* #53. You can use long-length bits to increase your working time before you have to remove the chisel holder.

Next, slide the mortising chisel all the way into the chisel holder and temporarily secure it with the holder's setscrew. Since it's easy to drop the chisel and bit during assembly, you can prevent them from being damaged by covering the iron table and base with scrapwood.

Aligning the chisel—The chisel must be square or parallel to the fence. You should set the fence the requisite distance from the chisel, and then adjust the chisel to a try square held against the fence.

My chisels are worn and difficult to adjust, and so I set them

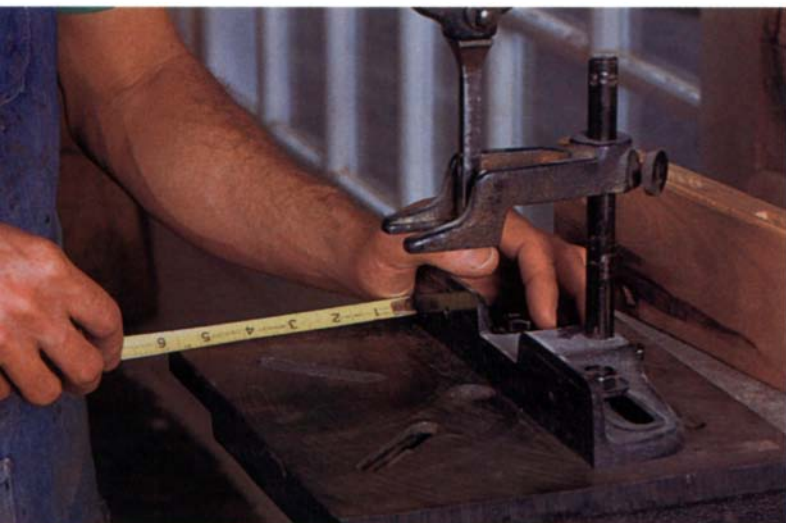
only once by making them parallel to the front of my square drill-press table. Then each time I readjust the fence, I make it parallel to the table front (shown in the top photo on the following page). I first align the chisel's front face parallel to the table's front edge (or a line drawn on a round table).

To do this, first lock the chisel in the down position so that it extends through the table's center hole (see the above photo at right). Then make a wooden test jig that is about $\frac{3}{4}$ in. thick, as long as the table is wide, and as wide as the distance from the front of the chisel to the edge of the table. The chisel and table are parallel when one edge of the test jig is flat against the face of the chisel and parallel to the front of the table. When the chisel is aligned, secure it tightly in the chisel holder.

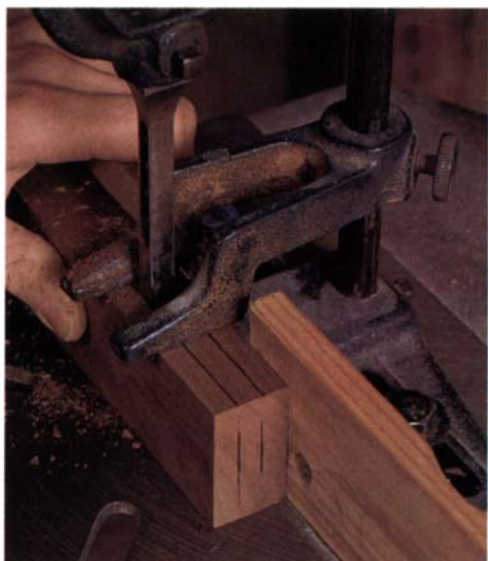
Now insert the bit through the chisel and into the drill chuck. If the bit is too long to go all the way into the chisel, you may have to cut its shank. You should leave about a $\frac{1}{64}$ -in. to $\frac{1}{32}$ -in. gap between the bit's spurs and the chisel's corner points (shown in the bottom, left photo on the following page). Otherwise, the two will wear against each other excessively and cause overheating. Adjust the height of the table so the stock to be mortised is about $\frac{1}{4}$ in. below the chisel when the chisel is raised to its upper limit. Finally, realign the chisel and table by centering the table under the chisel.

Installing the fence—The fence must have a hold-down (such as the one shown in figure 1 and the bottom, right photo on the next page) so you can retract the chisel after cutting the mortise. My cast-iron fence is about as long as my drill-press table is wide and it's attached with bolts that pass through slots in the table.

In order to mortise long pieces and to provide a place for attaching stop blocks, I fastened a $\frac{3}{4}$ x6x168 auxiliary wooden fence to the cast-iron fence, shown in figure 1. To do this, I drilled holes and tapped the iron fence for $\frac{1}{4}$ -20 machine screws and countersunk the flat-head screws into the auxiliary fence. I glued a $\frac{1}{2}$ -in.-thick by 3-in.-wide shelf to the bottom edge of the auxiliary fence on each side of the table. As shown in the left photo above, the shelf supports the workpiece and makes it easier to attach stop blocks that control the length and location of mortises. In order for the workpiece to fit snug and flat against the fence and table,



After aligning the chisel to the table and setting the table height, Erickson aligns the fence and chisel. He positions the table's center hole under the chisel, and then adjusts the fence parallel to the table edge so that the mortise will be parallel to the sides of the workpiece.



Left: The auger has been inserted up through the hollow chisel, with about 1/32-in. clearance between its cutting edges and the chisel's beveled edges (to prevent wear), and its shank has been secured in the chuck. The author has ground the corners of this chisel to reduce friction when mortising. Right: Erickson adjusts the fence to center the chisel between lines on a test piece and cuts a practice mortise. Debris is expelled through the chip-ejection slot and a hold-down clamp retains the workpiece in order to withdraw the chisel.

you must keep debris out of the inside corner between them. To provide space for debris until it's vacuumed out, I cut a 1/4-in.-wide by 1/4-in.-deep rabbet in the bottom edge of the fence. Then, to accommodate narrow workpieces as well as wide ones, I cut the wooden fence to be as high as the cast-iron fence adjacent to the hold-down. Be sure to provide support legs under each end of the auxiliary fence to keep it from sagging.

Setting up and checking the cut—If you center the mortises on the edge of the workpiece, you can flip the piece over and finish cutting through mortises from the opposite side, without having to move the fence or change the position of stop blocks. If you cut mortises off center, you will have to keep the same side of the workpiece against the fence and reset the stop blocks for half of the cuts. Center the workpiece under the chisel. To do this, draw two lines on the workpiece surface that are equidistant from each edge and a little farther apart than the width of the chisel using a marking gauge as a guide along each edge. When you lower the chisel against the workpiece, it should be centered between the lines. Make a test piece the same thickness and width as your workpiece and adjust the fence until the test piece is centered under the chisel. Check that the fence is parallel to the front table edge, secure it and cut a test mortise.

Finally, crosscut through the trial mortise and use the previously set marking gauge to check that the mortise sides are parallel to and centered between the sides of the workpiece. If the sides aren't aligned correctly, you can adjust the auxiliary fence parallel to the chisel by shimming between it and the iron fence. Set the mortise depth with the drill-press depth-adjusting rod and check it by using the crosscut test piece as a gauge.

Cutting mortises—Depending on the hardness of the wood, you might have to apply quite a bit of downward pressure to cut a mortise, and for deep cuts, you may need to use both hands on the handles. Advance the chisel smoothly, and raise it as soon as it reaches the bottom of the cut to prevent it from overheating and clogging. The chisel normally gets very hot in use, but you can reduce friction by coating the outside of the chisel with paste wax or non-silicone lubricant. I've used Elmer's Slide-All (available at hardware stores), which hasn't caused fisheyes in my finishes. However, if the chisel causes undue heat or smoke, stop and sharpen the chisel and bit. It also helps to hone the sides of the chisel smooth.

Once your chisel is advancing smoothly, the chips it removes should eject from the chisel's slot during the cut. If the chisel clogs, it often clears between cuts or during the next plunge. However, if it becomes jammed, try blowing compressed air into the chip-ejection

Fig. 2: Stop blocks and inserts

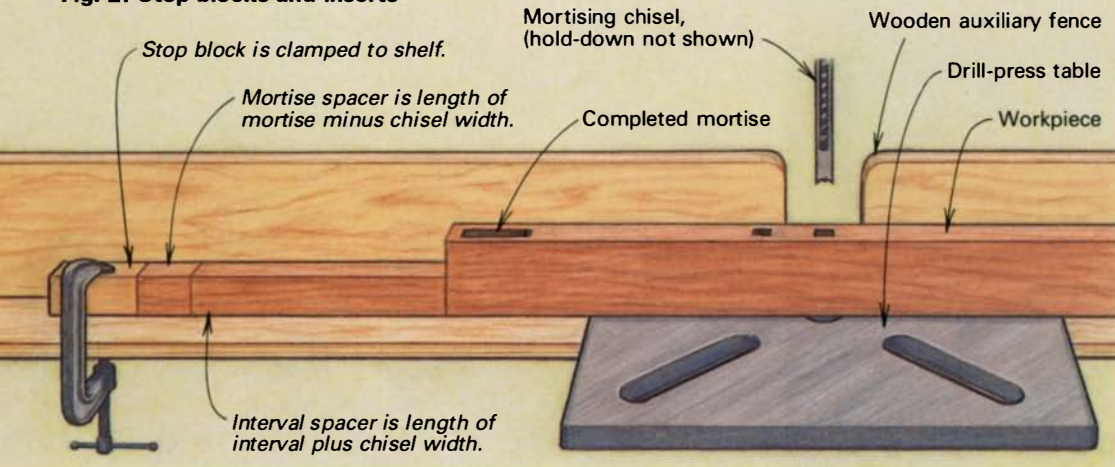
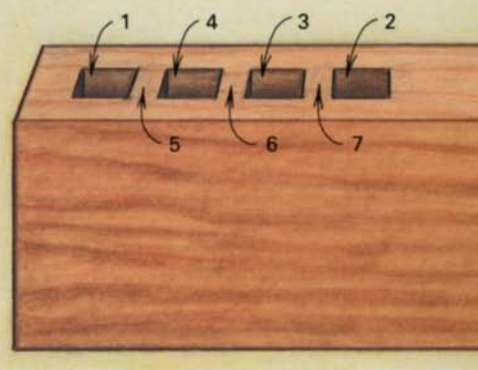


Fig. 3: Sequence for cutting long mortises

Spaces 5, 6 and 7 are one-half the width of mortising chisel.



A pedal feed for a drill press

by J. Kirkham Jenner

Some time ago, I greatly increased the versatility and convenience of my drill press by equipping it with a foot-pedal mechanism. Now I can advance the quill with my foot, and both hands are free to hold the workpiece. I don't use the pedal all the time, but it's invaluable for certain operations such as mortising, where pieces have to be aligned, clamped, cut and then released.

My bench-type drill press is fastened to a shop-built, angle-iron stand. Since your machine is probably different, you may have to adapt the setup shown in figure 4 at right to your machine's configuration. The mechanism's two levers pivot at their center point on axles mounted on the stand. The pedal lever's motion is reversed by the upper lever, which pulls down on a wire that turns the pinion shaft and lowers the quill.

The foot pedal is $\frac{3}{8}$ x4x20 plywood stiffened with two pieces of $1\frac{1}{2}$ -in. angle iron screwed to its sides from underneath. The pedal's angle-iron sides are drilled to accept its $\frac{5}{8}$ -in.-dia. pivot rod. I turned each end of the rod to $\frac{1}{2}$ in. dia. and then threaded them. The rod's threaded ends are first inserted through $\frac{1}{2}$ -in.-dia. holes in the middle of the $\frac{1}{4}$ -in.-thick by $1\frac{1}{2}$ -in.-wide angle-iron stretchers on each side of the stand and then secured with nuts. If you don't have a lathe to turn the rod, you can drill $\frac{5}{8}$ -in.-dia. holes in the stretchers and secure the pivot rod with cotter pins.

The angle iron on the right side of the pedal is longer than the one on the left, and it extends beyond the stand at the back. Here, it's attached to a $\frac{1}{4}$ -in.-thick by $1\frac{1}{2}$ -in.-wide flat-bar linkage that connects the pedal lever to the front end of the upper lever. The ends of the linkage bar are attached to the pedal and upper lever by 1-in.-long, $\frac{1}{4}$ -in. machine screws that are held in place by two nuts jammed together. In order for the joints to move freely, don't tighten the first nut, but hold it while you tighten the jam nut against it.

The upper lever, which is made of the same flat bar as the linkage, pivots on a $\frac{5}{8}$ -in.-dia. rod that is fastened to the stand's back legs in the same manner that the foot-pedal pivot rod is attached to the stretchers. To position the upper lever on the rod (aligned with the pedal and the drill-press pinion shaft), I slid a short piece of electrical conduit over the rod on each side of the lever, and I secured it with #8-32 machine screws that pass through the conduit and rod.

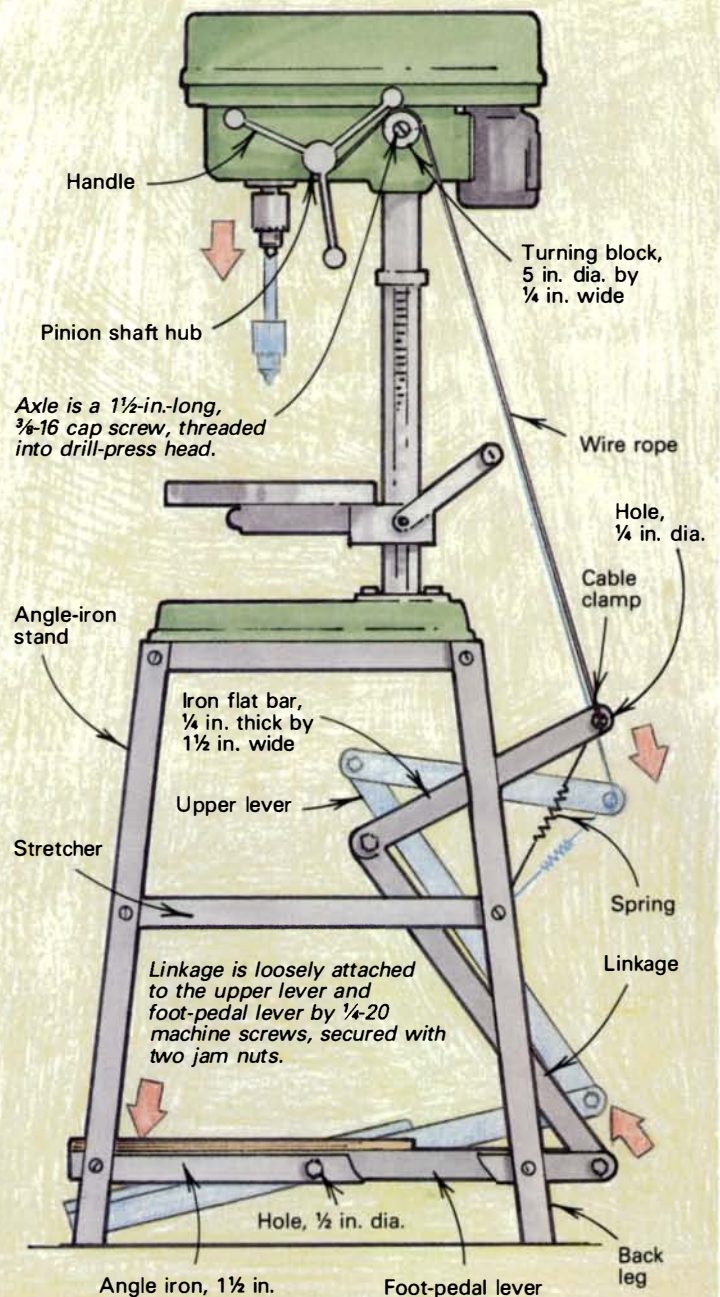
Next, I anchored stainless-steel wire rope (which was bicycle brake cable in its past life) to one of the hub's handles. I did this simply by backing the handle out a couple of turns, wrapping the frayed end of the cable around its exposed threads, and then tightening the handle, which jammed the wire in its threads. The wire is then wound counterclockwise around the hub four or five times. The wire is led from the underside of the hub back over a turning block and then down to the top of the upper lever. The turning block is a 5-in.-dia., $\frac{1}{4}$ -in.-wide V-belt pulley, and it rotates on a $1\frac{1}{2}$ -in.-long, $\frac{3}{8}$ -in.-dia. machine-screw axle that is threaded into the right side of the drill-press head. Almost any narrow V-belt pulley will do, or you could use a wooden one turned on a lathe.

I attached the wire to the lever with a loose loop through a $\frac{1}{4}$ -in.-dia. hole in the lever and secured the wire with a small cable clamp. To keep the wire moderately taut at all times, I attached one end of a spring to the back of the upper lever and anchored its other end to the middle stretcher on the back of the stand. This spring should be stiff enough to cancel the weight of the levers upon the quill's return ascent.

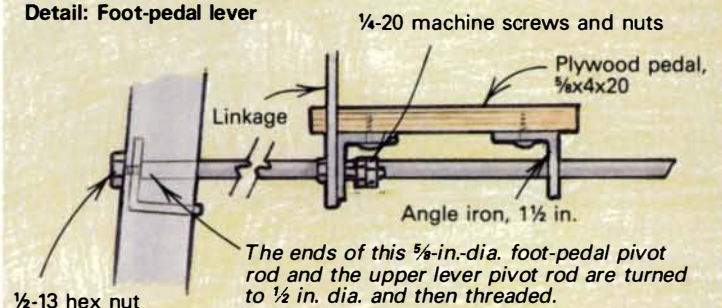
There isn't enough power in my foot pedal to drill large holes in wood or small holes in hard metal; it was designed for speed. You can add power by attaching the bottom of the linkage closer to the pedal lever's pivot point. But as you gain power, you sacrifice speed. □

J. Kirkham Jenner is a woodworker in Grant's Pass, Oreg.

Fig. 4: A foot pedal for a drill press



Detail: Foot-pedal lever



slot while the machine is running, or shut off the drill press and pick out as much as possible by hand. Then try again. As a last resort, remove the bit, clear it, and then realign and resecure it in the chuck.

You should keep the table and fence clean, to prevent chips and dust from misaligning the workpiece. When cutting a lot of mortises, I attach the vacuum's nozzle close to the chisel and workpiece to help remove the chips and cool the bit (shown in the left photo on p. 53). You may have to clear chips from completed mortises with a screwdriver or chisel, or push jammed chips out the other side of through mortises.

Using stop blocks—By clamping stop blocks to the auxiliary fence, you can ensure that all mortises will be cut the same length and in the same location in each piece. The simplest method is to clamp a stop block in position at each end of the workpiece.

If your workpiece requires multiple mortises, clamp only one stop block in position and insert spacers between the stop block and workpiece to set the length and location of each mortise, as shown in figure 2 on p. 54. First, align the right end of the mortise with the right cutting edge of the chisel, temporarily clamp the workpiece to the table, and clamp a stop block to the fence so it bears against the left end of the workpiece. Then, cut a mortise spacer as long as the mortise minus the width of the chisel. When the spacer is inserted between the stop block and end of the workpiece, it aligns the left end of the mortise with the left cutting edge of the chisel.

To cut the mortise, first butt the spacer against the stop block, hold the workpiece against the spacer and cut the left end of the mortise. Then, remove the spacer, hold the workpiece against the stop block and cut the right end of the mortise. Finally, complete the mortise in between. Similarly, you can make spacers that govern the interval distance between mortises. You'll have to use three spac-

ers for double-tenon mortises because you need to set the limits for each mortise and the space in between. Mark them A, B and C so you will always use them in the proper order. By saving the spacers, the length of the mortise and spacing intervals can be reproduced.

When you're cutting long mortises, don't use a succession of overlapping cuts. Instead, skip a space between each cut (about half the width of the mortising chisel), as shown in figure 3 on p. 54, to keep the chisel from bending into a neighboring hole or wandering off center and to prevent undue sideways stress on the chisel and the drill press. Drill the length of the mortises in this way and then return to clear out these sections.

If the stile is to have a panel groove on its inside edge, it may be cut before or after mortising. If the groove is plowed first, be sure it is centered on the stock, and if you are using haunched tenons, the groove should be the same width as the mortising chisel to accommodate the haunched portion of the tenon.

Sharpening hollow chisels—To grind the bevel angle and sharpen the chisel's edges, you must use a conical-shape stone (see the left photo). Although the stone I use is intended for a die grinder, I dressed it to fit the chisel's bevels and use it in a portable drill clamped in a bench vise with the stone pointing up. Then, with the stone turning at about 1,000 RPM, I hold the chisel perpendicular and lower its end gently onto the stone. Since repeated use grooves the stone, you must dress it often. I prefer sharpening the chisels with countersink-like Clico sharpeners shown in the right photo. These high-speed-steel cutters, which are turned with a bit brace, have either fixed or interchangeable pilots matched to the inside diameter of the hollow chisel. Grind or cut only until the chisel's edges are sharp, and then remove the burrs left on the outside of the chisel by honing each side on a hard (fine-grit) benchstone. To reduce surface area and therefore friction, you can grind away the corners of your chisel to look like the one in the bottom, left photo on p. 54. As with any spur bit, sharpen the mortising bit with an auger file. Clamp the bit in a vise (between protective wood blocks), and file the inside edges of the spurs and the bevel. Then, hone the burrs from the edges with a hard slip stone. □

Ben Erickson is a woodworker in Eutaw, Ala.

Sources of supply

Hollow-mortising attachments—chisels, holders and fences—are available from the following:

Delta International Machinery Corp., 246 Alpha Drive, Pittsburgh, PA 15238; (800) 438-2486, (800) 438-2487.

General Manufacturing Co., Ltd., 835 Cherrier St., Drummondville, Que., Canada J2B 5A8; (819) 472-1161.

Grizzly Imports Inc., 1821 Valencia St., Bellingham, WA 98226; (800) 541-5537, (800) 523-4777.

Jet Equipment and Tools, Box 1477, Tacoma, WA 98401-1477; (206) 572-5200, (800) 243-8538.

Powermatic, Morrison Road, McMinnville, TN 37110; (800) 248-0144.

Sears, Roebuck and Co., Sears Tower, Chicago, IL 60684; (312) 875-2500.

Shopsmith Inc., 3931 Image Drive, Dayton, OH 45414-2591; (800) 762-7555, (800) 543-7586.

Wilke Machinery Co., 120 Derry Court, York, PA 17402; (717) 846-2800.

Sharpening stones are available from:

Forest City Tool—Textron, 620 23rd St. N.W., Hickory, NC 28603; (704) 322-4266.

Countersink-like sharpeners are available from:

Clico, Sheffield Tooling Ltd., Unit 7, Fell Road Industrial Estate, Sheffield S9 2AL, England; (0742) 43307.



Left: The author grinds the inside bevels of a hollow chisel by lowering its end onto a conical-shape stone turning at about 1,000 RPM in a hand drill. Edges are ground only until sharp, and burrs are removed by honing the chisel's outside on a flat stone. Right: Erickson prefers to sharpen hollow chisels by grinding their bevels with high-speed-steel, countersink-like bits turned by hand. The bits have fixed or interchangeable pilots that center them in the chisel.



The author peels birch bark from the log with a 2-in. slick. The board lying behind him can be used to help hold the bark out of the way as the work progresses.

Veneering with Birch Bark

A natural way to add a decorative touch

by Dick Sellew

I've always enjoyed the natural beauty of the birch trees that grow in abundance on my father's 100-acre lot in southwestern Massachusetts. The contrast of the dark streaks on the lighter background and the texture of the bark itself is so intriguing that I wanted to incorporate these features in my work. The similarities between the flexible bark and veneer inspired my first efforts: I veneered the aprons on a Shaker-style table and found the effect very appealing. Flush with success, I veneered a folding screen, but the ostentatious bark on this scale was overpowering.

As a result of these experiments, I use small splashes of bark to accent and brighten simple designs, like the display tables shown in the photo at right on the following page and discussed in the sidebar on p. 59. I also played with color by using various hardwoods or tints and dyes, and found that the bark's neutral color goes well with almost everything.

Finding and harvesting birch bark—One of the most enjoyable aspects of working with the bark is tramping through the woods looking for the perfect birch tree. Indians harvested bark for their canoes in the spring or fall, when the sap is running and the trees are easier to skin. I'm not excited about taking bark off living trees; it reminds me a little of elephant hunters seeking the tusks. But I enjoy roaming the woods for dead birch trees and there is a certain satisfaction in knowing that an otherwise lost resource will find a continuing life in one of my projects. Stripping a dead tree is also easier than a live tree, because often the trunk has shrunk, leaving the bark loose and manageable. Also, I have found the bark to be looser in late winter or early spring than in the hot and humid summer. To avoid a lot of strenuous hauling, I debark the logs where I find them. Other than a chainsaw, all you need is a razor knife, a 2-in.-wide slick chisel and a ¾-in. board, roughly

6 in. wide by 24 in. long, beveled along one edge. To further simplify the equipment requirements, you can substitute a bucksaw and a lot of energy for the chainsaw.

I look for a birch tree that has enough clear bark to cover the individual pieces of a project. Because birch bark has many layers, surface defects like sloughy bark, mold and other growth can be removed easily, but branch protrusions and other defects that penetrate the bark should be avoided. You can glue up sections of the bark for larger panels, but unlike regular veneer, the seams will generally show and it would be almost impossible to match patterns for making repairs. If I find a prime tree with lots of clear bark, I try to get as large a piece as possible. However, the larger skins are also more difficult to handle and apply as veneer. Designing projects with only small areas of bark makes your quest much easier because almost any dead tree will do.

If the birch tree I select is still standing, I first cut it down with my chainsaw and then section it to yield the largest pieces of clear bark. With the razor knife, slit the bark the length of the log section, and then begin working the 2-in.-wide slick between the bark and the sapwood along the length of the slit. Grasp the edge of the bark with your free hand and continue working around the log with the slick to free the bark, as shown above. Once you get one-third to one-half of the way around the log, or if the bark starts to split, use the bevel-edge board for holding and pushing the bark back as you continue to peel it away with the slick. If the bark is particularly difficult to remove, find another dead tree to debark, leaving the first tree for another day.

When I arrive back at my shop, I flatten the bark by moistening its inside face, laying it on a flat surface and then weighting it down under a piece of plywood to dry overnight. The next day, I clean both faces of the bark with a standard 1-in.-wide paint scraper to



Above: After contact-cementing the bark veneer to the leg, the excess layers are peeled away to leave a single layer of paper-thin veneer. Below: The author blows off loose and damaged bark with compressed air at 80 psi. Clear sections of bark large enough to cover the aprons and top can then be selected.



The plain lines of these display tables make a perfect stage for showing off the natural beauty of the unusual birch-bark veneer that accents the top, aprons and feet.

remove dirt, mushrooms and other protrusions that would damage the bark during clamping. Although you should exercise some care in this operation, don't be overly concerned about marring the bark because removing the sloughy outer layers with blasts of compressed air at 80 psi, as shown in the bottom, left photo, will also remove minor defects. The bark is ready for veneering when the air blasts no longer lift loose layers. As an alternative to compressed air, you can apply 2-in.-wide masking tape to the face of the bark. When the tape is removed, it will pull away loose bark. However, this method is slow going and will require several taping applications.

Applying birch-bark veneer—There are other differences between birch bark and regular veneer besides matching patterns and hiding joints. Because the bark-veneered panels are small, the stable man-made core materials can overcome any tendency to warp when veneered on only one face. For anything larger than a square foot, however, I recommend laminating the opposite face with any $\frac{1}{2}$ -in.- or $\frac{1}{2}$ -in.-thick veneer so that the panel's construction remains balanced. Also, you can apply the bark veneer before cutting your pieces to final size. If I veneer after the panel is sized, I allow the birch bark to overhang the backing panel and then I trim the bark with a flush-trimming bit in my router. However, the bark mars very easily and cannot be sanded, so you must handle it with care throughout the process. One benefit of the delicately layered bark is that minor blemishes can be repaired by blowing off a few more layers.

Using your backing panels as templates, select and cut the birch bark, allowing about $\frac{1}{8}$ -in. overhang on all sides. Roll or spread a thin, even coat of yellow glue on the back of the bark to ensure good adhesion without a lot of squeeze-out and then position the bark on the backing panels. I tape the bark to keep it from slipping out of position and clamp the panels in pairs, using $\frac{3}{4}$ -in. plywood on top and bottom as pads and wax paper between the layers to keep them from being glued together accidentally. For larger panels, you will need heavier cauls and battens to evenly distribute the clamping pressure. Make sure there is no debris on the cauls or panels, as this could damage the bark before clamping the layers together. I like to let these veneered panels dry at least six hours

and preferably overnight. When the clamps are removed, I again blast the bark with 80 psi of air to remove any more loose material.

Detail work, such as on the bottoms of the legs of the display table in the photo at right, is best done by laminating the bark directly to the piece. I used to inlay this detail, but because of the variability in thickness of the birch bark, it was a time-consuming process and it was impossible to get the veneer flush with the surface. Now I contact-cement a piece of bark to the surface and peel away the extra layers, leaving a single thickness of paper-thin bark; this method is quicker and yields more consistent results.

Finish-sand the piece before veneering and assembling, as this single layer is easily damaged. When veneering the feet of table legs or when accenting a similar piece, I use a hardboard template to cut strips of bark to size. After covering the area with contact cement, I apply the bark and fix it with firm pressure from a veneer roller to ensure good contact. Trim the bark to the edge of the piece with a safety razor blade and then use the blade to lift up a corner of the extra bark and pull it away (see the top, left photo). Turn the piece and repeat this procedure until all sides are done.

Applying a finish—As I mentioned earlier, I think the birch bark looks good with a variety of colors, so don't be afraid to experiment with tints, stains and dyes. For a protective finish, however, I prefer Sherwin-Williams Sher-Wood, a moisture-resistant lacquer with a medium sheen. Before finishing, touch up with 120-grit sandpaper, but be sure to avoid the birch bark. Then spray on the first sealer coat. I let this coat dry an hour and then test the adhesion of the birch bark with a blast from the air compressor. If there is any sloughing at this point, a lighter-color lower layer of bark will be revealed. However, another light coat of Sher-Wood on the damaged area will usually blend it in with the rest of the piece. Sand between coats, avoiding the bark, and apply two more coats per the instructions on the can. The final coat can be left as is, waxed, or polished with wool lube or rubbing compound to the desired sheen. □

Dick Sellew is a furnituremaker in New Marlboro, Mass.

Making a display table

I designed this display table with simple lines to complement the more intricate pattern of the birch-bark accents on the aprons, top and feet. By using sliding tables on my tablesaw to cut all the parts, construction goes very quickly. I used biscuits to join the tapered legs to the bark-veneered plywood aprons and to join the mitered frame to the bark-veneered top. A piece of glass recessed into the top frame protects the birch bark, and metal tabletop fasteners secure the assembled top to the base.

Shaping the legs: I use three shopmade sliding tables with a variety of guides and stops to taper the legs, cut the compound angles for the top and bottom of the legs, cut the angled sides of the aprons, and miter the top edgebanding. With these setups, I perform repeated operations easily and accurately; I can then quickly assemble the display table with biscuit joints, as shown in the drawing at right.

I begin by dimensioning the leg stock as shown and then arranging the four legs for the most pleasing grain and color match. Next, I number each leg and mark the outside faces for reference when cutting and assembling the table. Tilt the tablesaw blade to 5° and with a 5° angle block on the sliding table, cut off the top and bottom ends of the legs. To cut the top of each leg, the outside faces of the leg should be against the fence and the table, but for the bottom, these faces should be away from the fence and table. Beginning 10 in. down from the top, I taper both inside faces of the legs, from 1½ in. at the top to ¾ in. at the bottom, on an extra-long sliding table with a tapered fence. A regular taper jig and the standard tablesaw fence can also be used. Clean up the sawmarks with a light pass on the jointer or with a handplane.

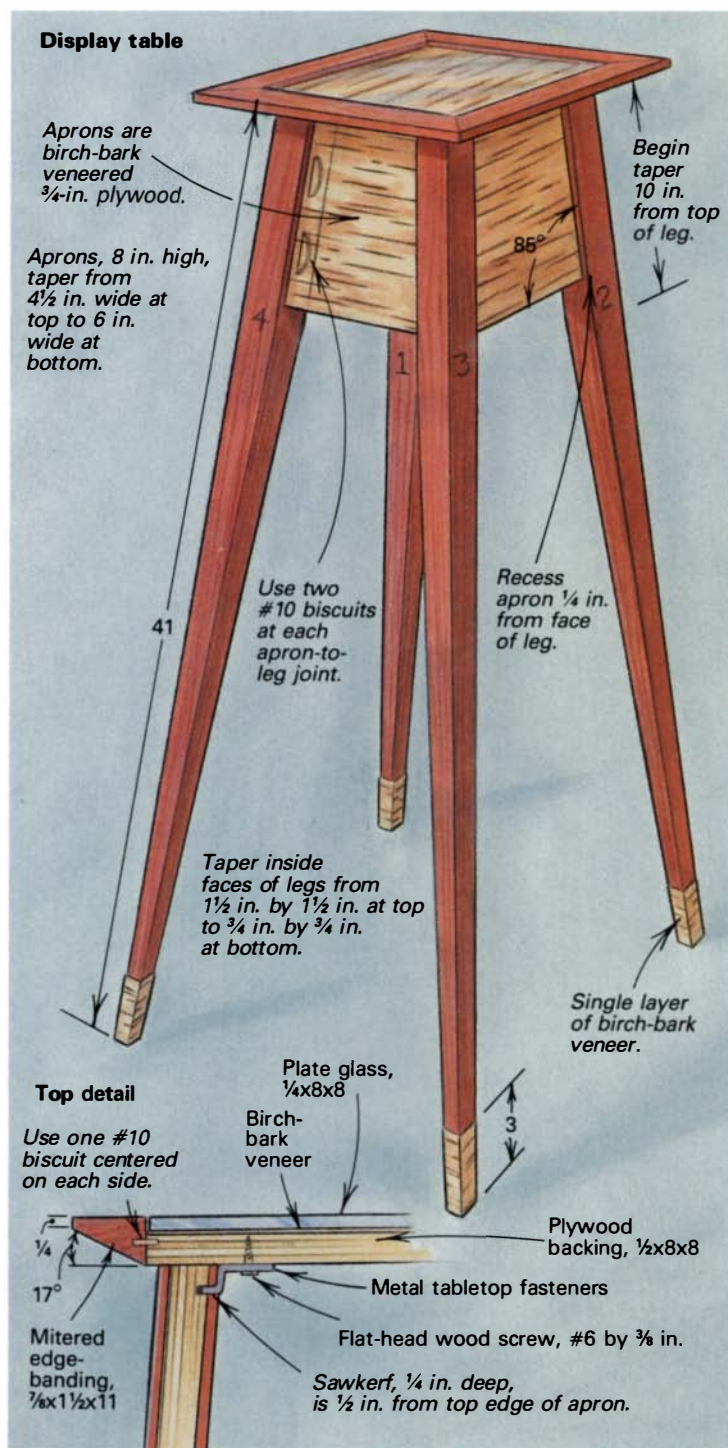
Assembling the base: The sides of the aprons are mitered at 5°, thereby splaying the legs for a lighter appearance and a stable base. After veneering the core material, flush-trim the overhanging bark with a router (see the main article). I usually veneer oversize blanks and then cut them to the sizes given in the drawing on a sliding table, using a 5°-angle block on the left side for the first cut and a 10°-angle block on the right side to compensate for the 5° angle already cut. A ¼-in.-deep sawkerf, located ½ in. down from the top edge of the apron, receives the tabletop fasteners (available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, Minn. 55374-9514; 612-428-2199) that hold the top to the base.

I join the aprons to the legs with two #10 biscuits at each joint, recessing each apron ¼ in. from the face of the legs. Biscuits were developed specifically for manufactured sheet goods and they provide a reasonably secure joint between man-made panels or between panels and solid stock. Additionally, biscuits are great in production situations because they are quick and easy to use. (See *FWW* #76, pp. 60-64, for more on biscuit joiners.)

Before gluing up the base, use the previously drawn reference marks to ensure that the legs are in the appropriate position, and have clamps and pads close at hand. To ease the burden of holding clamps, pads, legs and an apron all at the same time, I make special clamping pads by sandwiching two pieces of ½x1½x8 scraps between two pieces of 24-in.-long duct tape, with the scraps at each end of the tape. Spread the glue evenly on the sides of the biscuit and the slots, as well as on the edge of the apron and on the mating face of the leg. Glue two leg-apron units, aligning the top of the apron with the top of the legs. The special clamping pad is then laid across the top of the leg-apron unit, with the wood scraps hanging down the sides of the legs ready for clamps. After clamping, check that the unit is square and flat, and clean up squeeze-out with a damp rag, rubbing gently to avoid damaging

the bark. When the glue has dried, complete the base by gluing these two units to the remaining aprons.

Topping it off: The top edgebanding is mitered on a sliding table and biscuit-joined to the veneered plywood top. By aligning the bottom of the edgebanding with the bottom of the plywood top, a recess is created for plate glass that protects the bark from wear and tear. A full ⅞-in.-thick top looks heavy on this small table; so I bevel the underside of the edgebanding on the tablesaw to form a ¼-in.-thick edge. A light touch with a belt sander removes sawkerfs, and you're ready for finishing as discussed in the main article. —D.S.





Left: To clean the wood's pores of impurities before filling, Frank uses a soft-steel-bristle brush, scrubbing lightly and with the grain. The brass-bristle brush on the bench can also be used. Right: After



sealing the dyed wood with a thin coat of shellac, Frank mixes the filler made of powdered whiting with colored pigments and paste wax. He rubs the filler into the grain with a cheese-cloth applicator.

Creating a Decorative Filled Finish

Treating wood's pores for color and contrast

by George Frank

When I left my native Hungary and emigrated to Paris in 1924, I carried all my possessions in a small suitcase that couldn't have weighed more than 15 lbs. But I also carried a wood-finishing method in my head that was to keep me busy experimenting for many years to come. The wood-finishing process involved filling the pores of dyed open-grain woods with a contrasting-color filler to produce decorative effects. My old wood-technology teacher at the Technological Institute of Budapest, Hungary, had showed me an example of decorative filling years earlier on an oak desk that had been blackened and its pores loaded with white filler. The effect was striking! Although he told me that the piece had been made by Central-European cabinetmakers around the turn of the century, he couldn't tell me anything about the pore-filling process other than the composition of the white filler: plaster of Paris.

Three years later, I struck a bargain with the elderly owner of the rooming house where I lived: I repaired her furniture, and she gave me the key to a decent little workshop where I could experiment with decorative filled finishes. After endless research and hundreds of ruined samples—a potbellied stove helped me dispose of my errors and failures—I produced 15 pairs of master samples that helped my fledgling finishing business take a giant step forward.

Of all the finishing methods I've ever conjured up, the decorative filled finish is probably the most versatile and one of the most successful processes I've used to enhance wood furniture, cabinets, paneling and architectural interiors. A decorative filled finish is an easy, attractive way to dress up plain woods, giving them color and bringing out the grain pattern. It is accomplished by using a dye of one

hue to color the surface of the wood, and a contrasting- or complementary-hue filler to color the pores. Thus, you can create a vast range of decorative effects, adding color as subtly or as boldly as you choose. I'll tell you how I produce a set of samples with my decorative filled finish, including preparing the wood, dyeing or staining, sealing, filling the grain, and finishing. With these methods and a little practice, you can produce decorative filled finishes, like the samples on the facing page, and use them to create colorful effects on your furniture and cabinets.

Preparing the wood—While the decorative filled finish will work on any open-pore wood, the finish is most stunning on ash or red oak. Close-pore woods, like birch or maple, won't work because the pores are too small to accept the filler. To prepare my original master samples, I started by cutting several dozen 1/4-in.-thick boards. To make the proportions of the samples pleasing, I cut them 10 in. long by 6 3/16 in. wide, which corresponds to the “golden mean,” a sophisticated and visually pleasing ratio that occurs in nature. (For more on the golden mean, see *FWW* #66, p. 78.)

After selecting the best-looking sample boards, I smooth each piece with a steel scraper blade, filed flat and freshly sharpened, and then sand with 100-, 120- and 150-grit papers. To keep the surfaces flat, I stretch the sandpaper over a hand-size block of marble. With sanding complete, I use a clean sponge to apply warm rainwater on the samples. You may substitute distilled or spring water for rainwater; the point is, use water free of chemical contaminants. After the wood has dried, I resand with 220-grit to clean up the raised grain.



By staining or dyeing wood, sealing it and then packing the pores with a contrasting filler, you can create a decorative filled finish that adds color and brings out the grain pattern in any open-pore wood. From left to right, the samples are: red oak with black ani-

line dye and plain white filler; red oak with red aniline dye and yellow-color filler; ash with walnut stain and peach-color filler; white oak with green aniline dye and blue-color filler; ash with logwood and potassium-dichromate dye and beige-color filler.

The sample boards are now smooth as a baby's bottom; next, the pores have to be cleaned, since the filler can't be introduced into pores filled with debris. I have a powerful air compressor in my shop and flush out most of the sawdust with a blow gun. Then, as shown in the left photo on the facing page, I use a dry, clean wire brush to scrub the wood with the grain to clean the pores of impurities. I prefer a brush with either soft-brass or fine-steel bristles. *Don't* use a brush with coarse, hardened-steel bristles.

Coloring the wood—The smooth, clean, dustless samples are now ready to be stained. For me, coloring the wood is a passion; I feel wood is alive and responds to my care with shades, hues, brilliance, depth and beauty that compensate me for all the preparatory work. To color my first sets of samples, I used mostly natural dyes, combined with some color-producing chemicals. For example, I combined brazilwood extract with varying concentrations of dichromate of potassium to create attractive reds, from crimson to pale pink. One of these colors is shown in the sample on the right. Another one of my favorite colors comes from a natural dye made from walnuts called “brou de noix.” This dye changes a light-color wood to a rich brown color, as shown in the center sample. All my natural coloring ingredients are water soluble, and I use them as warm as I can handle, to get better penetration. For more on natural and chemical dyes, see my book, *Adventures in Wood Finishing* (The Taunton Press, 1981) and my article in *FWW* #66. A variety of natural and chemical dyes are available from Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, Pa. 17402.

As my Paris wood-finishing business grew during the 1920s to employ over two dozen workers (a success bolstered by my winning France's prestigious “Brevet d'Invention” award in 1928 for my finishing processes), we were faced with larger commissions requiring decorative filled finishes done by the square meter. I then reluctantly replaced my natural and chemical dyes with aniline dyes. The little lost in the sheer beauty of the natural dyes is gained back in consistency and ease of application with the anilines. I favor the German Arti brand dyes (available from Highland Hardware, 1045 N. Highland Ave., Atlanta, Ga. 30306), preparing them according to the directions on the package. To apply the dye, I saturate a small piece of scrap foam rubber and wipe it with the grain, using long, overlapping strokes. If you use a water-base aniline, you may need to lightly resand the wood with very fine paper.

Once the wood is dyed, I apply a coat of shellac using the French-polishing method. Using a tampon (but *no* lubricating oil), I rub on several breath-thin layers of shellac, so that the wood's dyed color is well protected by a transparent shield, but the pores remain open and clean. For more on this, see “French Polishing” in *FWW* #58.

Mixing and applying the filler—I filled the pores on my earliest samples with plaster of Paris, but cleaning off the hardened excess proved too time-consuming. Therefore, I improved the filler mix-

ture by substituting a new basic ingredient: whiting, a powdered chalk sometimes called “gilder's whiting,” (available from local hardware stores or Pearl Paint Co., Canal Street, New York, N.Y. 10013). This mixture not only fills pores well, but excess is easy to clean off. To make colored filler for a decorative finish, I combined about a cup of whiting with a couple of teaspoons of colored pigment powder (sometimes called earth colors or fresco colors, and available from Constantine, 2050 Eastchester Road, Bronx, N.Y. 10461). Mix the whiting and pigment into a paste by adding a little varnish maker's and painter's (VM&P) naphtha or mineral spirits until the filler is slightly thicker than toothpaste. Also to this mix, I add a teaspoon or so of regular paste wax (available at hardware stores or supermarkets), which acts as a binder. Don't substitute a specially formulated automotive wax, as it may contain petroleum oils or silicones that can cause finishing problems later.

To use the filler, mix it in a clean container, stirring it into a smooth, heavy paste. Then, using a piece of cheese cloth, wipe the paste on the colored wood surface, forcing it into the pores by rubbing in a swirling motion (see the photo at right on the facing page). After the pores are loaded, use a clean piece of cheese cloth and wipe off the excess filler (you don't have to wait for it to dry) *across the grain*. The filler dries completely in two to three days, depending on the thickness of the mixture and the humidity in your area.

Final finishing—With the samples sporting deep, well-defined colors, with contrasting fillers emphasizing the natural markings of the wood, the next job is to preserve and protect the colors with a topcoat of finish. While you can apply most common finishes (such as oil, varnish and shellac) over the filler, it's a good idea to seal the surface with shellac before topcoating and to check finish compatibility on a sample before doing an entire piece.

Now that I've given you the basics for preparing a decorative filled finish, experiment with different stains or dyes and color combinations. You may choose to leave the wood natural and add wild colors—maybe even metallic pigment—to the filler. Another possibility is to bleach the wood before filling and use a very light-color filler, to create a soft, weathered effect. Each of these options works well with my techniques. Just take careful notes and keep track of how you prepare each mixture, so you can duplicate it if it's a winner.

In conclusion, I'll leave you with a true story about how much a decorative filled finish can appeal to a customer. In 1935, I had my eyes on a revolutionary new car, the Citroen 6. Unfortunately, not only was it costly, it was hard to get: one could wait two or three years for delivery. So, I went to the local Citroen dealer, with samples in hand, and I told him, “I would be honored to refinish the paneling in your showroom, if you're willing to do me a little favor...” Three months later, yours truly was driving his own Citroen 6 around the streets of Paris, with a smile on his face. □

George Frank is a master wood finisher living in South Venice, Fla.

String Inlay

Using dental burrs for cutting grooves

by Irving Gerber



String inlay adds another dimension to a flat surface by defining its shape and filling its empty spaces with eye-pleasing curves. The simple vine-and-berry pattern on the author's cherry two-drawer chest sets off the drawers and complements the drop pulls.

Furnituremakers have used string inlay to decorate their work for centuries. The fine, contrasting lines can accentuate the shape of a drawer front or tabletop, emphasize the taper of a leg or create the swirling design of a vine-and-berry pattern. Although the technique is often associated with Federal-style furniture, it is adaptable to most styles and the design possibilities are many and varied, as shown here.

The thin, flexible inlay material, known as stringing, is often sliced from holly veneer because of its nearly pure-white color. But any other straight-grain veneer that is not too brittle and is of a contrasting color to the primary wood will also work. The stringing is inserted edgewise into the surface to be decorated; so the resulting inlay is only as wide as the veneer is thick. Traditionally, the narrow grooves that receive the stringing were scratched into the surface with a tiny rectangular tooth filed or ground on the edge of a cabinet scraper that's mounted in a wood holder. This shopmade tool, called a scratch stock, works well enough, but presents certain problems: The necessary 0.033-in.-wide tooth is fragile and hard to grind accurately. And in some cases the edges of the grooves tear or crumble, especially when cutting across the grain or on highly figured veneers. As an alternative to the scratch stock, I've been using a hand-held rotary tool, the Dremel model 395. It cuts grooves faster and with consistently better quality, but it's not foolproof. Cutting grooves is precise work and there is a technique to be mastered.

Setting up the rotary tool—Dremel (4915 21st St., Racine, Wisc. 53406; 414-554-1390) has three models of Moto-Tools: a single speed (no. 275), two speed (no. 285) and variable speed (no. 395), ranging in price from about \$45 for the single speed to \$100 for the variable speed. When routing the small grooves for stringing, I run the variable-speed model at its top setting of 30,000 RPM. Since the single-speed model runs at a comparable 28,000 RPM, I don't see why any of the models wouldn't work equally well for this operation. You'll also need Dremel's router-base attachment, part no. 230 (about \$24), which quickly turns any of the standard hand-held models into a minirouter (see the top photo on the facing page). However, I replaced the platform portion of the base with a piece of 1/8-in.-thick clear Plexiglas cut 4 in. longer and 2 in. wider than the platform

that came with the tool. Drilled to mate with the router attachment and screwed in place, the larger clear plastic platform adds immeasurably to the stability of the tool and gives you a better view of the bit while cutting. The router attachment comes with a guide fence that mounts on two rods and that is adjustable out to about 3 in. If you need a straight groove more than 3 in. from the edge, you can clamp a wooden guide fence to the workpiece. For cutting curved grooves, I made a separate compass platform that attaches to the router base (see figure 1). The compass platform is made by laminating pieces of 1/8-in.-thick Plexiglas and leaving a slot for an adjustable arm fitted with a center point. I borrowed a center point with a shoulder from a compass set and bonded it into a hole in one end of the arm with instant glue (cyanoacrylate glue). My prototype version of this compass platform depends on double-stick tape to secure the arm once it's set. It might be better to make a slot in the arm and countersink it for a flat-head machine screw that could lock the adjustable arm in place with a wing nut. But this is one of those fixtures that I put together quickly to see how it would work, and it worked so well I haven't gotten around to rebuilding it yet.

For the cutting bit I use an S.S. White carbide dental burr #SSWFG56 available from Health Co International, 1 Field Lane, Orchard Ridge Corporate Park, Brewster, N.Y. 10509; (914) 277-4074, and other dental-supply houses. Ten bits cost about \$13. This particular burr has spiral flutes similar to a twist-drill bit, and it cuts cleaner and disposes of the debris better than the more common dental burrs with straight flutes and serrated or toothed sides. The burr cuts a 0.034-in.-wide groove, which works well with stringing sliced from the most common, 1/32-in.-thick (0.033 in.) veneers.

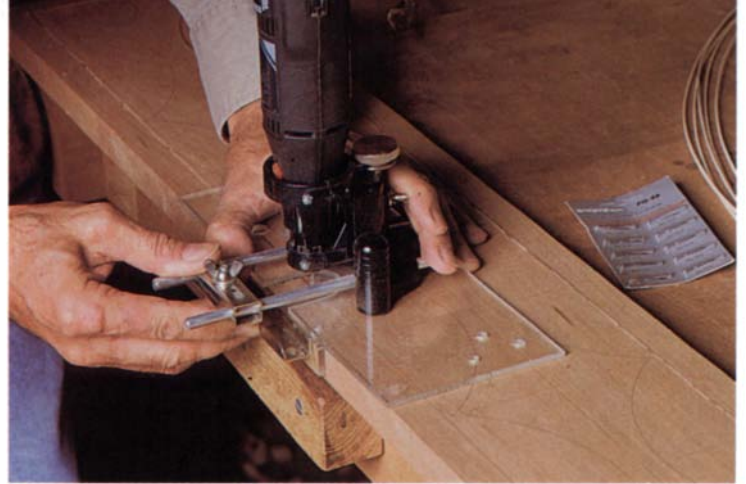
With the tool set up for use as a router, chuck the burr into the tool and adjust the router base to allow for a 1/16-in.-deep cut. But don't be in a rush to groove your finished work; some practice and experimentation to get the hang of this minirouter is essential. The tiny-diameter burr will deflect and then break if you advance it too fast. If you move it too slowly, the bit will burn rather than cut. Although some burning is inevitable because the tiny chips clog the groove, you should adjust the speed of your forward motion to keep burning to a minimum. To further complicate matters, you must vary the feed speed to minimize bit deflection and drift as

you cut through areas of different hardness when the groove passes close to a knot or from one material to another, such as from a solid banding to a veneered field on a tabletop. With this minirouter, the tiny bit will deflect instead of overload, and so there will be no change in the pitch of the motor as there is with a full-size router. The only way to learn to deal with all the variables is by practicing long cuts on the same material as your project. Before you move on to the project at hand, experiment with both straight and curved cuts until you can put the tool to the wood with confidence.

Here are a few more tips that will help you become proficient at routing grooves. Always shut off the tool while the burr is still in the groove. If you try to lift it out while it's still rotating, it will invariably nick the edge. Don't make a second pass to remove the debris that stays packed in the grooves. This will only widen the groove and increase the potential for error. Instead, loosen the debris by running a single-edge razor blade down the center of the groove, and then clean out the loose sawdust and chips with a mini-chisel made from a broken-off piece of hacksaw blade. The mini-chisel is also handy for squaring the end of a groove at a corner.

Cutting the grooves—The surface to be inlaid should be trimmed to final size and completed except for finish-sanding. In pencil, draw the design for the stringing pattern onto the workpiece exactly as you want it to be cut. Make sure the lines are dark enough that you can see exactly where each straight cut should end, and mark the centers of the arcs.

When grooving in a rectangle, for example outlining the face of a drawer, it's best to start each cut where the last cut ended, as shown in figure 2A below. I usually work from left to right when it's convenient, but because you're making such a light cut, working in either direction doesn't present any problems. To start the first cut, hold the guide fence against the edge of the workpiece with the burr directly above the groove's starting point but not touching the wood. Then, turn on the tool, lower the burr into the wood and proceed through the cut, holding the fence against the workpiece edge (see the top photo). After cutting the first groove, move the guide fence around the corner of the workpiece and, with the fence against the edge, try to set the burr down into the end of



Above: Gerber uses a Dremel tool, fitted with an auxiliary router base and a dental burr, to cut the narrow grooves for string inlay. Here he's making a straight cut near the edge of a drawer front. The router-base platform has been replaced with a larger piece of Plexiglas to increase stability and visibility. Above: For cutting curved grooves, Gerber replaces the router-base platform with a shopmade compass platform. He holds the adjustable arm's compass point with one hand and slowly advances the tool with the other. The steel rule, affixed to the work with double-stick tape, acts as a barricade at the end of the cut.

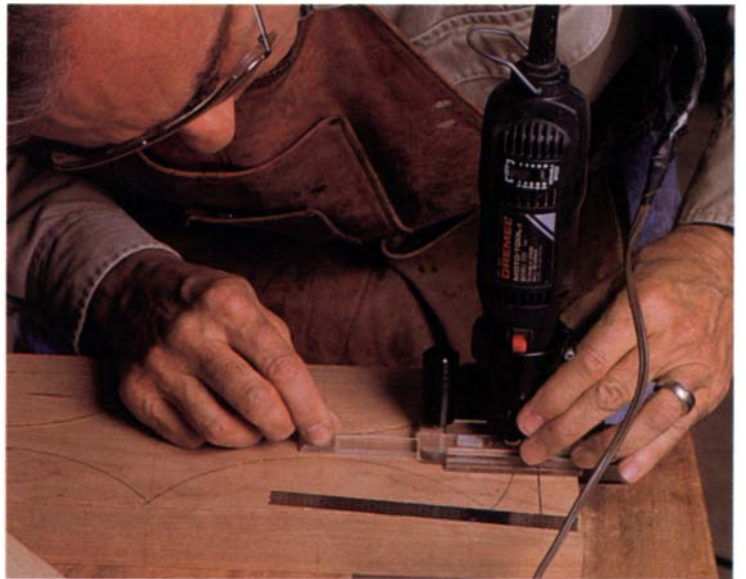


Fig. 1: Compass platform

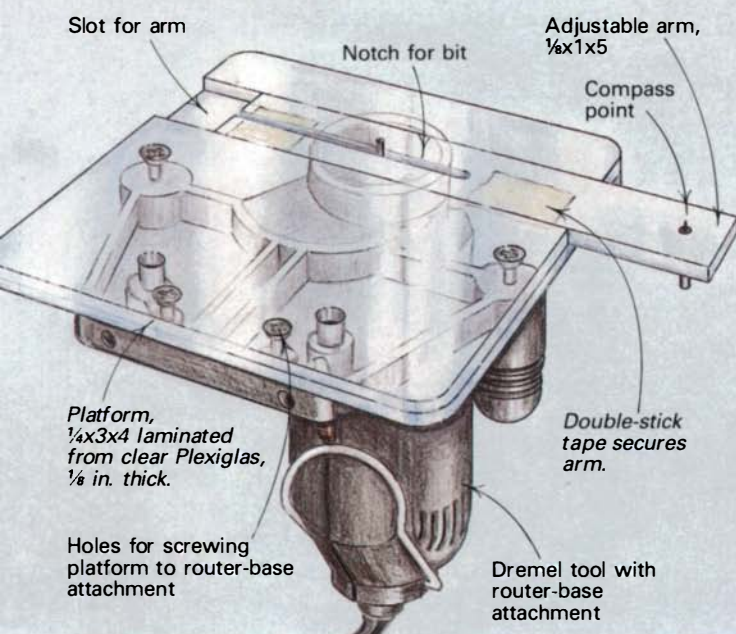
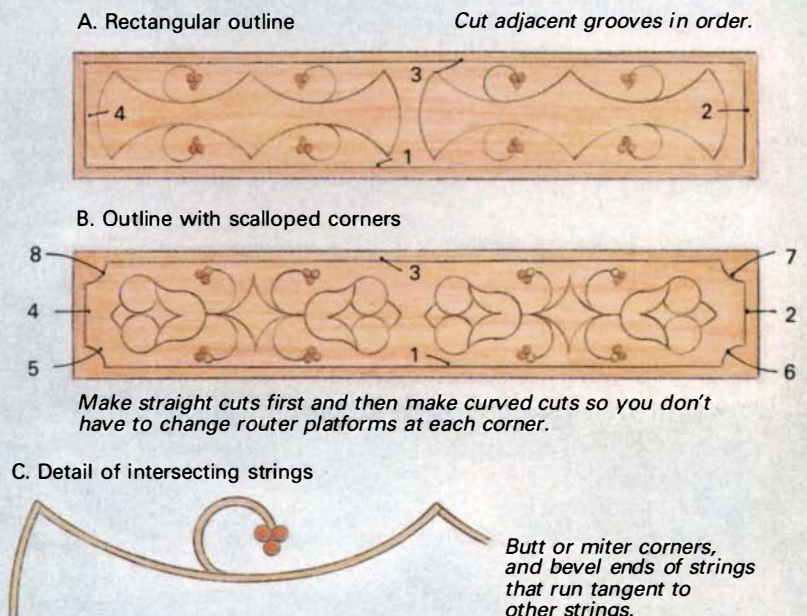
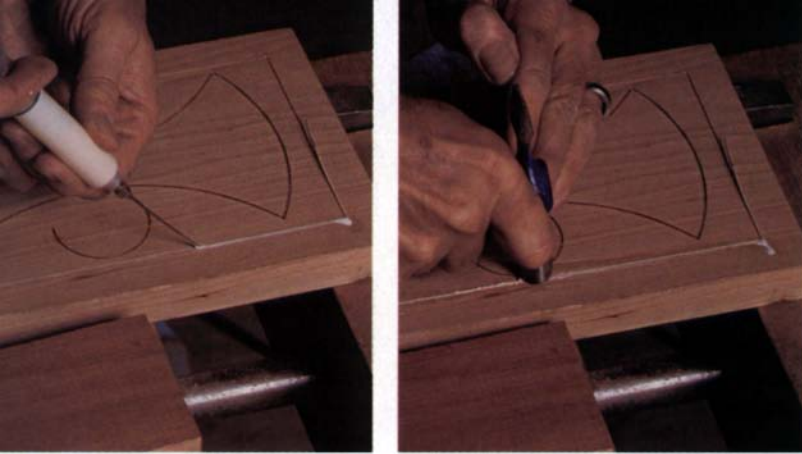


Fig. 2: Drawer patterns





At left, glue is injected into a groove with a syringe. Then a piece of stringing is placed in the groove and pressed home with a hammer (right). Note the stub of stringing inserted into the adjacent groove to keep glue from seeping into it and hardening.

the first groove. If you stopped the first groove a bit short or ran it a tad long, adjust the fence accordingly until the burr fits right into the end, and then switch on the tool and make the second cut. Readjusting the fence is preferable to trying to extend a groove once you've stopped because the burr may have been deflecting slightly at the end of the cut. Resetting the fence will ensure a crisp corner, which is much more critical than a slight discrepancy in the distance of the stringing from the edge of the work.

If your drawer pattern has scalloped corners, like the one in figure 2B on the previous page, it's impractical to go around the drawer's perimeter, from cut to adjacent cut, because it requires changing router platforms from straight to curved and back again four different times. In this case, you should make the straight grooves first, stopping them precisely as drawn, and then connect the ends of the straight grooves with the curved grooves. Instead of just relying on my eye to precisely stop a cut, I fasten a small metal pocket rule with double-stick tape at the point where I want the cut to end (see the bottom photo on the previous page). When I hear the carbide bit hit the metal, I know it's time to stop.

After cutting all the straight grooves in your pattern, remove the fence and platform from the router attachment and install the compass platform. The arcs on the scalloped drawer pattern must connect the ends of the straight grooves, which means careful placement of the center point is essential. If you stopped your straight cuts right on the mark, you can simply use the same center you used when drawing the pattern. But if there is any discrepancy from the drawn pattern, set your drawing compass for the original radius and relocate the center so that the arc intersects the end points of both straight cuts. Then use the compass spread to set the adjustable arm on the platform. When you're sure that the center point of the compass platform is located properly, place the burr in the end of one of the grooves that the arc is intersecting and switch on the tool. As shown in the bottom photo on the previous page, I hold the compass point with one hand as I swing the tool through the arc with the other. If you are making the first cut in some part of the pattern, you'll have to hold the center point in place with the burr above the work, switch on the tool and lower the burr into the wood. To avoid marring the finished surface with compass-point holes, fasten a thick piece of veneer at the center point with double-stick tape. When the center of an arc falls beyond the edge of the workpiece, I clamp a block to the edge for locating the center.

Inlaying the stringing—After carefully cutting all the inlay grooves, clean out any debris with a single-edge razor blade and the minichisel described previously. Square up any corners that aren't crisp, but be careful not to widen the grooves. Use a sharp X-Acto knife and a straightedge to slice stringing from standard $\frac{1}{30}$ -in.-thick veneer. Se-

lect veneer with as straight grain as possible, and slice parallel with the grain so the stringing doesn't splinter out of the groove when you scrape it level with the host surface. To ensure straight grain, slice through one sheet of veneer at a time and if necessary orient the cut diagonally on the sheet to follow the grain. Hold the knife vertically as you slice because you want a square cut on the stringing so it will seat well in the bottom of the groove. If your grooves are $\frac{1}{16}$ in. deep, cut the stringing $\frac{3}{32}$ in. wide so it will stand $\frac{1}{32}$ in. proud of the host surface; stringing that protrudes any more than that will split or mush out when you try to press it into the groove.

If you used the burr I recommended, your grooves will be 0.034 in. wide. And if your stringing is sliced from standard $\frac{1}{30}$ -in. veneer, you will have 0.001-in. clearance in the grooves. However, since the thickness of the veneer can vary, you should check each string for fit after cutting it to length. If it feels at all snug when inserted into the groove dry, take a few swipes with 180-grit paper on each side of the stringing to knock off any fuzz or splinters. Also, keep in mind that the veneer will swell a little when it hits the wet glue in the grooves. To be sure you have the right fit, practice by gluing a sample string into a groove that's at least as long as the longest run in your pattern.

I squirt yellow carpenter's glue into the groove with a #18 medical hypodermic needle, as shown in the left photo, to ensure I get a continuous layer of glue. If it's difficult or illegal to obtain these needles in your state, you can get a glue injector, which is an inexpensive plastic syringe without a needle, from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, Minn. 55374-9514.

After cutting a piece of stringing to length and testing its fit in the groove, place one end tightly into the groove's corner and hold it there with one finger as you work the string into the length of the groove with a finger of the other hand. Press the string home by running the face of a hammer over it, as shown in the photo at right. As you get close to the end of the groove, you'll find that the combination of the moisture in the glue and the pressing action of the hammer has caused the stringing to stretch slightly; so a final trim to length is necessary. I use a small pair of jeweler's side cutters to nip off the excess, and then I press the stringing into the last inch or so of the groove with the hammer. If there are other grooves that intersect with the one you're inlaying, insert short stubs of stringing as temporary dams to keep the glue from seeping into the adjoining grooves (see the left photo). Pull out the stubs when the glue starts to set or you'll ruin the groove trying to dig it out later. If you're a purist, you may try to miter the corner, but it becomes such a gooey mess that I don't think it's worth the trouble. However, it is necessary to trim the end of a string at an angle with an X-Acto knife to make a continuous transition between inlays where a curved groove runs tangent to another groove (see figure 2C on the previous page). I inlay the straightest string first and then cut the tangent string to fit up to it. When one string actually intersects and passes through another, I run one string and butt the other to it from both sides. As an alternate method, you can cut only one of the intersecting grooves, glue the stringing into it, scrape it flush, and then come back and cut the intersecting groove right through the inlaid string.

After all the stringing has been glued into the grooves and the glue has had time to set completely, scrape the stringing flush with the surface. If your pattern includes berries, the circular inlays that often accompany stringing, drill holes for them with a Forstner or brad-point bit after scraping the stringing flush, and let one of the berries slightly overlap the end of the stringing. Make the berry inlays with a plug cutter by drilling several plugs in a narrow board and then resawing the board to release $\frac{1}{16}$ -in.-thick discs. □

Irving Gerber builds custom furniture in Charlestown, Mass. For more on string inlay see FWW #59, pp. 58-60 and FWW #72, p. 79.

Tagua: The Vegetable Ivory Substitute

Cleod Christiansen turns palm nuts into translucent vessels

by Fred J. Hunger



Tagua, a vegetable material from the nut of a South American palm tree, looks, feels and works like animal ivory. It has been used for decades to make small functional and decorative items.

Cleod Christiansen is one woodworker who turns tagua on the wood lathe to make tiny translucent bowls, boxes, vases, rings and vessels, like the ones shown here.

Animal ivory has been crafted into functional and decorative objects for millennia. But the potential extinction of the animals that provide that precious material has made the question of whether or not to use ivory a serious ethical issue. Those in favor of using ivory say it's a shame to waste the tusks of elephants or walrus that have died naturally; those against it say that even using "antique" ivory, which has been around longer than these issues have been argued, creates a public desire for animal ivory—and a market for the poachers who will wantonly slaughter ivory-bearing beasts into extinction.

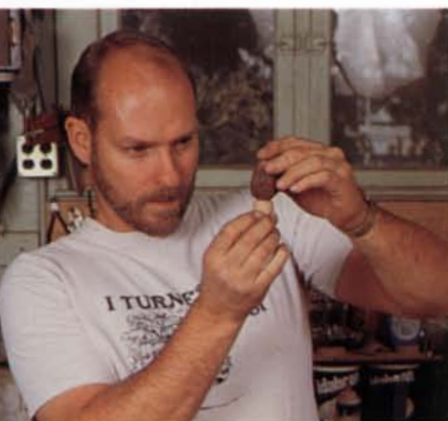
Fortunately, there is an ivory substitute available that may resolve the ethical dilemma for many craftsmen who want to use small pieces of ivory. It's a natural material that has most of animal ivory's working and aesthetic qualities, and it literally grows on trees: The tagua nut is the seed of a South American palm tree. One craftsman who has used tagua extensively is Cleod Christiansen, a woodturner in Ogden, Utah. Christiansen first became aware of the tagua nut when he saw a scrimshaw artist engraving the material at a Maryland craft show in 1982. He believed that if tagua could be engraved, then it probably could be turned as well. Since then, Christiansen has turned hundreds of tagua nuts into beautiful miniature vases, boxes, bowls, rings and vessels, like those shown above. In this article, I'll describe the tools and methods Christiansen uses for turning a tagua vessel on a regular woodturning lathe. But first, a little more background on the amazing tagua nut.

All about tagua—Sometimes called ivory nuts, tagua nuts come from the ivory palm tree (*Phytelephas macrocarpa*), where they grow in clusters weighing up to 25 lbs. The ivory palm is native to the equatorial regions of Central and South America, and flour-

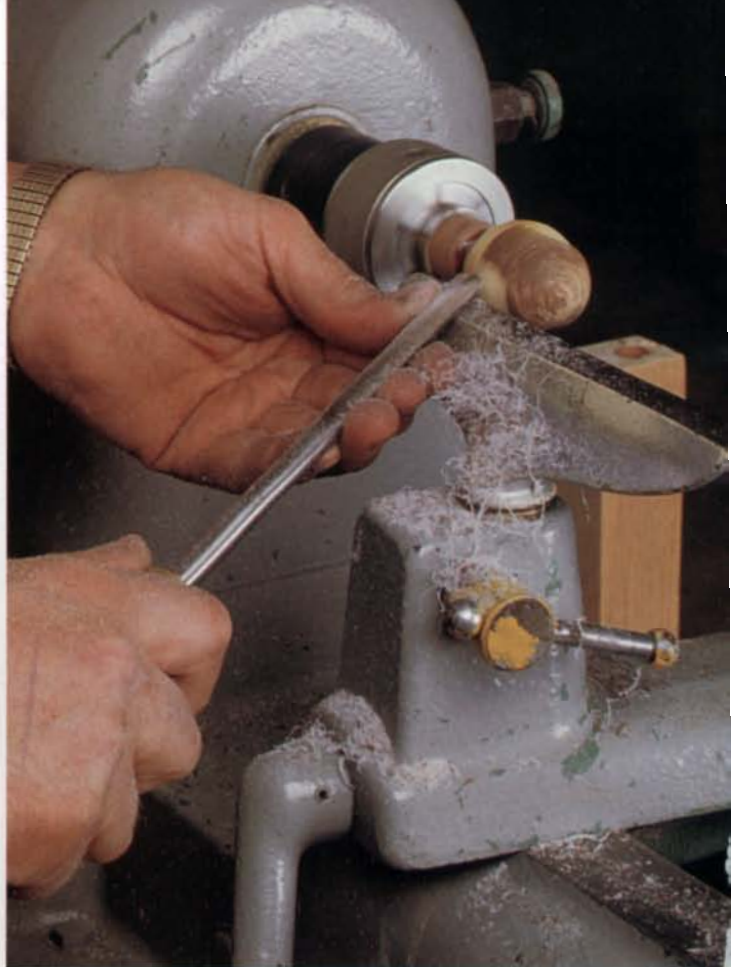
ishes along the banks of the Rio Magdalena, in Columbia. After the tagua (pronounced tah-wah by Andean natives) nuts are harvested, they become dry and hard, protected by a crusty, shell-like covering. A medium-size tagua nut is approximately 1½ in. long by 1¼ in. in diameter. It is rounded with four slightly flat sides, a pointed end, and a stem end that is slightly concave, much like the indentation on the stem end of an apple. The tagua nut is completely non-toxic, composed of mannose sugar; in fact, when the nut is first harvested, it is soft, edible and sweet.

Tagua ivory, according to Shirl Schabillon's booklet, *All in a Nutshell*, has been used as a crafting and commercial raw material for more than 160 years. The Japanese have been using it for 100 years or more for carved netsukes and, since Victorian times, tagua has been fashioned into jewelry. It was also used extensively in button manufacturing until plastics became popular in the mid-1900s. In past decades, craftsmen have found tagua nut ivory quite suitable for turned and carved needle boxes, dice, cane handles, scrimshaw, and other applications for durable, attractive items. There are even stories that one man used tagua to construct replacement dentures for himself (an indication that the dried, carved nut is moisture resistant). Today, tagua nuts are available from several mail-order sources, including: Woodcraft Supply, 210 Wood County Industrial Park, Parkersburg, W.V. 26102-1686; (800) 225-1153, (304) 428-4866; The Turning Post, 225 23rd St., Ogden, Utah 84401; (801) 393-2320; Mississippi Petrified Forest, Box 37, Flora, Miss. 39071; (601) 879-8189; or Lee Valley Tools Ltd., 1080 Morrison Drive, Ottawa, Ont., Canada K2H 8K7; (613) 596-0350.

Mounting the nut for turning—To prepare the ivory nut for turning, a portion of its outer covering is sanded away, usually at



Left: Before turning, the tagua nut is sanded flat on one end and glued to the end of a dowel to be held in the lathe by a spigot-type chuck. Christiansen checks the nut-to-dowel fit before bonding. Right: Turning small vessels from tagua is much like turning miniatures from dense hardwood. Christiansen uses a $\frac{3}{8}$ -in. bowl gouge, with the tip reground to a lady-finger profile, to rough-turn the outside of the vessel. Below: Producing shavings that look like coconut, Christiansen starts hollowing the inside of the vessel using a $\frac{1}{8}$ -in.-deep fluted gouge, cutting from the edge toward the center.



Left: By positioning a lamp above the spinning tagua vessel, Christiansen can judge its wall thickness by watching the shadow of the tool and the light color of the translucent tagua. He uses a modified dental tool with a reground tip to contour the inside. Above: After sanding all the way down to 600-grit, the tagua vessel is polished to a high shine with a small cloth buffing wheel chucked in an electric hand drill.

the more pointy end, creating a flat surface. The nut is then glued to a short (approximately 2 in. long), 1-in.-dia. hardwood dowel using cyanoacrylate adhesive, which can be purchased at a hobby or hardware store as Super Glue, Hot Stuff or Flex Zap. While gluing, Christiansen uses a spray-on accelerator called Hot Shot to speed the curing time of the glue. I asked Christiansen about using a five-minute epoxy instead of the cyanoacrylate, but he said epoxy didn't seem to work well for gluing tagua.

After the glue is set, the dowel is inserted into the lathe's headstock collet, a spigot chuck or a self-centering three-jaw chuck, so that the dowel extends about $\frac{3}{4}$ in. beyond the chuck. (Using the three-jaw chuck is a hazard to fingers and hands, and great care needs to be taken.) Christiansen uses an old Oliver lathe, set to rotate at approximately 2,000 RPM.

The method Christiansen developed for turning tagua nuts into tiny translucent products is fairly simple. Actually, turning tagua is very similar to turning regular hardwoods; Christiansen uses the same tools, techniques and about the same amount of tool pressure against the turning tagua. Good lighting is provided by an adjustable lamp set very close to the turning workpiece, shining from the back side of the lathe. Christiansen wears a face shield and follows the same safety practices he would for any woodturning.

Turning the outside—Before turning begins, the tool rest is positioned just below the centerline of the lathe and is set as close as possible to the tagua nut so that it just clears the rough nut. The initial angle of the tool rest in relationship to the lathe's centerline is between 7° and 10° , with the tool rest closer at the chuck end (see the top, right photo on the facing page). This setting allows the bottom of the turned vessel to be shaped first. Then, Christiansen rough-turns the vessel on the outside, using $\frac{1}{8}$ -in.- and $\frac{3}{8}$ -in.-dia. fluted gouges. (He uses Henry Taylor brand gouges that are available from Craft Supplies USA, 1287 E. 1120 South, Provo, Utah 84601; 801-373-0917.) The gouge's cutting edges are sharpened to a "fingernail" profile so that they cut with a shear-scraping action, as described in Steve Gellman's article in *FWW* #79. The actual cutting takes place just about the centerline of the spinning tagua nut. Instead of dust, the shear-scraping produces thin shavings that look just like finely shredded coconut. The tool rest should be adjusted frequently to remain very close to the work during roughing out, to prevent chatter problems; however, these nuts have very good dimensional stability and rarely crack or break apart during turning.

The final shape of a turned tagua vessel is affected by several things: the original size and shape of the raw nut, as well as by the nut's internal structure. Each nut has a natural cavity inside and a small hole, connecting the cavity to the outside, covered by a small kernel. You must cut around these features so you don't end up with a void in the finished object, unless it's desired; Christiansen sometimes accentuates a hole in a vessel, such as the small vase in the photo on p. 65. If you're turning a small bowl, vase or other vessel that's open at the top, it's best to glue the nut to the dowel with the navel pointing away from the dowel. Still, the shape of the turning might have to change as you discover the extent of the void inside.

Hollowing—To hollow the inside of a vessel, the tool rest is repositioned perpendicular to the centerline at the free end of the nut. The lip is formed at the beginning of the hollowing process. While cutting the lip, Christiansen stops the lathe often to verify lip thickness, because the dark color of the natural edge looks deceptively wide when seen with the vessel spinning. Christiansen often leaves

the natural brown edge of the tagua's crusty outer shell intact on the lip, as a decorative touch.

To start hollowing, an initial entrance hole is made with the $\frac{1}{8}$ -in. gouge plunged into the nut until it encounters the natural cavity inside the nut. The kernel is removed during the evacuation of the nut's center. Initial cutting into the irregular shape of the nut must be done very carefully to avoid snagging the material. It's best to start the entrance cut at the outer perimeter of the nut and move the tool toward the center. This eliminates chatter, which can result while making the rough surface cuts on the interior of the vessel.

For the major hollowing, Christiansen uses a modified dentist's tooth-filling packing tool. This tool has an approximate 60° elbow near its cutting end, which makes it handy for reaching inside a bulbous vessel. He regrinds the top surface of the tool to create a flat, sharp cutting edge (similar to a round-nose scraper), and then he mounts the tool in a hardwood handle. (Dental tools are available from dental-supply houses for approximately \$15 or, if your dental bill is paid, you might ask your dentist for an old one.) As Christiansen hollows the vessel deeper and deeper, the shavings tend to get stuck inside, so he uses a simple soda straw to blow them out.

Christiansen continues hollowing with the modified dental tool until the wall starts getting thin. At this point, he positions the desk lamp above and slightly behind the turning, until he can actually see the shadow of the tool through the translucent tagua nut (see the bottom, left photo on the facing page). By gauging the darkness or lightness of the nut, Christiansen can tell how thin the vessel's wall is getting. Experience with this method tells him when the wall thickness is just right—about $\frac{1}{16}$ in.

Trimming, sanding and buffing—After the wall of the vessel is worked to a uniform thickness, Christiansen removes any ridges and smooths out rough areas left from the hollowing-out process. He repositions the tool rest to the outside of the workpiece as before and then shapes the vessel's base and does any final trimming or fairing on the outside.

After all the shaping is done, the tool rest is removed from the lathe to allow unobstructed access to the vessel for sanding and buffing. The nut is then carefully sanded, usually beginning with 220-grit paper. Christiansen sands the vessel's exterior with the lathe running and until all scratches and tool marks are gone. He sands with progressively finer-grit paper, until final-sanding with 600-grit. Next, the nearly finished vessel is buffed using a 4-in.-dia., white-cotton buffing wheel chucked into a hand drill. Christiansen first charges the wheel with brown tripoli buffing compound (available from a jeweler-supply house) and then presses it against the spinning vessel (see the bottom, right photo on the facing page).

After buffing, the tool rest is reinstalled and positioned parallel to the lathe's centerline, to allow the vessel to be parted off the dowel. Most vessels will part-off easily; however, it's prudent to keep a hand around the vessel while parting, just in case. The little ridge or boss that remains on the bottom of the vessel can be sanded away by hand.

In an hour, an experienced tagua-nut turner can produce three or four miniature vessels, which typically sell for about \$25 each, although some of the best work sells for hundreds of dollars. Christiansen signs the bottom of the each tagua turning he makes, using a vibrating marker (the kind used to identify tools and other valuables). Hot branding-iron-type markers should be avoided, because the heat may scorch or crack the nut. □

Fred Hunger writes and works in Ogden, Utah.

Making a Veneered Game Cabinet

A journeyman's exam piece to test your skill

by Norbert Heinold



This veneered game cabinet was part of the author's journeyman's exam. Building it not only provides attractive and flexible storage for a variety of games, but it also provides lessons in a variety of veneering techniques with several different core materials.

While electronic games are currently all the rage, traditional pastimes like chess, checkers and backgammon are still very popular. These games have lots of pieces, however, that become dust collectors or are easily lost unless you have a good way to store them. A game chest or cabinet has been a practical and beautiful solution to these problems for centuries. The inlaid decorations on the cabinet shown here add some fun to the piece, and challenge the woodworker's skill.

This game cabinet is the culmination of my three-year apprenticeship at Werkstaetten Knorr, a workshop in Wuppertal, Germany. As part of my journeyman examination, I had to design and build a cabinet with doors and at least one dovetailed drawer; so I developed the veneered game cabinet shown in figure 2 on p. 71. Veneering has many advantages over solid-wood construction. First, using dimensionally stable core materials eliminates wood-movement problems. And veneers are available in species that might otherwise be prohibitively expensive, are easily stored and can be made into panels of any size. But the main reason I favor veneers is they allow for a design freedom that is impossible to achieve with solid woods.

Because the construction of the game cabinet is relatively simple, here I'll concentrate primarily on veneering techniques rather than on joinery. The carcass is $\frac{3}{4}$ -in. lumbercore plywood, edged in solid mahogany, and veneered on the outside with mahogany and on the inside with maple, as shown in figure 2. The mitered corners are reinforced with special L-shape plastic angles; I haven't found these in the United States, but instead you can use plastic miter dowels (available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, Minn. 55374-9514; 612-428-2899). The parti-

tions and top and bottom shelves are doweled in place, but the other three shelves are adjustable to provide flexible storage for board games. To make the drawers for game pieces and cards, I screwed an inlaid and veneered front to dovetailed maple boxes, as shown in figure 2 on p. 71. I picked $\frac{3}{4}$ -in. particleboard as the core material for the doors because greater dimensional stability is particularly important for inlaid veneers. The particleboard is edgebanded with solid mahogany and veneered on both sides with book-matched mahogany. Ledger strips attached to the inside of the doors store two veneered game boards.

Some veneering basics—Veneering requires few special tools: an X-Acto knife, a veneer saw, a paint roller for spreading glue and most importantly, a method for applying even pressure over a large surface. Hot-press veneering provides a solid, durable, moisture-resistant bond and is my favorite method, but the high cost of a hot press (as much as \$40,000) puts this technique out of reach for the average woodworker. Cold pressing remains the most reasonable alternative for the home woodworker. The most common method of cold-pressing veneers, and the one I'll discuss here, is with clamps, press plates and cauls, which distribute clamping pressure across the entire veneer, as shown in figure 1 on the facing page. Another cold-pressing method gaining popularity is vacuum veneering (see Greg Elder's article in *FWW* #56, pp. 70-71).

Any veneer project starts with selecting and preparing the core material. Furniture-grade particleboard or preferably medium-density fiberboard (MDF) offers an extremely stable base for veneer, but both are heavy. Although plywood is a lighter yet still stable material,

it tends to warp or cup unless held in place by carcase joinery. Whatever core material you choose, the edges must be banded. Edgebanding not only dresses up the raw core material, but also provides a solid surface for joining, hanging hinges, machining details or easing the veneered corners without fear of sanding through to the core. Often, veneer suppliers can provide solid stock from the same tree as the veneer so the solid edgebanding matches the veneered faces. The edgebanding should be just wide enough to accommodate the desired edge treatment. The wider the edgebanding, the more it will react to moisture changes, while the man-made core material remains stable. This may result in the glue joint between the edgebanding and the core material telegraphing through the veneer. After I glue on the solid edgebanding, I usually wait two to three days to allow for any minor wood movement before planing the edgebanding flush to the core material and veneering the faces.

Because veneers are so thin, usually ranging from $\frac{1}{16}$ in. to $\frac{1}{32}$ in. thick, it is easy to store a large quantity in a small space. But proper storage is important. Lay the veneer sheets out flat so they are fully supported with no overhang. Keep the sheets away from direct sunlight, which can fade the woods. If possible, the veneer should be kept at a temperature of 60°F to 70°F and a humidity of about 80%. If you live in a dry area, wrap the veneer in plastic to retain moisture and keep it clean. However, if the veneer is too dry or cracked, sprinkle water on each sheet and put it in a cold press or on a cement floor weighted down under boards for at least six hours and preferably overnight. After the sheets are flat and dry, tape the cracks and secure the ends with veneer tape to prevent further cracking. For greater stability when using a plywood core, the veneer grain must be perpendicular to the plywood grain.

A major principle in veneering is that core materials must always be veneered equally on both sides or else each face will react to moisture differently and the piece will warp. Generally, the backing veneer can be an easily worked species such as mahogany, but it should be the same thickness as the show veneer to maintain structural balance. Bird's-eye maple veneer, however, should be backed by bird's-eye maple, even if it will not show, because this veneer is strong enough to bend more easily worked species.

Applying veneers—Before beginning a veneering project, you should be well organized, have a clean working surface, and prepare the core material and veneers, including marking each piece so you know exactly where it goes. A felt-tip marker works well to mark the core material, but chalk is better on the veneers and is easier to remove. All surfaces have to be sanded, clean and dry, and you should have plenty of glue and clamps. A shopmade press, like that shown in figure 1, can greatly reduce the problems of managing the numerous pieces of plywood, particleboard, battens, cauls and clamps. MDF on the face of the cauls provides a very stable and perfectly flat surface. Plastic laminate or heavily waxed tempered hardboard makes good press plates that won't stick to the veneer and that are easily cleaned of glue that might squeeze through the porous veneer.

Begin the actual veneering process by placing the bottom caul on a work surface or bench so you can clamp along both the front and back sides. Lay the bottom press plate on the caul and then lay the backing veneer facedown on the bottom press plate. Make sure no debris is stuck to the cauls, press plates, veneers or core material that might mar the finished surface. With a paint roller, apply a thin, even coat of white glue to one side of the core. Experience is the only way to learn how much glue is needed, as requirements will vary with each material and veneer. But you don't want so much glue that it squeezes out around the edges and through the veneer, creating a mess that requires considerable scraping and sanding to clean up. Then, place the core, glued-side down, on top

of the backing veneer. After rolling a thin, even coat of glue on the exposed side of the core, complete the veneer "sandwich" by adding the face veneer, the top press plate and finally the top caul. Begin applying clamp pressure from the center of the panel to the outer edges, to avoid trapping glue in the center and causing bubbles in the finished surface. Leave the panel clamped for two to four hours, or longer depending on humidity and temperature. Higher temperatures cause the glue to set more quickly. Conversely, higher humidity lengthens the setting period by increasing the moisture content of the wood, and it inhibits glue penetration. I leave some veneers, such as inlays, clamped for eight hours or more. Once the panels come out of the press, I trim the overhanging veneer with a knife, a saw or just a sanding block with 80-grit to 100-grit paper.

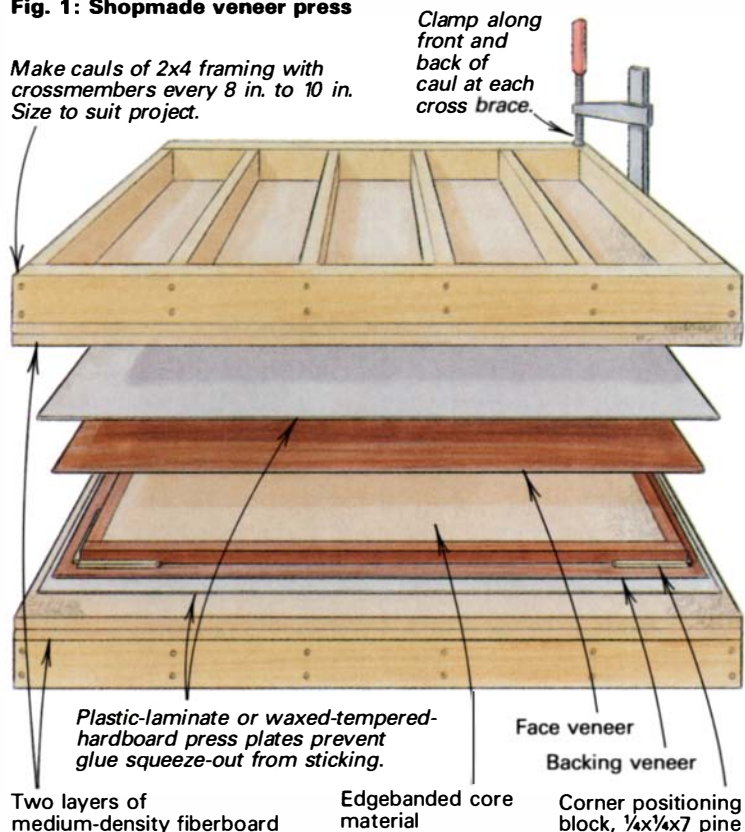
It is common for the veneer to slip slightly on the core as the clamps are tightened. Because the veneers are cut about $\frac{1}{2}$ in. oversize on each side, this is usually of little consequence. However, if grain orientation or positioning is important, as with the game boards, I prevent veneer slippage by gluing $\frac{1}{4}$ x $\frac{1}{4}$ x7 pine positioning blocks on each corner, as shown in figure 1 below.

Inlaying veneers—I really enjoy inlaying designs and decorations in my projects. Not only do they add interest and detail, as shown in the photos on the following page, but they can provide information about the piece. The playing card symbols on the doors of my game cabinet and the game pieces on the drawer fronts, for example, tell what's inside.

To inlay a pattern, draw the design on the background veneer, or on a piece of paper and then tape the design to the veneer. Holding the X-Acto knife at 90°, cut the pattern for the inlay from the background. Choosing the right color and pattern for the inlay from the dizzying selection of domestic and exotic veneers that is available can take longer than the actual cutting. But attention to detail here is important to the overall success of the piece.

The fruit-wood veneers, like cherry, pear, plum and apple, are best for beginners because they are easy to work. Walnut and maple

Fig. 1: Shopmade veneer press





Above: The club and spade inlays add an interesting detail to the plain cabinet exterior. The knobs are glued up from endgrain and are edge-veneered to emphasize their shapes. The diamond knob operates the cabinet latch. Left: The inlaid veneer in the drawers will challenge your veneering skills. Custom trays and racks can be designed to accommodate your particular games and storage needs.

also work well. Veneers like oak, mahogany, teak and basswood are better saved for later projects because they are brittle. If I'm inlaying small straight pieces in a soft veneer, I can just press the background veneer down on top of the inlay veneer and cut through both layers in one pass. To do this, hold the knife at 65° to 70° with your hand tipped to the center of the inlay. The resulting inlay will be slightly larger than the opening, and when inserted from the back, it will eliminate gaps between the inlay and the background veneer. For the more brittle veneers, I first cut out the pattern from the background veneer and then lay the background veneer over the inlay veneer to lightly trace the pattern with my knife. To prevent movement while tracing these inlays, it helps to first cut the inlay piece slightly oversize and tape it to the back of the background piece. After tracing the pattern, remove the background veneer and complete the cut by making several light passes on the inlay veneer. The most difficult veneers to work without damaging are ebony, rosewood, tulip wood and any burl. To avoid splitting and breaking these veneers, I cover the entire back with paper veneering tape and then make numerous light passes to complete the cut. The backing tape must be removed before glue-up.

When making up an inlay of several small pieces, like the joker on the drawer bottom in the photo on p. 68, I use clear tape to hold the cut pieces in place as I go, which allows me to see the design as I work. Once the inlay is complete, I tape it into the background and then hold it up to the light and check for gaps and broken pieces. After the inlay is glued in place, I remove the tape by gently pulling it across the grain to avoid lifting the veneer.

When I'm making the game boards, I use the same technique to prepare the veneer for the field and the edging. To make the checkerboard with 1¾-in. squares for example, first cut veneer strips about 16 in. long and about 2¼ in. wide. You will need five

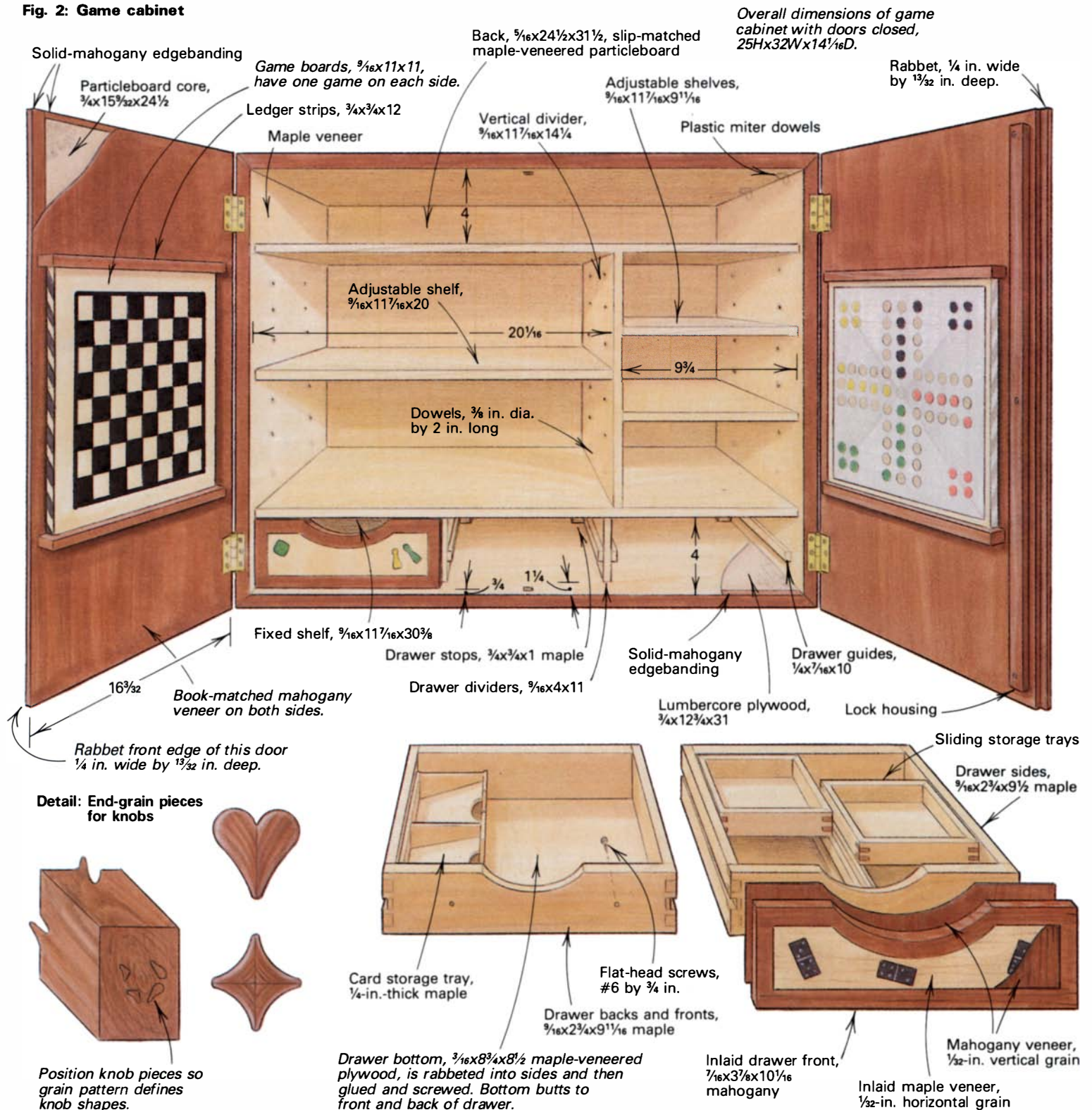
strips of one veneer and four strips of a contrasting color. Clamp the veneer strips between two solid pieces of ¾x1¾x18 stock by screwing the solid stock together at the ends, without screwing through the veneer, and then plane the protruding edges of veneer flush to the clamping stock. Remove the clamping stock and tape the veneer strips together, alternating the colors. Then, with a straightedge guide and an X-Acto knife, cut across the alternating strips to form 1¾-in. strips with contrasting colored squares of veneer. Reposition and tape these strips to form the checkerboard pattern by offsetting every other row. The diagonal-stripe edging is made by alternating ½-in. strips of ebony or gray-dyed maple with maple and then crosscutting on an angle instead of straight across the veneer strips as the checkerboard was done. After trimming off the extra squares at either end, laminate the checkerboard to ½-in. particleboard and add the striped edging.

Building the carcass—Begin by determining the size cabinet you want. My cabinet was designed in Germany to fit continental game sizes, but American game boards in general and your collection of games in particular may dictate different dimensions. Work backward from your finished dimensions, subtracting the thickness of veneers and solid edgebandings to find the size of the core panels. Depending on the veneer, I used ¼-in.-thick mahogany or maple edgebanding, mitered at the corners, on all edges of each piece, except on the mating edges of the doors and on the ends of the carcass pieces. Here, ½-in.-thick edgebanding provides extra stock for rabbeting the door edges and mitering the carcass corners. Edgebanding at the ends of the carcass pieces allows me to slightly ease the mitered joint if necessary without fear of sanding through the veneer to the core. I wanted to match the faces of the panels as closely as possible, but was unable to get solid edgebanding stock to match my veneers; so I veneered all the exposed panel edges with mahogany from the same flitch used for the face veneers. Edge veneers are particularly recommended when using aniline- or alcohol-base stains to ensure even color. Before staining, raise the grain with a slightly damp rag and then lightly sand with 180-grit paper to remove the fuzz.

With all of the individual panels veneered, I began the actual construction by rabbeting the back edge of the sides, top and bottom, ½ in. deep by 1 in. wide, to accept the maple-veneered particleboard back and to conceal the French cleat used to hang the cabinet on the wall. I drilled the holes for the plastic miter dowels before mitering the ends of the carcass pieces, and then I drilled the holes for the adjustable shelves as well as the holes for the ¾-in.-dia. by 2-in.-long dowels that join the fixed shelves and vertical dividers. The plastic miter dowels made dry-fitting these parts much easier. Before final assembly, all parts were sanded with 100-grit and then 150-grit paper. Although the back is dry-fitted during construction, it is not glued and screwed into its rabbet until after the carcass is assembled, the drawer guides installed and the interior lacquered. To make the French cleat, rip a ¾x5x31½ maple board down the center with the sawblade at a 30° angle. The top half of the board, glued and screwed to the cabinet back, hooks over the bottom half of the board, screwed to the wall, to hang the cabinet.

Dovetail and fit the solid-maple drawers, shown in the bottom photo above, to their openings before dadoing the drawer-guide slots and rabbeting the sides for the bottom. The ¾-in. maple-veneered plywood bottoms are glued and screwed into the side rabbets and simply butt against the front and back of the drawer. The inlaid front screwed to the drawer is solid mahogany with veneers on both sides. The back of the drawer front is veneered with vertical-grain mahogany. Then, I rout an inset in the face of the drawer front to accommodate a double layer of veneer. A vertical-grain mahogany substrate provides a good base for the maple veneer that

Fig. 2: Game cabinet



has grain running in the same direction as the solid drawer front.

The doors are built, as detailed in figure 2, with ½-in.-wide edgework on their mating edges. Rabbets cut into this edge form a lap joint so that the right door overlaps the left. This way, the locking mechanism, two sliding bars operated by turning the knob, will also hold the left door closed. I made the doorknobs from sections of endgrain glued together, so the grain pattern reflects the design of the knob, and then chiseled, carved and sanded the knobs to shape. The veneer edging strips were glued on with contact cement because it's difficult to clamp these odd shapes. While contact cement works well in this application, and is the adhesive of choice for plastic-laminate work, I don't recommend it

for general veneer work because it has a tendency to soften and loosen over time and it can cause the veneer to shrink, leaving gaps up to ⅛ in. wide. Also, solvents in many finishing products can penetrate the veneer and hasten the softening process. The ledger strips holding the game boards on the back of the doors work just like a sliding-door track. The rabbet in the bottom ledger is ¾ in. deep and the rabbet in the top ledger is ¾ in. deep so that the top of the board may be raised into the top ledger to move the bottom of the board into or out of the bottom ledger. □

Norbert Heinold builds custom cabinets and veneered pieces in Canoga Park, Cal.

Dust and the Woodworker

Examining the respiratory hazards

by Kirk Kundtz, M.D.



In 15 minutes of use, this disc sander filled a shop's atmosphere with a cup of powdery dust, the size that can negotiate your lung's smallest airways. The Occupational Safety and Health Administration (OSHA) recommends that your short-term exposure

limit (STEL) be less than one rounded teaspoon of dust in a 24-ft. by 24-ft. shop in 15 minutes. OSHA's permissible exposure limit (PEL) for an eight-hour shift is about one-half of a teaspoon of dust suspended continuously in the same shop's atmosphere.

What serious woodworker doesn't know the pleasure of wiping a delicate film of very fine dust off a well-waxed jointer bed? I like reaching into a tablesaw base and spilling out arm loads of wood dust onto my knees and the surrounding floor. In fact, I don't mind dust in my hair, in my beard and in my pockets. And I've not only come to love the feel and sight of wood dust, but the satisfying aroma as well. I was first tempted to start woodworking when my best friend built a cedar porch swing for me—the air in his shop was filled with the rich scent of the wood. Since then, I've built my own shop and filled the air with dust from a dozen different woods, including sassafras, walnut, redwood, mahogany, teak, cherry, maple, oak and poplar.

Yes, the woodworker in me enjoys wood dust, but the doctor in me is suspicious because the dust so often irritates my eyes and lungs. My concerns led me to the hospital library to research woodworking's effects on the respiratory system. What I found was both surprising and a little disconcerting. A computer search of medical literature revealed more than 250 articles pertaining to the hazards of woodworking. The articles covered a wide range of problems, including traumatic injuries, skin disorders and cancer associations, but most dealt with how wood-dust inhalation affects the lungs.

How much dust is harmful?—Wood comes off tools in many different shapes and sizes, including broad, flat shavings; long, thin splinters; small chips; and coarse and fine powdery dust, such as that produced by the disc sander shown above. Hand-sanding produces fine dust. But power sanders, the big guns in the sanding arsenal, are the tools most responsible for creating lingering dust clouds in the shop. Powdery dust consists of the smallest particles and represents the greatest health hazard to the lungs. This fine powdery dust not only floats in the air for a long time, but it can be inhaled very deeply.

Dust particles can be classified into two groups: those smaller than 10 microns in diameter and those larger than 10 microns (one micron equals one millionth of a meter). The smaller particles are respirable: they are little enough to negotiate the tiny

airways that reach deep into the lungs. Particles bigger than 10 microns tend to get trapped in the larger airways.

Wood dust, as inviting as it may be, is no friend to the woodworker. Given the fact that most of us are not going to sacrifice woodworking to save our respiratory system, the question arises: How much wood dust is too much? Two variables that must be considered are the amount of dust you breathe and how long you breathe it. If you spend just a few hours per week in the shop or if you work mainly on small projects that do not demand much sawing and sanding, you probably do not have to worry about bronchitis, pneumonia or nose cancer. If, however, you spend long hours on big projects that require extensive ripping and sanding, you should be cautious, especially in light of the small amount of dust that researchers and government regulators say is the threshold limit for ambient dust (beyond which lung disease begins to develop).

According to a 1981 report published by the American Conference of Governmental Industrial Hygienists, the maximum level of airborne respirable particles should average no more than five milligrams of dust per cubic meter of shop space in eight hours. Other studies suggest that this level is too high and recommend a maximum of two milligrams of dust per cubic meter. These studies propose that more than two milligrams of wood dust per cubic meter of shop space may damage your lungs.

What do these limits mean to you? Let's suppose your shop is 27 ft. long by 21 ft. wide and the ceiling is 9 ft. high, so it is roughly 170 cubic meters. According to the stricter guideline of two milligrams of dust per cubic meter, you should limit airborne dust to less than 340 milligrams. This is one-third of a gram, which I discovered equals slightly less than one-quarter of a teaspoon of dust. A full sandwich bag weighs almost 50 grams, which is enough to exceed the threshold limit of a 25,000-cubic-meter shop. This is all very disconcerting and even the authors of the cited study conceded that, though ideal, this strict (two milligram per cubic meter) standard is not very realistic.

A guide to your respiratory system—Dust's affect on your lungs, however, is realistic, but you must first understand your

Getting out of the dust

by Theodore J. Fink, M.D.

Getting rid of dust in a woodshop is like trying to eliminate salt from your diet, which is impossible because almost everything you eat or drink contains sodium. So the goal is not to totally eliminate dust, but to minimize your exposure. This can be accomplished with a three-phase dust-control plan that includes: decreased dust production, wood-dust capture and personal protection.

Decrease your dust production: Your woodworking techniques and tools determine the quantity and size of dust particles you produce. The larger the particles, the less hazardous the dust. Large particles settle quickly, are more easily captured by dust-collection systems and are not respirable. The finest dust particles, which are the most hazardous, tend to escape most collection methods. If you shine a beam of light through a dark, presumably clean workshop, the airborne particles you will see are those larger than 20 microns in size. Respirable dust (under 10 microns) is invisible.

You can reduce very fine wood dust by minimizing the need for sanding. By cutting rather than scraping when turning wood and by planing and scraping rather than belt-sanding, you will produce shavings rather than dust. All sawblades, planer blades and bits should be sharp, because dull blades produce finer dust. You should select the proper blade and feed rate to produce smoother surfaces when sawing. When bandsawing scroll work, you can get a finer finish requiring less sanding by using a blade with more teeth per inch (t.p.i.) and with standard tooth form (not a hook tooth). When ripping with a hook-tooth blade, be sure it has a large-size gullet that will accommodate large particles and use a fast feed rate. To decrease the amount of finish-sanding, be sure stock is precisely dimensioned by planing and jointing before assembly.

Dust capture: Despite your best efforts, you will make dust. Therefore, you should attempt to capture the dust before it becomes airborne. The most efficient method includes a dust-collection system hooked directly into stationary tools (see *FWW* #67, p. 70). Also, when buying small power tools, such as sanders and power planes, select those equipped with dust-collection bags. Although these are commonly called "dustless" and greatly reduce the amount of dust put into the air, they fail to capture some of the very fine dust.

Whenever wood is machined, a wide assortment of particle sizes is produced and to each particle a positive electrical charge is imparted. This is especially important for



3M's model 8500 dust mask, on the right, should be used "for comfort only," and isn't approved by the National Institute for Occupational Safety and Health (NIOSH). The Gerson 1710 and 1725, in the center, are approved for dust and some mist protection. The 1725 has an easy-breathing valve. The NIOSH-approved Willson 1200 series cartridge respirator, on the left, comes with replaceable particle filters, and an assortment of cartridges is available that protect you from a variety of hazardous chemical vapors and mists.

the smallest particles, which, because of low mass and positive charges, remain suspended in air for hours after production. Eventually these fine particles do settle, but because they repel each other, they are easily resuspended in the atmosphere when swept with a broom. Thus, it is much better to vacuum dust whenever possible.

Skin and eye protection: Coveralls that can be taken off before leaving the shop protect most of your skin. The coveralls should be cleaned regularly and dust remaining on skin and hair should be washed off immediately after leaving the shop.

Standard safety goggles provide some eye protection from fine dust, but if you are using a very irritating wood or one to which you have developed an allergy, an airtight full-face mask or diver's (underwater) goggles may be necessary.

Respirators and dust masks: The amount of exposure to the skin and eyes is minuscule compared to the surface area in the respiratory tract. Furthermore, all the respiratory surfaces are moist and very reactive to foreign substances. Thus, the most critical personal protective equipment is the dust mask or respirator.

These items, which must cover nose and mouth, vary widely in cost, comfort and effectiveness. The most comfortable, least expensive *and* least effective is the lightweight molded mask that is commonly held in place by a single elastic band, such as the 3M 8500 (shown above on the right) or the Gerson 1501 (not shown). Although these masks filter out up to 95% of airborne dust, air leaks readily around their edges. Neither mask is approved by the National Institute for Occupational Safety and Health (NIOSH).

3M's Model 8710 mask (not shown) and the Gerson 1710 mask (shown above, second from the right) filter in excess of 99%

of respirable dust. Both have two wide elastic straps for a tight, form fit, yet they're still quite comfortable, lightweight and disposable. And they are durable enough for extended use. Both are adequate for fine-dust protection, but not for harmful vapors.

If you need protection from paint, varnish or other harmful vapors, as well as dust particles, NIOSH recommends a cartridge-type mask, such as the Willson 1200 respirator (shown above on the left) or a similar model from 3M, U.S. Safety or North Safety Equipment. The Willson comes with replaceable particle filters and you can purchase an assortment of cartridges that protect you from a variety of hazardous chemicals.

Masks and respirators are only as good as their fit, and a tight fit may be difficult if you have a beard. The air helmet, such as the Airstream Dust Helmet (or similar battery-powered air-purifying respirator/hard-hat combinations), may be a solution for bearded woodworkers.

Respirable dust remains suspended in the air for hours and it's invisible. Therefore, once you put on a mask or respirator for a dust-producing operation in the shop, leave it on for the rest of the workday.

As a mask or respirator is used, retained wood particles clog its pores and breathing becomes more difficult. As this happens, the effectiveness of dust capture by the mask actually improves, provided there are no air leaks around the mask. When you notice the increased breathing difficulty, it is time to change filters or the mask.

Before using any respirator or dust mask, always be sure to read and follow all instructions and warnings supplied by the manufacturer and NIOSH. □

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respiratory system so that you realize just how injurious dust can be. The lungs are extraordinary organs that continually bring fresh air into very close contact with your body's circulatory system. Structurally, the lungs are like sponges with millions of tiny air pockets. Their ultimate purpose is to remove carbon dioxide from the blood stream and replace it with fresh oxygen from the atmosphere. This process is called gas exchange. The air pockets are called alveoli, shown in the drawing on the facing page, and gas exchange takes place within them. When you breathe in, the alveoli fill with air and oxygen passes through their ultra-thin walls and into the surrounding blood. At the same time, carbon dioxide from the blood passes into the alveoli, where it is expelled during exhalation.

The flow of air in the lungs takes place through a set of airways that spread out very much like the branches of a tree, as shown in the drawing. The tree trunk corresponds to the trachea, the first large branches are the bronchi and the smaller branches are the bronchioles. In this analogy, the alveoli are like the leaves of the tree.

In addition to moving air in and out of the body, the lungs must keep themselves and the air clean, warm and moist. This job is accomplished by the "mucocilliary transport" system, a term for the mucus-producing tissue that lines the "bronchial tree" (see the drawing). We are all familiar with mucus, though we may not be familiar with its purpose. Not only does it serve to moisten the air, it also protects the underlying tissue from drying out. In addition, it acts like flypaper to catch the microscopic dust and dirt in the air we breathe. Once these dust particles are trapped, they must be discarded. This is done by the other part of the mucocilliary transport system, the ciliated epithelial cells. These cells have hundreds of tiny little arms that literally sweep the dust-laden mucus up and out of the lungs. In addition, a backup mechanism, the "alveolar macrophage," serves to clean out dust that gets into the alveoli. This system consists of cells that wander around in the alveoli like little street cleaners, sweeping up particles that threaten to interfere with the crucial gas-exchange system.

How does dust harm these organs?—In the healthy person, occasional dust particles in the lungs is not a serious problem because the lungs have built-in defense mechanisms, such as the mucus that lines the airways, that halt harmful substances like dust. The dust-laden mucus is then expelled from the lungs by the sweeping-motion cells lining the airways, as well as by coughing. Unfortunately, however, chronic inhalation of wood dust may damage the lungs' cleaning systems. When this happens, a vicious circle begins as more dust collects and further damages the lungs. The body then responds as it does to skin injury—it mobilizes an inflammatory response. That is, the bronchial airways become red, swollen and painful. Swelling decreases the diameter of the airways and produces shortness of breath, induces coughing and increases sputum, which is saliva and other discharged matter from the respiratory passages. A number of studies have shown that these symptoms are common in active woodworkers: those that spend long hours in the shop. Other studies have shown that woodworkers tend to develop lung problems similar to those found in patients with chronic bronchitis and emphysema—diseases associated primarily with cigarette smoking. Inhaling wood dust, while probably not as harmful as smoking, can be dangerous.

Perhaps the most documented effect of wood-dust exposure is nose cancer. Dozens of studies in more than 10 countries have shown an increased rate of this relatively rare form of cancer

among woodworkers. Medically it is known as "nasal adenocarcinoma." Mucus-secreting glands in the noses of woodworkers tend to become cancerous at a rate 1,000 times greater than non-woodworkers, apparently because of the dust. Fortunately, this type of cancer is relatively rare even among woodworkers (only about one in 1,500 active woodworkers will ever develop it), and the time lag between exposure and the onset of symptoms is as much as 40 years.

Finally, wood dust can cause respiratory illness because it contains many types of allergens and toxins. These range from chemicals deposited on the tree from the outside, such as pesticides and fungal spores, to chemicals created by the trees themselves, such as alkaloids, saponins, aldehydes, quinones, flavonoids, steroids and resins. Individuals respond differently to these various toxins, but the symptoms are universal: coughing, sneezing, increased phlegm and sputum production, runny nose, red eyes and, in extreme conditions, bronchitis, pneumonitis, and asthma. These symptoms are found in woodworkers more often than in the general population.

You are probably more familiar with some toxins and allergens than with others. Perhaps woodworkers are most aware of the allergen called plicatic acid, a substance in red cedar that is responsible for a condition known as red-cedar asthma. This very debilitating condition occurs in about 5% of people who work with red cedar. Another similar condition is maple-bark disease, a severe form of asthma probably caused by fungal spores found in maple bark. Two other North American woods considered to have significant allergenic effects are boxwood and sequoia redwood.

Clearly, the concern about dust is not just academic and all of us woodworkers must be aware of these insidious problems. Most of us don't hesitate to use goggles, push sticks and blade guards, but how many of us use face masks and dust collectors regularly? Not many, I'm afraid. Dust masks can be uncomfortable and dust collectors are expensive, but both are well worth the investment. As with many other items I've bought for my shop, I've agonized over spending money on a dust-collection system, but I'll probably wonder how I ever got by without it once I use it. □

Kirk Kundtz is a resident physician in internal medicine at Mount Sinai Hospital in Cleveland, Ohio, and is an active woodworker. Thanks to Drs. Lawrence Martin and James Edmonson for assistance in preparing this article.

Sources of supply

Dust masks and respirators are manufactured by:

Louis M. Gerson Co., Inc., 15 Sproat St., Middleboro, MA 02346; (508) 947-4000.

Glendale Protective Technologies, 130 Crossways Park Drive, Woodbury, NY 11797; (516) 921-5800.

Mine Safety Appliance Co., Box 426, Pittsburgh, PA 15230; (412) 967-3000.

North Healthcare, 1515 Elmwood Road, Rockford, IL 61103; (815) 877-2531.

North Safety Equipment, 2000 Plainfield Turnpike, Cranston, RI 02921; (401) 943-4400.

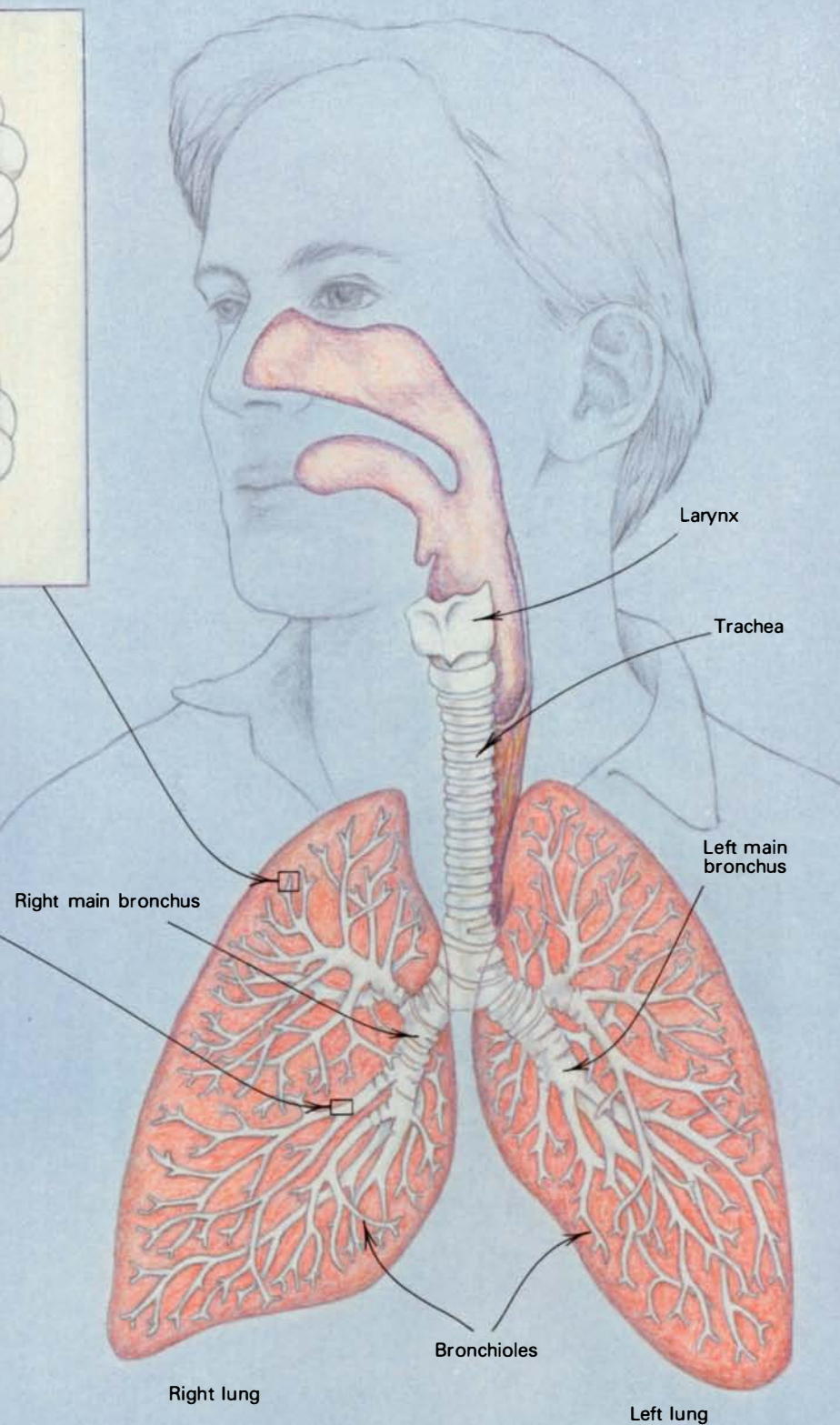
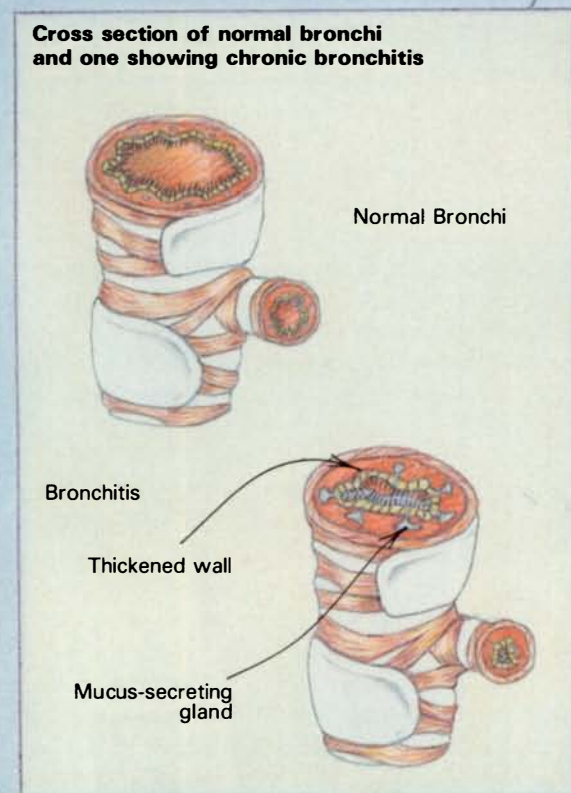
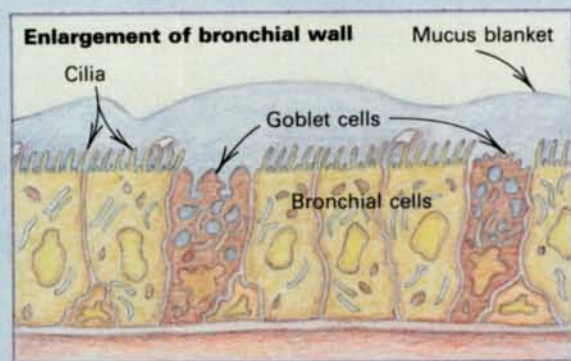
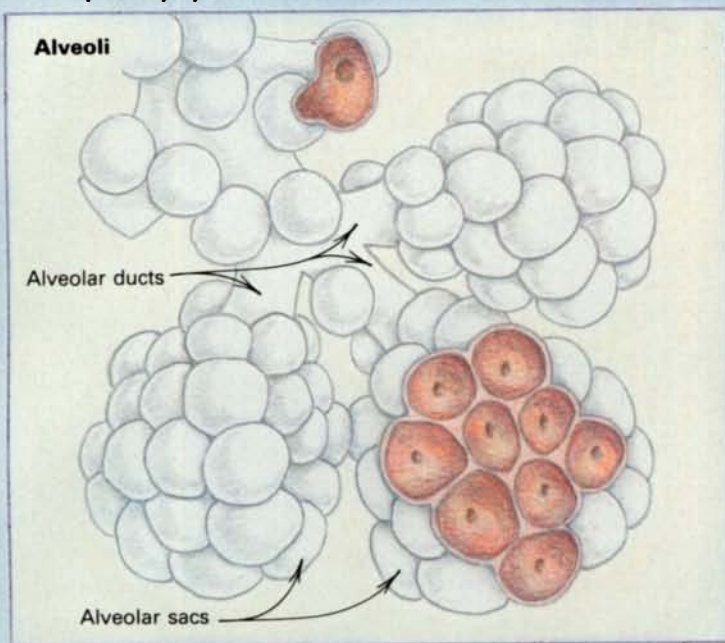
Racal, Airstream Division, 7305 Executive Way, Frederick, MD 21701; (301) 695-8200.

3M/Occupational Health & Environmental Safety Division, 220-3E-04 3M Center, St. Paul, MN 55144-1000; (800) 328-1667, (612) 733-8029.

U.S. Safety, 1535 Walnut St., Kansas City, MO 64108-1312; (816) 842-8500.

Willson Safety Products, Box 622, Reading, PA 19603; (215) 376-6161.

The respiratory system



Carving a Dough Bowl

Using ax, adze, knife and gouge

by Wille Sundqvist

My experience with carving is rooted in my very early years in my grandparents' kitchen. My grandfather's workbench was there, and my brother and I often sat at it whittling toys and other important things. In later years I have often pondered the fact that never once did I hear my grandmother complain about the chips and shavings we left behind on the kitchen floor. At one time, the kitchen was the room that was kept warmest, and it was there that people spent the most time, making and repairing things. Women carded wool, spun yarn, wove and knitted, while men made utensils and other implements for the household and farm, including dough bowls. These bowls were very common kitchen objects when I grew up and they are still useful in today's homes.



For a safe stance while hewing, keep your legs wide apart and the blank well forward on the chopping block. This way, if the hatchet slips from the wood, it ends up in the block, not in your leg.

In this article I'll tell you how to carve a dough bowl using mainly an ax, adze, knife and gouge. Deformities in trees, such as burls, can be hollowed to make natural bowls or scoops. Traditional Swedish drinking vessels were made from burls, and sometimes part of the tree trunk was left on the vessel as a handle. Larger troughs or bowls, however, are often made from split round stock. Feeding troughs, several feet in length, were made for livestock. Smaller troughs were used for making cheese, kneading bread and serving food.

Tools and material—You will need an ax or hewing hatchet, a hollowing adze and a couple of gouges to rough out the bowl. For truing surfaces and finish-carving, a knife, drawknife or splitting knife, spokeshave and plane will be helpful. A stable workbench or a low bench with some means of securing the stock is an advantage. And, of course, you will need a chopping block.

The size and sweep of the gouges determine the technique needed to work with them and the type of cut produced. Wide gouges remove more wood, but require more power. A gouge with a deep sweep is good for roughing out; a shallow gouge removes ridges left by the deep gouge. A bent gouge is sometimes necessary to smooth the bottom of the bowl.

Traditionally, softer woods have been used for troughs and bowls. Aspen and birch are among the first choices, but pine and spruce are not uncommon. Almost any kind of wood can be used, except for those that are toxic, contain resins or might otherwise taint food. Alder, tulip poplar and basswood are easy to work; maple, beech, mountain ash, juniper and fruitwood are more challenging.

Avoid wood with knots and uneven grain. The pith and some wood close to it should be removed to avoid radial checking. Whether you work with green or dry wood is often a question of what you have access to. Roughing out green wood is easier than dry wood, but you must prevent checking and cracking when it dries. For green-wood bowls, leave the blank $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. larger than you intend the final shape to be, so you can make adjustments after the wood has dried.

Hewing with an ax—To shape an object with an ax, it is necessary to use a technique other than one you would use when felling or limbing trees. When you hew on a chopping block, you don't chop the wood, but shear it. The cut starts at the near corner of the blade edge and slices toward the far corner. This stroke, combined with the momentum gained through the ax's weight, lets you cut with the entire length of the blade edge. This technique applies to axes with short edges, but precision is increased with long-edge axes because the bevel registers on more of the blank's surface.

Because of this shearing action, your feet should be fairly wide

apart. If you hew with your right hand, your right leg should be far back, as shown in the photo on the facing page. This stance keeps your leg out of the path of the ax and also helps you gain power for your stroke. When making a stroke, the ax head should angle upward, with your hand well below it. It's a good idea to support the blank on the far side of the block, especially on full-powered strokes, so if you miss or strike a glancing blow, the ax edge ends up in the block, not in your leg.

Start hewing low on the blank and work upward, but not clear to the top; then turn the blank upside down to work the opposite end. Work carefully in controlled increments. Don't take that last stroke after you've decided you're getting tired and should stop for a rest.

Roughing out the blank—Choose a piece of round stock at least 4 in. longer than the intended bowl. Remove the bark, split the stock down the middle and hew away the pith. Hew a flat on the bark side, approximately parallel with the pith side, and true this with a plane. This flat will become the bottom of the bowl.

On the other side of the blank, lay out the shape of the bowl's

inner rim, leaving a 1-in. margin along the sides and twice that at the ends. The margin can vary depending on the strength of the wood you are using and the shape you are aiming for, but the end walls must be thicker than the side walls to accommodate the weaker endgrain. If the ends will be shaped with handles, leave room for them, too. You can draw the shape freehand or make a symmetrical pattern by folding a piece of paper and drawing half the shape on the fold. Cut out the pattern with the paper still folded.

Use a hollowing adze with a short handle to rough out the bowl. The blank can be held at an angle on a chopping block, as shown in the top, left photo on the next page, or secured between the dogs of a cabinetmaker's workbench. But to get a longer, more powerful swing, a low bench with pegs and wedges is ideal (see the top, right photo on the next page). You can straddle the bench or stand to the side to work on the walls of the bowl. You can also secure the blank in a bowl-chopping block, which allows you to work on the blank without having to hold it with your hand.

The stroke with the adze is that of a pendulum, with your wrist at the center. The knob of the handle is rounded to fit in the palm of your hand, and so there is some tool rotation at the beginning

Dough-bowl design

A bowl made from wood should be designed to be functional. Dough bowls, like the one shown in the photo below, need wide, long bottoms to keep them from tipping, and serving bowls need handles. Basic Scandinavian bowl design is usually worked out from the rectangle of a split bowl blank, as seen in the plan views in figure 1 at right. The bowls are usually at least twice as long as they are wide, and their walls are not very steep. This is especially important for the end-grain walls, which should be thicker than long-grain walls to ensure adequate strength. Handles can be included by extending the length of the bowl and undercutting for a finger hold, as shown in figure 2 below. A common bowl shape has curved corners. If your blank is tapered, a boat-shaped bowl can be an attractive result. Bowls can also be made from a split round, pith-side down. Such bowls will be shallow, but they will be graphically striking because the annual rings will follow the inner shape of the bowl.

—W.S.

Fig. 1: Design variations for a dough bowl

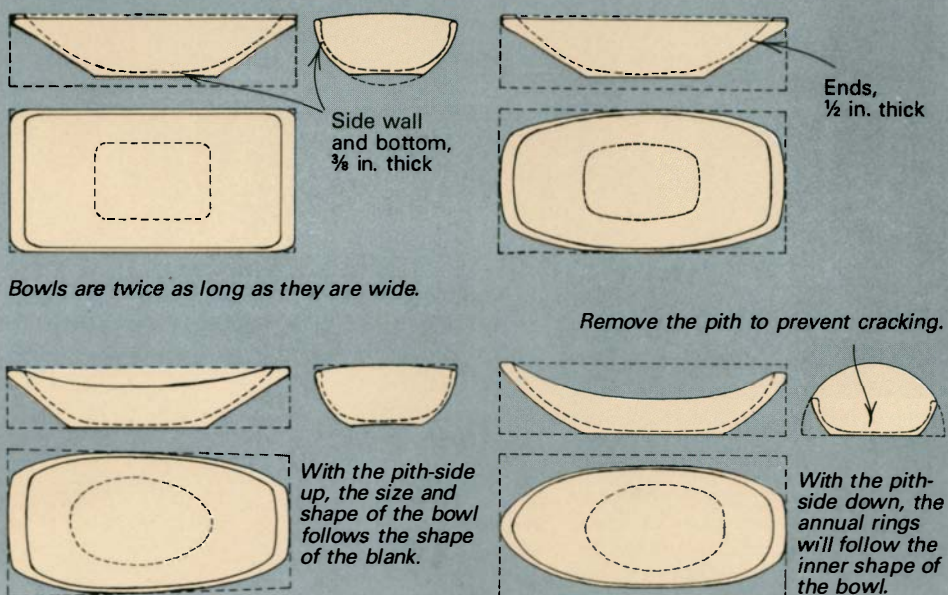
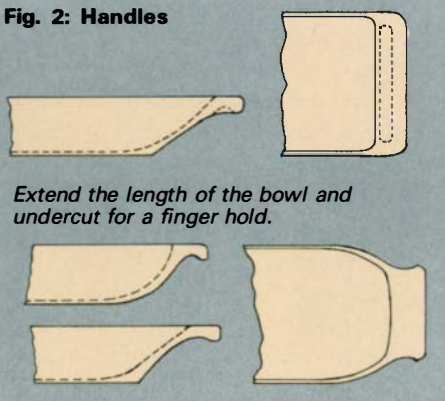


Fig. 2: Handles



Tool marks are still visible on this fruit-filled dough bowl, a traditional Swedish vessel that was carved with a hatchet, adze, gouges and knives from half of a fireplace-size log.



Left: After initially shaping the outside, a hollowing adze excavates the blank that is held at an angle on a chopping block.

Above: Instead of a bowl-chopping block, a low bench fit with pegs and wedges allows the user to hollow the bowl taking longer strokes. Support is added by grasping the adze with both hands.



Right: Check the depth of your bowl periodically, using a straightedge and ruler. The bottom thickness should be finished to about 1/2 in.



Above: Control the gouge by supporting your hands against your body, the blank and the bench. Use two hands on the gouge: one pushing and one pressing the bevel down while restraining stroke travel. Right: When you can, wrap a finger or fingers around the edge of the blank for support.



and end of the stroke from this center, too. You can add support by grasping the adze hand itself, as shown in the top, right photo, or the wrist of that hand. But don't grip the adze handle above the adze hand, as this would inhibit the arc of the stroke. As when hewing, there is also a more powerful one-handed stroke, entering the wood high up and following through on an arc. Snapping your wrist releases the chip.

Work alternately from both ends to keep from cutting up the grain. You can hollow entirely with the adze, or you can remove the rough waste in the middle with an ax. First, use the adze to cut inward from either end, and then chop out the waste with the ax parallel to the sides of the bowl, working from either side toward the middle. As you deepen the hollow, slope the end-grain walls inward, but not too steeply or they will be weak. You can now use the adze to carve down one end and along the bottom to meet the adze strokes on the other end. Check the depth of your bowl with a straightedge and ruler, as shown in the center, right photo, so you

don't cut too deeply. Once you are familiar with the hollowing adze, you'll discover its effectiveness for quickly hollowing a blank.

Shaping the inside—The hollowing adze has a deeply curved edge and it always leaves some chop marks, so a gouge is used to smooth the shape. There are two technical difficulties when working with gouges: powering the stroke and stopping it. A gouge can be tapped with a mallet, but this tends to leave a choppy surface. Powering by hand can yield longer, smoother strokes, as long as you can stop the gouge before it cuts against the grain. The bottom of the bowl curves into and then out of the grain. In addition, any wavy grain will change direction in a flat surface. The gouge must always cut with the grain or the wood will tear; so you must be able to stop the stroke precisely where grain direction changes.

You can control power with the gouge by locking your arms against your sides and/or the blank and pushing with your entire body, as shown in the bottom, left photo. You can also rest your



Above: After shaping the rim, taper the outside ends of the bowl, first chopping off the corners of the blank and then the remaining wood until the outside shape parallels the inside. Right: Fine-tune the width of the rim as you smooth the inside gouge marks with a wider, flatter gouge.



elbow against your hip to power the stroke. As when using an ax, if you are working at a standard-height bench, your stance should be wide and the stroke should be initiated from your legs. A low bench, on the other hand, permits you to kneel or sit, but your legs should still be spread wide and you should power the stroke with your upper body.

You should have two hands on the gouge: one pushing forward and the other pressing the bevel down as well as resisting too much travel in the stroke. Keep your hand positioned on the chest, with an arm on the knee, or a forearm or wrist on the blank so that power is controlled through the stroke. Along the sides of the bowl you can hook your thumb or fingers over the rim for guidance, as shown in the bottom, right photo on the facing page. You should take repeated cuts at a controlled depth, and stop at the same place each time.

Roughing the outside—If you are working with green wood, it is best to rough-hew the outside of the bowl as soon as you have hollowed the inside so that the blank will dry evenly and be less likely to crack. Even so, if you ever put the blank aside for a while, keep it from drying too rapidly by storing it in a plastic bag with some shavings. Shape the rim along the sides first, working from the middle toward each end. Hew as close as possible to the layout line. Next, chop the corners off the back of the blank, and then angle the ends as in the left photo above. With both ends tapered to an angle that corresponds to the end-grain walls on the inside of the bowl, begin shaping the outside to match the long-grain walls. Here you are trying to duplicate the inside shape of the bowl, and you must stop periodically to test the thickness with your thumb and fingers.

Smoothing the bowl—To smooth the outside surfaces roughed out by the ax, clamp the bowl upside down on a bench and work it with a drawknife or spokeshave, taking long strokes for a smooth, continuous cut. Position a block of wood inside to support the bowl above the bench's surface. You can finalize the shape of the bottom at this time.

Before smoothing the inside of the bowl, it's a good idea to refine the shape of the rim. You can use a block plane or knife to carve the perimeter. With the bowl held on the chopping block, use a block plane or spokeshave to smooth the surface of the rim.

Now you can adjust the width of the rim as you smooth the inside of the bowl with a wider, flatter gouge, such as the one in the above photo at right. The gouge marks you leave can be the final surface of the bowl. Aim for long, smooth strokes that produce a pleasantly sculpted surface. Alternately, you can sand the bowl, but green wood must first be allowed to dry.

Green wood carves easily, but it's fibrous; so when you try to smooth it, it tends to fray. Drying it makes it hard and crisp and easier to cut. But you must take measures to keep the blank from drying too fast, which causes it to check and crack. I learned an excellent drying method at a workshop at the Sätergläntan School in 1974. The instructor, Birger Lindén, had carved a spoon from very green wood. It was evening. He rubbed its surface with a boiled potato and laid it on a warm radiator. The next morning the spoon was completely dry, without checks or cracks, and the potato residue didn't make further carving difficult. Be particularly careful to rub the potato into the end-grain areas, especially on the bowl's ends, both inside and out. If drying is not retarded, moisture will leave these areas too quickly and cause checks and cracks.

Finally, an old recipe for finishing cooking utensils is merely to boil them in milk for a couple of hours. The casein, which is sometimes used in water-resistant, water-base paint or glue, is absorbed into the wood, protecting and preserving it. Raw linseed oil (found in art-supply stores) or walnut oil (from health-food stores) are edible finishes and should be applied two or three times, with about a week between applications. These oils take a long time to cure, but the process can be hastened by heating the oil in a double boiler or by immersing the oil container in water that is already hot, and then keeping the oiled utensil warm until it dries. □

Wille Sundqvist teaches traditional Swedish woodworking and is a retired Provincial Handcrafts Consultant in Västerbotten, Sweden. He is teaching a carving class at Country Workshops, 90 Mill Creek Road, Marshall, N.C. 28753, this July. This article has been adapted from Swedish Carving Techniques, ©1990, published by The Taunton Press. Sculptor's adzes and knives are available from Kestral Tool, Route 1, Box 1762, Lopez, Wash. 98261; some Swedish original and American reproductions of these tools are also available from Country Workshops.

Making a Walnut Occasional Table

A simple project from a single plank

by Richard Kapuaala

Cutting up a large, rough plank of wood is always exciting for me, but I can't help feeling a little anxiety. I worry whether the furniture I intend to build will enhance or detract from the wood's natural beauty. This was my dilemma when I set out to build an occasional table from a roughsawn, 4x13x96 walnut plank. It was hard to tell what the piece of wood was like beneath its exterior; but upon resawing, I saw the lovely color and grain pattern inside, and I adapted my design ideas to fit the character of the wood. The resulting table, shown here, has a single drawer with all-wood guides, a custom-made wooden pull, and a top large enough for a lamp, magazines or other accessories. Construction is based on joinery that you're probably familiar with: dovetails for the drawer, mortises and tenons for the legs and aprons, sliding dovetails for the aprons and bridle joints for the partitions. Even with the small details I've added to make the table more visually interesting, building it should take you about 30 hours. The drawing on the facing page and

the bill of materials on p. 83 include the dimensions for all the parts. To help you get started, I'll tell you how I built my table.

Sawing the parts—After a little handplaning, I knew my walnut planks were richly colored with deep crimsons and purple streaks. What I couldn't see until after I had resawn the planks was the wood's beautiful flame-figured grain pattern, with dark, wing-shape intrusions at the edges. When I set the pieces side by side and in mirror symmetry, I knew the figure would look best if the tabletop was book-matched. Since the table's legs required the thickest material, I cut them out before resawing the plank to 3/4-in.-thick stock for the other parts. Because the plank was more than twice the thickness needed for the 1 3/8-in.-square legs, I cut them out in pairs, so they would match and the grain would be symmetrical. It's a good idea to match the legs of any piece to minimize problems in case there is any moisture-related twisting or bowing: The opposing pairs of legs will warp symmetrically. If you can't saw matching legs from the same piece of stock, choose stock with straight grain for less chance of warping.

After crosscutting the plank into more manageable, shorter lengths with my radial-arm saw, I jointed the bark-side edge to remove sapwood from the walnut, and then I ripped the sections to rough widths. Using a standard bandsaw fence and a 3/4-in.-wide blade, I resawn the sections of the plank to about 7/8 in. thick (except for the legs). This left enough stock to thickness-plane the sections to 3/4 in. or thinner, as required for the parts. Before final thicknessing, sticker the resawn stock and let it stabilize at shop temperature and humidity for a few days. This way, you can take out slight warping with the jointer or planer and set aside any stock that warps more severely. Finally, I use the tablesaw and radial-arm saw to cut all the parts to width and length, following the bill of materials. If some of the parts on the bill appear to be oversize, the extra stock is either for joinery or it will be trimmed away later.

Cutting the joints—First cut the 5-in.-wide by 1-in.-long tenons on the ends of the front and back aprons that will join the legs. There are many good machine or hand techniques for cutting tenons, but I prefer to use my tablesaw and a shopmade tenoning jig, which holds the stock upright during the cut. My procedure is similar to the one described in *FWW* #66, p. 70. Next, I cut the sliding dovetails on the ends of the side aprons, again using my tablesaw and the tenoning jig. As with tenons, the jig holds the workpiece vertically, but the blade is tilted 12° to cut the male dovetail (see the left photo on the next page). I prefer this method to using a router and a dovetail bit because it allows me to change the angle of the dovetail if I desire.

Next I cut the female dovetail slots into the front and back aprons. A regular miter gauge fitted with a special wooden fence is

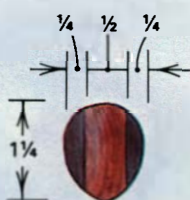


The author's occasional table was designed to fit the character of the wood: a single plank of 1 3/4 walnut that he resawn for the book-matched top, matched pairs of legs and most of the other parts. The top has room for magazines, a lamp or other accessories. The table has a single drawer with all-wood guides and a custom-made wooden pull.

Occasional table

Knob detail

Ebony (sides) and cocobollo knob

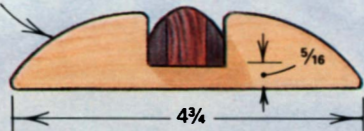


Front view



Side view

Maple wing, 3/8 in. thick



Top attached to collar with cleats that engage groove.

Construction detail

Maple drawer runners are screwed to collar.

Front of apron

Collar

Corner braces screwed to inside of apron through angled holes.

Maple partition frame, screwed to corner braces, is joined at corners with bridle joints.

Top view

Drawer runner

Sliding dovetail joins apron parts.

Partition

Ends of collar mitered 45°.

Drawer front is walnut; sides and back are maple.

Drawer bottom is poplar, 3/8 in. thick.

Front view

26 1/4

18 1/4

Edge detail shaped with 3/8-in.-radius cove bit in router.

Apron detail

Tabletop

Collar

1/4

5

1/8

3/8

1 1/8

4 13/16

Side view

Half-blind dovetails join drawer front to sides.

Drawer guide blocks screwed to back extend above back to engage runners.

24 3/4

17 1/8

Leg, 1 1/8 in. square

Top of collar extends above apron.

Drawer opening, 3 11/16 in. high, cut out in apron.

Bottom and top end and edges of legs hand-shaped with files and spokeshaves.



Left: To cut the male dovetails on the ends of the side aprons, Kapuaala uses his tablesaw and homemade tenon jig, which supports the workpiece vertically as it is guided past the tilted blade. Center: After crosscutting the female sliding dovetails in the front and rear aprons with a miter gauge on the tablesaw, Kapuaala pares the bottom of each flat with a chisel. Right: To



cut out the drawer opening in the front apron, the author uses a plunge router fitted with a guide bushing that follows a rectangular hole cut into a particleboard template. With the template clamped on top of the apron, he plunges the bit and follows around the template clockwise, cleaning up the corners of the opening with a chisel after routing.

used to push the stock through, again with the blade tilted 12°. The fence I made is as long as my saw table and has a wooden runner that fits in the slot on the right side of the blade. I cut one side of the dovetail, rotate the piece around and then cut the other side, repositioning the stop between cuts. After cutting both sides of each female dovetail, I remove the waste in the center by crosscutting with the blade squared and lowered; then I pare the bottom flat with a chisel (see the center photo). Now trial-fit the apron pieces, and if necessary, trim the male dovetail until the joints slide smoothly, yet fit snugly together.

With the joints done, it's time to trim the aprons to their final width. I joint both edges *after* cutting the dovetails so that all traces of tearout disappear. You may decide that you don't need to do this, but if your joints aren't perfect, it helps keep the apron looking good.

Shaping the aprons—To lend a decorative element to this occasional table, the corners of the front and back aprons are cut back and rounded. I bandsaw four 2 $\frac{7}{16}$ -in.-long pieces from each apron, as shown in the drawing. I first make the rip cut using the fence on the bandsaw as a guide. Don't go too far or you'll cut into the sliding dovetails. Then, crosscut with the bandsaw's miter gauge to remove each corner strip, and use a rasp or file to round over the corners on the new stepped areas. Next, I chuck a $\frac{1}{4}$ -in.-radius roundover bit into the router table to shape the entire edge on the outside faces of the front, back and side aprons, stopping short of the tenons.

Now comes a potentially tricky step: cutting out the drawer opening in the front apron. I use a $\frac{1}{2}$ -in.-dia. straight bit in a plunge router with a guide bushing fitted in its base. The bushing follows a rectangular hole cut into a Masonite or particleboard template. I waste the cut-out piece because it's too tedious a job to saw it out with a thin-kerf sawblade and save. I substitute a piece with similar grain for the drawer front. With the template clamped on top of the apron, I plunge the bit down about $\frac{1}{4}$ in. and then follow around the template clockwise (see the photo at right). I repeat this till the bit cuts all the way through. I clean up the rounded corners of the opening with a chisel, but before routing, you could cut these corners square with a hollow-chisel mortiser if you have one. Routing sometimes tears up the wood, so it's wise to make an extra apron front, just in case. Finally, glue up the aprons without the legs.

To complete the apron assembly, I make and attach the collar: a thin frame that fits around the apron assembly's top inside edge

and sticks up $\frac{7}{16}$ in. above the apron assembly. A $\frac{1}{4}$ -in.-wide by $\frac{3}{8}$ -in.-deep groove around the inside of the collar, cut with a dado blade on the tablesaw, provides a means for attaching the top with small cabinetmaker's buttons, as described further on. The ends of the collar are mitered, and the four pieces are screwed to the apron through countersunk holes. Take care not to drill a hole where the drawer runners will be attached later (see the drawing). I use a marking gauge to scribe orientation lines on the inside of the apron to help align the collar as it is screwed into place.

Making the drawer—Having routed the opening earlier, handplane the piece for the drawer front until it fits snugly. Now you're ready to make the drawer. I won't go into detail on drawer construction since it's covered in other texts (see *FWW* #73, p. 48). I prefer to make all my drawers with hardwood rather than softwood because I think it lasts longer and looks better. For my occasional table, I made the drawer sides and back from maple, which contrasts nicely with the walnut. The drawer bottom is $\frac{3}{8}$ -in.-thick poplar, but a $\frac{1}{4}$ -in.-thick plywood bottom works also. The dovetails on my drawer aren't sized in any fixed way: I lay them out so they look pleasing. With a sliding T-bevel, I mark the angle of the half-blind dovetails at the front of the drawer and the through dovetails at the back. To keep the drawer from rubbing on the sides of the opening, make the front of the drawer slightly wider than the back. Cut the pins on the drawer back slightly deeper, between $\frac{1}{64}$ in. and $\frac{1}{32}$ in., and then handplane them flush with the sides after assembly.

The drawer-guide system I use is a bit unusual, but it is relatively easy to install, is adjustable and keeps the drawer running smoothly. This system consists of two hardwood runners screwed to the apron's collar that keep the drawer aligned via two small guide blocks screwed to the back end of the drawer. For strength and wear resistance, I make the runners out of $\frac{1}{2}$ -in.-thick maple. The runners are attached with screws in countersunk holes drilled at an angle through both ends. Be sure to countersink the holes deep enough to keep the screw head from sticking out and interfering with drawer operation. Before screwing the runners in place, check that they are flush with and at perfect right angles to the bottom edge of the collar and are parallel to each other and the apron sides.

Next, turn the apron assembly upside down so that it rests on the collar and insert the drawer so that it rests on the drawer runners. Drill oversize pilot holes in the guide blocks (made from

maple scraps) so you can shift them around to adjust the drawer tracking in the future. With the drawer front flush with its opening in the apron, position each guide block to lightly contact the outside edge of each runner, and screw both to the back of the drawer with round-head screws and washers.

Before flipping the apron assembly over, I make the table's partition and the four corner braces it will be screwed to. In addition to keeping the apron from racking, the partition supports the drawer, like a dust-panel frame in a dresser, and provides a surface for the drawer to slide on. The 3/4-in.-thick partition frame is joined at the corners with bridle joints. These joints are cut on the tablesaw in much the same way that the apron tenons were earlier.

The corner braces, made from maple scraps with 45° cuts on each end, are screwed to the inside corners of the apron through angled holes (see the drawing on p. 81). Before securing the braces, I scribe a line around the inside of the apron to mark where the top edge of the partition will be when installed. This way, when the table is upright, the top of the partition is flush with the bottom edge of the drawer opening. Since the partition screws to the braces, this line also determines where the bottom edge of each brace will be. When everything jibes, I screw on the braces, but I leave the partition off until the top has been attached.

Gluing up the tabletop—If you haven't already glued up your tabletop, do so now. I used blind splines to join the two 9 1/8-in.-wide book-matched walnut boards, but you may prefer biscuit joints or just glue. In any case, after the glue is dry and the excess is scraped off, I lay out the top's curved outline with the spline-and-weight method described in *FWW* #71, p. 45. However, I didn't have real architect's weights; so I used regular C-clamps to hold the spline I made from a 1/8-in. maple strip, and then I band-sawed the top. The table's edge detail consists of two small cove cuts, one on the top of the edge and one on the bottom. I would have preferred to use a 3/8-in. ball-bearing-piloted cove bit in the router to shape the detail, but since I didn't have one, I used the cove portion of my Roman ogee bit.

Small cabinetmaker's buttons are screwed to the underside of the top and attach it to the table; a small tongue cut on one end of each cabinetmaker's button engages the groove around the inside of the collar. The buttons allow the top to float: an important feature since wood can get very cranky if it's denied freedom to expand and contract. I space the six cleats around the collar; you might want to use more than six, but don't use fewer or the top will move whenever you touch it. When you set the cabinetmaker's buttons, make sure the tongues don't bottom out in the grooves, as that would restrict the top from moving and defeat the purpose of the cleats. Once the top is attached, screw the partition to the braces. Now, flip the apron/top assembly over and make sure the drawer slides smoothly. Adjust the guide blocks if they rub too hard against the runners and wax them if necessary.

Shaping and mortising the legs—With the top on and the drawer in place, it's time to attach the legs to the occasional table. Taking the blanks that were cut out earlier, hold the top end of each leg against the bottom of the tabletop with one edge butted to the apron tenon it will join. Now, with a marking knife, scribe lines at the top and bottom of the tenon to show where the mortise will begin and end. Repeat with all the legs, and then lay out the width of the mortises, centering them 1 1/16 in. from the outer face of each leg. To chop the mortises, I used the mortising table attachment on my combination jointer/planer. However, a router with a straight bit and a good mortising jig, like the one described in *FWW* #80, p. 46, will also work. If you chop the mortises by hand, you may wish to leave a "horn" at

the top of each leg to prevent the short endgrain at the top of the mortise from splitting out (it gets cut off after mortising).

I wanted the tops and bottoms of the legs to be slightly rounded, and so instead of shaping those profiles on the router table or shaper, I used a combination of files, planes and spokeshaves. First, I ease the edges with a small block plane, and then use the files and spokeshaves to create the soft contours on the edges and ends. Finally, I finish-sand the legs before gluing them to the apron, since it's a real pain to try to sand after glue-up.

Making the drawer pull—Since I built my occasional table from an original design, I wasn't about to settle for a store-bought pull for the drawer. For this design, I came up with the pull shown in the drawing because it seemed to fit the mood of the piece. The design has a central knob glued up from small pieces of ebony and cocobolo, with a horizontal maple "wing" intersecting the knob.

To make the knob for the drawer pull, I cut out three round blanks using a 1 3/8-in.-dia. hole saw in the drill press. This yields three 1 1/4-in.-dia. discs that I laminate together: two 1/4-in.-thick ebony with one 1/2-in.-thick cocobolo in between. After the glue dries, I clamp the knob in the vise on my workbench and cut out the notch for the wing, proportioned as shown in the drawing. I used my Japanese dovetail saw for the cuts, but any thin-blade, sharp handsaw will do. I then shape the knob to its soft contour on a stationary belt sander, holding the knob in a pair of channel locks with padded jaws so I don't sand my fingertips.

The pull's maple wings are marked out with a compass and then cut out on the scroll saw. I set my pencil compass to a 3 7/8-in. radius, and then sketch an arc on the 3/8-in.-thick maple stock. After sawing the arc, I cut out the notch to fit the knob with a standard dovetail saw. Next, dry fit the pieces and trim the notches to fit. Gradually use finer and finer grades of sandpaper to polish the pull. Finally, glue the knob and wing together, drill two 1/16-in.-dia. holes on the back of the wings, and screw the pull to the drawer front.

By now your occasional table should be ready for a good finish. I used several coats of tung oil, with a final coat of beeswax after the tung oil had dried. All the work I put into my table seemed worthwhile the first time I saw the midday sun hit it, sending shimmering ripples of light across the walnut top. □

Richard Kapuaala is a professional woodworker in Salinas, Cal.

Bill of Materials

No.	Description	Dimensions (T × W × L)
4	Legs	1 5/8 × 1 5/8 × 24
1	Top	3/4 × 18 1/4 × 26 5/8†
2	Aprons (front and back)	3/4 × 5 3/4 × 24 3/8**
2	Aprons (sides)	3/4 × 5 3/4 × 15 1/2**
2	Collars (front and back)	3/4 × 1 13/16 × 16††
2	Collars (sides)	3/4 × 1 13/16 × 14 3/4††
1	Drawer front	5/8 × 3 3/4 × 12 3/4†
2	Drawer sides	1/2 × 3 5/16 × 14†
1	Drawer back	1/2 × 3 5/16 × 12 3/4†
1	Drawer bottom	3/8 × 16 × 12 3/4†
2	Drawer runners	1/2 × 1 7/16 × 13 3/8†
2	Drawer guide blocks	1/2 × 3/4 × 2
2	Partition frames (front and back)	3/4 × 2 × 16##
2	Partition frames (sides)	3/4 × 2 1/8 × 14 3/4
4	Corner braces	3/4 × 2 1/4 × 2††
6	Cabinetmaker's buttons	3/4 × 1 1/2 × 2

- * Includes 1-in.-long tenons on both ends. †† 45° miter on both ends.
 ** Includes 3/8-in.-long sliding dovetails on both ends. # Includes 1/4-in.-thick tongue on one long edge.
 † Trim to final size. ## Includes bridle joints on both ends.



John Wittenburg takes a break from fitting mortises and tenons for a koa bedstead. Like many of Hawaii's earliest furnituremakers, Wittenburg immigrated from Germany as a journeyman cabinetmaker and adapted his training to the styles and materials of Hawaii.

Furnituremaking in Hawaii

Where East meets West and koa is king

by Jim Boesel

Historically, Hawaiian furniture is a blend of two traditions: the Western, characterized by the simple furniture brought, commissioned and built by early New England missionaries, and the Eastern, which came with the influx of Chinese and Japanese immigrants in the late 1800s. But the one unifying element in Hawaiian furniture that transcends East and West, as well as past and present, is the use of koa as the primary furniture wood.

Acacia koa, a large evergreen hardwood, is unique to the Hawaiian Islands. It boasts perhaps the widest variation of color and figure of any hardwood: from light, almost blonde, straight-grain construction-grade timber to the dark-reddish brown, cabinet grade that often displays outrageously iridescent fiddleback or quilted

figuring. In Hawaii, the appreciation of koa, among residents and tourists alike, is so universal that it can be difficult for furnituremakers to sell anything not made from koa. But, as several Hawaii-based furnituremakers pointed out, "If you have to be stuck with a single wood to work, this is the one to be stuck with."

My exposure to Hawaiian woodworking began with the book, *Hawaiian Furniture and Hawaii's Cabinetmakers 1820-1940*, by Irving Jenkins (see the sidebar on p. 87). Although this book is historical, tracing the development of furnituremaking in Hawaii from its beginning in 1820 until 1940, it turned out to be a very appropriate place to begin my exploration of present-day furniture-making in Hawaii. When I began visiting shops in Hawaii, I found it

on every woodworker's bookshelf, and it was even open on many of their workbenches. Every furnituremaker, without fail, had pictures of furniture they'd built from photos in the book. Mission-style furniture, built from koa with large-scale parts and boxy shapes, was the earliest furniture in the islands and has always been most in demand. Beds, blanket chests, rocking chairs and plant stands in this style are reproduced extensively. Even the Chinese and Japanese furniture-makers of the late 1800s produced the bulk of their work in this Western style. But as the population and prosperity of immigrants from the Far East increased, oriental furniture forms and design elements became increasingly prevalent and reproductions of these are also in demand today. This intense interest in things that represent Hawaii's heritage is not too surprising considering the islands' unique and isolated position in the world. But it is also not surprising that many furnituremakers find this preoccupation with the past stifling to their creativity. However, most of them were finding ways to work within the tradition while modifying and combining some of the design elements and "pushing the envelope" whenever possible.

The people I visited were generally an adventuresome and well-traveled lot. A few had moved to the islands with their parents, a few were born there, but most had made a conscious decision to uproot from somewhere else and settle on an island in the middle of the Pacific Ocean. Some were surfers who came searching for a permanent wave; others came for a short visit 15 years ago and stayed; still others came looking for a new frontier. Most visits to Hawaii, as did mine, begin in Honolulu, on the island of Oahu. From there I went to The Big Island, Hawaii, and then on to Maui. But I begin my story on Maui because it was there I found a furnituremaker who provided a link between Hawaii's past and present.

Maui, a link with the past—Like many of Hawaii's earliest furnituremakers, John Wittenburg was trained in Europe and worked as a ship's carpenter in the merchant marine. He earned his journeyman's papers as a cabinetmaker in Germany in 1952, and emigrated first to Canada and then to the United States. He joined the U.S. Navy and was stationed in Hawaii from 1958 to 1962. After a two-year stint on the mainland, building huge 200,000-gal. redwood water tanks, he returned to Hawaii and settled on Maui.

The narrow road to Wittenburg's shop winds along cliffs that overlook the sea on the windward side of the West Maui Mountains. At nearly every hairpin curve, where steep ravines sliced inland, the earth beneath the roadway was falling away because of recent heavy rainfall. At the mouth of a green valley, tucked in behind a huge rock outcropping known as Kahakuloa Head, were the 20 or so iron-roofed wooden buildings that make up the village of Kahakuloa. In 1967, Wittenburg bought the lowest-lying piece of property in the village, where the waves lap against the rocky shoreline, and he began to settle in. Here was a place that lived up to my vision of Hawaii as an island paradise.

John and his 20-year-old son, Eb, greeted me at the door to the shop. Eb, who has worked in his father's shop through his teenage years, had recently returned from a two-year apprenticeship in Germany at the same cabinetmaking school his father attended. Another son, 16-year-old Hans, was serving his apprenticeship in Germany at the time of my visit. The 1,500-sq.-ft. shop was tidy, organized and very well lit from windows all around, including a continuous row of clearstory windows at the peak of the roof. John was working on a four-poster koa bed patterned after a bed that appears in Jenkins' book and belonged to Queen Emma, widow of King Kamehameha IV, in the late 1800s (see the photo on the facing page). Making the large-scale bedposts, each turned from an 8-ft.-long, beautifully figured koa 4x4, is nothing new to Wittenburg. Most of his furniture has hefty parts assembled with traditional joinery. A typi-

cal Wittenburg table has a one- or two-board top, nearly 2 in. thick, with crossmembers housed-dovetailed into its underside, and a 2-in. by 4-in. trestle with tusk tenons on each end mortised through and wedged on the outside of simply shaped slab pedestals.

Although it's tempting to think Wittenburg is hidden away here in complete isolation, that isn't entirely the case. Referring to a dog-eared book that contained his daily journal, he recalled the names of some of the woodturners he met one summer at a seminar at Anderson Ranch Arts Center in Colorado, and he spoke particularly fondly of a short visit a few years back to well-known furnituremaker Sam Maloof's home in Alta Loma, Cal. Wittenburg values his occasional trips to the mainland as a chance to see what other furnituremakers are doing and to "recharge his batteries."

Peter Naramore, my guide on Maui, enjoyed the time spent with John as much as I did. Even though they only live about 30 miles apart, neither had ever been to the other's shop. Naramore was born and raised in Rochester, N.Y., where he began working summers as a carpenter at age 15. For the next seven years, he worked in most aspects of the building trades, from concrete form building to remodeling commercial interiors. Then he traveled for a year through the U.S. and Canada in a homemade, gypsy-style camper with "Travelling Carpenter, Enquire Within" lettered across the back. His wanderlust still unquenched, he spent a short time in Sweden working at a friend's country woodworking shop, and then in 1976, he moved to Maui. He persevered through the frustrations of working out of rented garages and through the myriad difficulties of setting up a business in Hawaii, including a lack of tools, workspace and clientele. But when I visited Naramore, his main problem was keeping up with a two-year backlog of commissions while supervising the construction of a new 1,200-sq.-ft. shop next to his home at the 3,000-ft. elevation of Haleakala Crater in up-country Maui.

Naramore has been fairly successful at escaping the confines of the traditional work and materials: Many pieces in his portfolio are of his own design and are built with maple or walnut. But he too had Jenkins' book open on his bench, referring to a photo as he carved a pineapple motif on the tops of some short bedposts for a pair of koa beds (see the photo below and on the cover). Naramore



When I visited Peter Naramore on Maui, he was finishing up carving the pineapples that top off each of the eight posts on a pair of koa beds. The two headboards shown here, one queen size and the other king, offer a good example of koa's wide range of colors.



Photo: Tim Carr



Photo: Bill Robertson

Above: Two members of a Maui cooperative shop, Artisan Woodworkers, collaborated on the koa dining-room set above. Joe Schmeeckle built the twelve chairs and Tim Carr made the trestle table. The carved “wave” panels of the table’s base echo the curved slats in the chair backs. Right: Mission-style koa rocking chairs, like this one by Bill Robertson of Artisan Woodworkers, are by far the most popular pieces of furniture in Hawaii.

is fortunate to have a patron who has purchased numerous pieces of furniture over the past several years. This client often orders multiples of a piece and gives one away; once he commissioned Naramore to build eight chairs and then gave one back to him as a gift.

Our next stop was an old pineapple cannery in the town of Haiku, Maui, which houses several small woodworking businesses including Artisan Woodworkers, a six-man cooperative shop. Cabinet-maker John Borovka started the co-op in 1985. He located the shop space, financed the start-up and contributed his industrial-size woodworking machinery. Then he invited selected craftsmen to join him. In addition to helping some of the furniture-makers he admired make a decent living, he wanted to be free to travel at the drop of a hat and still find his shop set up, maintained and ready to go when he returned. The other five furniture-makers who make up the co-op each have different styles and specialties, including furniture, architectural woodworking and cabinetry. By banding together, they’ve been able to attract work of all kinds and to provide moral support to each other as they raise their prices enough to pay their taxes and turn a profit.

Joe Schmeeckle, a founding member of the co-op, was working on the second, six-chair installment of a set of 12 koa-and-rosewood chairs designed to accompany a large double-trestle table made by another member of the co-op, Tim Carr (see the left photo). Bill Robertson, who recently joined the co-op after being displaced from his shop of 10 years, built the classic Hawaiian koa rocker in the photo at right. Besides building furniture on commission, Robertson, like many of the furniture-makers I met, occasionally still does small production runs of the jewelry boxes, which he sells through galleries and which helped him get his start in woodworking. Curtis Paddock easily had the most diverse portfolio of the group, including a good deal of residential finish work such as a stairwell complete with curving rails and carved lotus-blossom newel posts. The final member, Christopher Burke, rounded out the group with equally distinctive examples of residential furniture.

Hawaii, the big island—In Hilo, on the island of Hawaii, the Big Island Woodworkers Guild got together to show me their slides and portfolios. The guild is a loose organization of furniture-makers, luthiers, bowl turners and carvers whose only regularly scheduled meetings are centered around their annual fall show. Past president Bob Gleason hosted the meeting at his shop, Pegasus Guitars, where he makes traditional Hawaiian guitars and uku-

leles, as well as hybrid instruments with elements derived from Spanish and other European traditions.

As expected, much of the furniture was based on the traditional Hawaiian mission style, but then a group of slides came up that caught my eye. The slides showed the details of the post-and-beam construction of a Japanese temple: mortises, tenons and the more exotic Japanese-style scarf joints for extending beams. Lonnie Tomono, the soft-spoken young man responsible for this work, flipped through the slides quickly and answered questions briefly, almost reluctant to back up the slide carousel when someone wanted a longer look. Tomono was born and raised in Hawaii by Japanese parents, and moved to California to attend the San Francisco Art Institute in 1973. However, his life took a turn when, working as a freelance carpenter and cabinetmaker between semesters, he happened to hire on with Makoto Imai, a Japanese-temple builder who was in San Francisco erecting an old temple that had been brought over in parts from Kyoto, Japan. Tomono worked with Imai for the next three years, and then he moved to Kyoto and continued his apprenticeship as a “miya daiku” or Japanese-temple carpenter under Imai’s teacher, Seiichiro Kitamura. He spent the next five years working with the fifth-generation craftsman, building and repairing temples and learning firsthand the techniques, tools and attitudes associated with this traditional craft. In 1987, Tomono returned to Hawaii and set up a furniture studio in the village of Volcano, just a few miles from Volcanoes National Park on the slopes of Mauna Kilauea. Intrigued by his story, I arranged to visit Tomono to see some of his furniture.

After a rainy 40-minute drive from Hilo, I came to Lonnie’s home. Sitting on the woven mats that covered the floor of his living room were two small chests, properly cha danzu, meant for storing the accoutrements used in a traditional Japanese tea ceremony. One was koa, with fabric-covered panels in the sliding doors and simple hand-wrought-iron pulls on the drawer. The other chest (shown in the center, left photo on p. 88) was slightly larger and made from Port Orford cedar, an Oregon-grown cypress with an incense-like fragrance that filled the whole room. Both these little chests were delightful and very well crafted, from their dovetailed carcasses to the neatly mortised-in finger holes on the sliding doors.

Tomono also had some snapshots of an unusual four-sided music stand he’d built that had an interesting story behind it. He received a phone call from a fellow who wanted him to build this quartet music stand that his grandfather had designed but never

built. Skeptical but curious, Tomono met with the man to look over the plans and was surprised to discover that the grandfather was none other than Frank Lloyd Wright. Needless to say, he took the job.

On the way back to Hilo, I stopped by Jay Warner's shop. Warner, whose parents moved to Hawaii when he was nine years old, seemed to be more of a native than an immigrant. His furniture was the best contemporary example of the mission style I'd seen, and his portfolio included all of the traditional Hawaiian forms: beds, blanket chests, plant stands and rocking chairs. This style seems to come naturally to him, and his good eye for proportions and his careful wood selection keep his pieces from having the heavy, blocky look that often plagues mission-style furniture. His pieces are not reproductions; instead he takes the traditional forms a step further, as shown by the rocking chair in the top, left photo on the next page. Historically these rockers are made from koa, but this chair is made from milo, a much harder Hawaiian wood with dark-reddish heartwood and creamy sapwood. The floral relief carvings by Scott Hare, who often collaborates with Warner, add to the unique character of the rocker.

Warner and Hare are examples of another aspect of woodworking in Hawaii: they're wood collectors. There are hundreds of different kinds of woods growing on the island that can be put to good use, and they are into finding, identifying and using them. If you go for a drive with these guys, you may end up bucking up a fallen tree with a chainsaw.

Oahu, port of entry—The island of Oahu is home to 80% of the total population of the state, and of those 800,000 people, 320,000 live in Honolulu. As Hawaii's capital and principal port, Honolulu has always been the point of entry for immigrants and their influences. Judging by the variety of work I saw when I met with a dozen furnituremakers there, Honolulu is still the port of call for cross-fertilization from abroad. Again, most of the work was made from koa and much of it based on traditional Hawaiian furniture, but there were also some contemporary urban influences and more examples of commercial commissions, such as office furnishings. In addition, some other styles were sneaking in from outside. Mike Daub, who

Hawaiian Furniture and Hawaii's Cabinetmakers 1820-1940

By Irving Jenkins. Published for the Daughter's of Hawaii by Editions Limited, 1123 Kapahulu Ave., Honolulu, Hawaii 96816; 1983. \$49.95, hardcover; 350 pp. Also available from The Taunton Press.

In his book, *Hawaiian Furniture and Hawaii's Cabinetmakers 1820-1940*, Irving Jenkins presents a detailed and vivid account of the 170-year history of Hawaiian furniture. Hawaii was virtually without furniture until New England missionaries arrived in 1820. As they set up house, they either built their own furniture or hired itinerant carpenters to build simple utilitarian furniture from local woods, especially koa. The next wave of immigration brought skilled European and American craftsmen who continued to work in the simple mission style with native hardwoods, but added embellishments such as turnings, carvings and inlays. In 1852, Chinese contract laborers began to arrive in Hawaii in large numbers. Some of them were highly trained craftsmen who soon left the sugar cane fields and established themselves as furnituremakers. By 1880, they were building some of the most ornate furniture ever made in Hawaii, some of which was commissioned by Hawaiian royalty. Another wave of agricultural laborers, this time from Japan, began arriving in the late 1800s, and by 1930, they dominated the skilled work force on every island. The furnituremakers among them worked in the mission style and also turned out more traditional Japanese pieces.

Jenkins tracks this chronology with well-researched profiles of more than 30 individual furnituremakers and cabinet shops. And in recognition of the importance of koa in the development of Hawaii's furniture trade, he begins the book with a chapter on the early logging industry on the islands. More than 300 photographs, most in color, don't just illustrate the text—they are really the soul of the book. They include studio shots of the furniture, as well as restored vintage photos of furnished rooms, workshops and the makers themselves. The captions, in acknowledgement that most people "read" the pictures first, have been expanded to give enough information so that even non-history buffs are eventually drawn into the text out of curiosity. *Hawaiian Furniture...* functions on several levels: It's a coffee-table book, an in-depth historical survey and a source book that's being used by Hawaii's present-day furniture-makers as an inspiration, a guide and a reminder of the special tradition of which they are a part.

J.B.



Alan Wilkinson wisely let the koa speak for itself on this chest of drawers, shown at right. But the maple armchair with koa seat and ebony details, shown below, is part of his continuing battle to get buyers to appreciate other woods besides koa.



Photos left and right: Jerry Chang

Center, left: Lonnie Tomono's Port cedar tea chest with koa panels and drawer front is 24 in. high and 29 in. wide. It sits on the floor and holds the items for a traditional Japanese tea ceremony. Top, left: Jay Warner and carver Scott Hare jazzed up this mission-style rocker by using milo instead of koa and by adding decorative relief carvings. Above: The koa desk, credenza and chairs reflect the contemporary sense of design that Stephen Meder and Steven Hill brought to the islands from the Rochester Institute of Technology.



recently came over from Boston, Mass., was finding work in his area of expertise, art nouveau carving. And John Gonczar of Waipahu, Oahu, broke with tradition by building a non-mission-style rocking chair with gracefully turned spindles and a high, flaring backrest.

By far the most contemporary designer-oriented furniture I saw was from the partnership of Stephen Meder and Steven Hill. Meder and Hill met in the 1970s at the Rochester Institute of Technology in Rochester, N.Y., where they were both enrolled in the furniture-design program. They came to Honolulu together in 1979, and after working for a short time at Martin and MacArthur, a commercial shop specializing in traditional koa furniture, they went into business together. In addition to building custom furniture, they hoped to get several designs into production, either in their own shop or with other manufacturers. Although this dream was never fully realized, they did produce a good deal of high-end commercial and residential furniture over the next five years. The office suite in the top photo at right on the facing page is a good example of their sense of design, range of techniques and attention to detail. However, they have recently closed up shop and turned their attention totally to designing.

In spite of the more cosmopolitan atmosphere on Oahu, some of the nicest work I saw there was firmly rooted in an earlier wave of cross-fertilization: the oriental influences that became a significant factor in Hawaiian furniture around 1880, when both Chinese and Japanese immigrants came in large numbers to work on the sugar cane plantations.

Alan Wilkinson came to Hawaii from Glendale, Cal., in 1962 because of the surfing. One of his first big breaks was signing on as an adviser and extra for the mid-'60s film, *Ride the Wild Surf*; at \$175 a day, it was a lucrative couple of weeks. After his short-lived film career, he worked in a shipyard repairing wooden boats and at the same time began dealing in antiques, both of which led to his interest in building furniture. In 1975, Wilkinson and his wife opened The Artists' Guild, a gallery specializing in local handicrafts and featuring Alan's furniture. Now he works by himself in a 2,400-sq.-ft. shop in a small industrial complex in the village of Wahiawa, about 25 miles outside of Honolulu. His gallery experience taught him the importance of presentation, and he now makes 70% of his sales out of a showroom built into a portion of his shop. He keeps the showroom stocked by building an extra piece along with many of his commissioned pieces, often using different woods and varying details.

The koa chest of drawers in the bottom photo at right on the facing page was inspired by traditional Japanese tansu, usually built as a kind of hope chest for brides-to-be. Like the tansu made by Japanese craftsmen in Hawaii in the early 1900s, Wilkinson used the highly figured koa to best advantage by resawing his own thick veneer and laminating it to much plainer, vertical-grain koa drawer fronts. However, by adding short legs with rosewood pad feet to the base and Chinese-style bird's-tail extensions to the top, Wilkinson has subtly altered the typically rectangular tansu form. That Wilkinson names the Craftsman-style architects Greene and Greene as a major influence is not surprising. Their designs often combined oriental details with the simple, mission style—exactly the same influences found in Hawaiian furniture. The maple chair in the bottom, left photo on the facing page has some Greene and Greene-type details, especially on the front legs; but again, Wilkinson adds his own touch with the shaped koa seat and curved back legs.

Robb Young is another Oahu furnituremaker whose work shows an oriental influence. Robb and his wife, Tish, run a custom-furniture shop out of the back of Winkler Wood Products, a lumber company in Honolulu that cuts, dries and surfaces koa from its Big Island-based mill. The couple moved to Hawaii from Los Angeles in 1971 to attend college. After receiving an undergraduate degree



Robb Young borrowed the basic design and proportions for his koa sideboard from a 19th-century museum piece. Then he commissioned John Nippolt to carve plumeria-leaf pulls and mango-branch relief carvings alongside the mirror, creating a piece that's even more Hawaiian in spirit than the original.

in premed, Robb worked as a technologist in a hospital, but by 1980 he was having trouble finding time for both work and their fledgling craft business. So he quit his job and went into woodworking full time. With Tish handling most of the production items, such as jewelry boxes and hand mirrors, Robb concentrated on furniture. They worked craft fairs for several years, supporting themselves with sales of the production pieces and building up interest in their furniture by showing their portfolio. Eventually, they dropped the production pieces, left the craft-fair circuit and began building custom furniture full time. Now, they're backlogged nearly a year with commercial and residential furniture commissions. Robb does very little work on speculation. Instead, he generally designs around the clients' wishes, and he rarely turns away a job no matter how big or small. Through the years he's been hired several times to build props for the *Magnum P.I.* television program, as well as furnishing the personal office of its star, Tom Selleck.

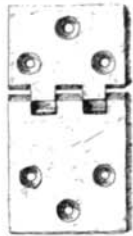
Although Young doesn't identify himself with any particular style of furniture, various oriental elements often show up in his work. He has modified the typical Chinese bowed leg with inward-turning "horse-hoof" foot, common on low tables, by reducing its usual bulky profile so it can be bandsawn from standard $\frac{3}{4}$ lumber. However, Young credits the personal taste of his clients for many of the oriental influences in his furniture. For example, the basic design of the koa sideboard in the photo above is taken from a piece pictured in Jenkins' book that was made by a transplanted European. But the carved handles and the relief carvings around the mirror and handles, done by John Nippolt of Honolulu, were added at the client's request and give the piece a look more reminiscent of highly decorated Chinese furniture.

Hawaii's furnituremakers find themselves in a unique situation. While the present market for furniture is good, it is very restrictive; the greatest demand is for regionally traditional furniture from locally grown woods. I found that most of the furnituremakers are finding ways to work within the regional tradition, while at the same time contributing to its evolution. In a way I envied them. To be part of a tradition in these days is a rare blessing. □

Jim Boesel is an Associate Editor at FWW.

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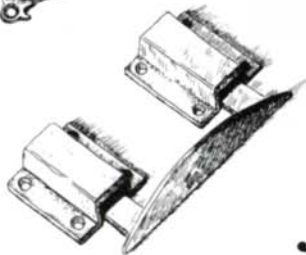
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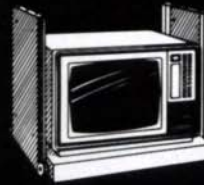


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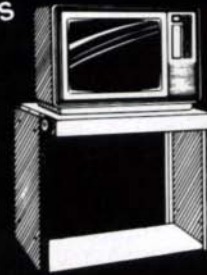
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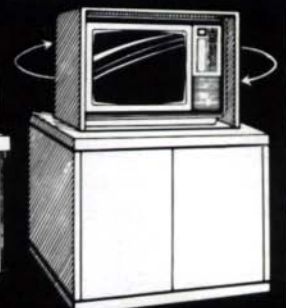
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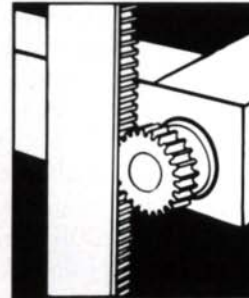
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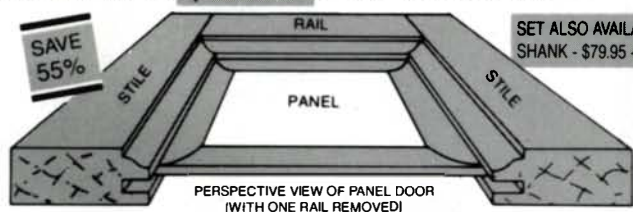
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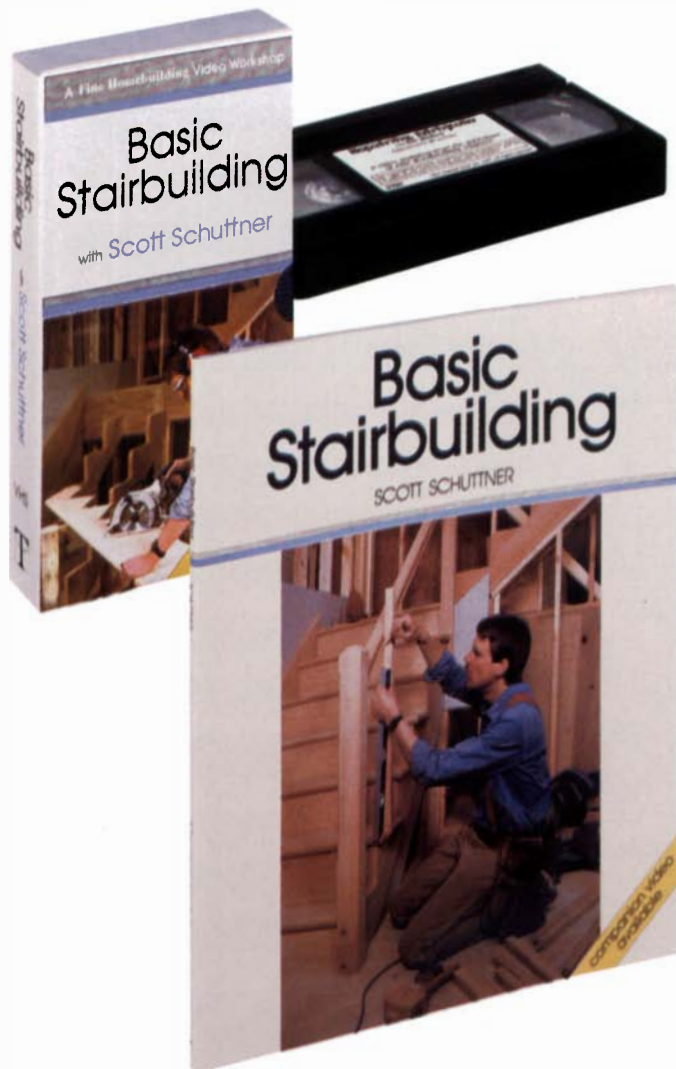


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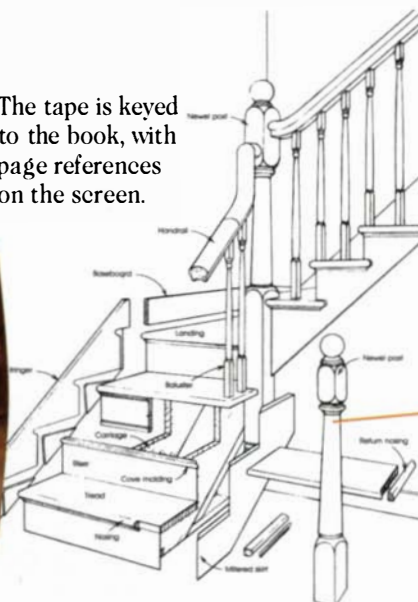
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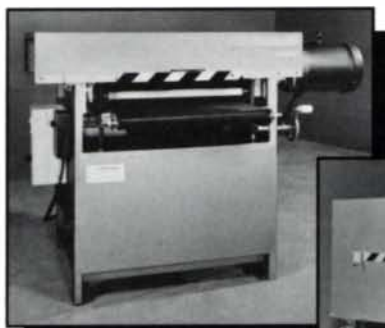
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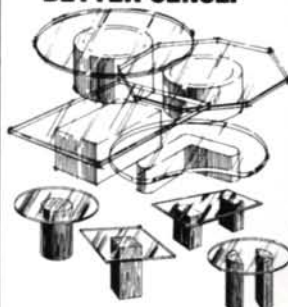
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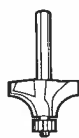
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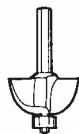
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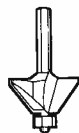
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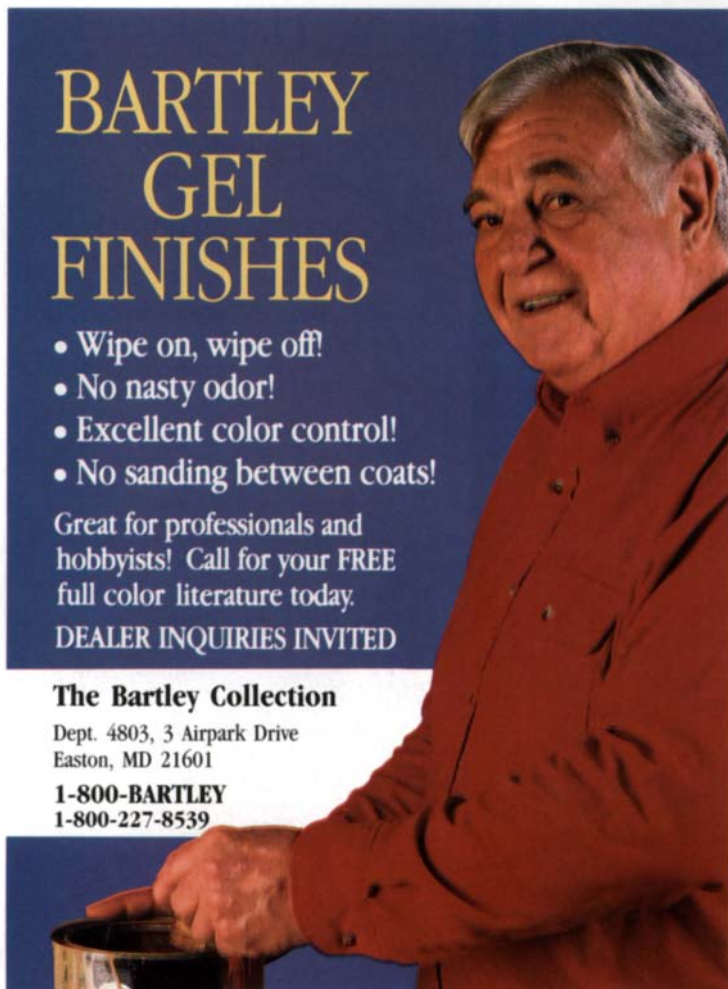
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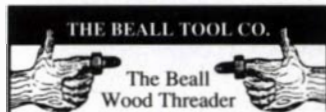
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READER SERVICE NO. 11

Building projects and a sense of accomplishment—We are always pleased to hear about someone building a piece of furniture based on an article in *FWW*. But many people seem a little reluctant to undertake some of the larger, more complex projects.

Gregory Moutsanides of Haines, Oreg., thinks these reluctant woodworkers are depriving themselves of the great sense of accomplishment and confidence that comes from completing a major piece. Greg recently built Ken Baumert's roll-top desk from the article and drawings in *FWW* #79. "I would strongly like to urge other readers, who for various reasons limit their projects, to take a chance on the unknown sometimes. By not being afraid of making mistakes, trying different methods, using your imagination and having patience, you will be greatly rewarded."

After years of rejecting other plans for a roll-top, Greg said he decided to build Baumert's because he felt it represented a balance of beauty, proportion and elegance he hadn't found on other versions. There were a couple of obstacles right off, though. He was concerned that he wouldn't be able to make the interlocking slats as Baumert did because he doesn't own a shaper. He also wasn't in a position to make a major investment in oak as Baumert had, so he opted to work in ponderosa pine, which is relatively plentiful and inexpensive near his home in eastern Oregon.

He said he basically followed Baumert's construction procedures throughout. To construct the slats, he ripped each one on the tablesaw to 1 $\frac{1}{16}$ in. wide. The socket portion was produced as described in the article, except he ground a $\frac{1}{2}$ -in.-dia. V-groove router bit to a steeper angle so he could produce all of the beveled portions. To make the neck of the ball, he used a $\frac{3}{8}$ -in. core-box bit and ran each slat on its side against his router-table fence. One pass on each side was required.

To make the ball portion, Greg used a $\frac{3}{4}$ -in. straight bit in the router table. Again using a fence, he made a pass on each side to obtain the finished dimension of $\frac{3}{4}$ in. The rounded portion of the ball was made with another pass on each side, this time using a $\frac{3}{8}$ -in. roundover bit with the router table and fence setup. Finally, he smoothed everything out with sandpaper. "The process does involve more set-up time. But it will faithfully produce the slats if you don't have a shaper."

Searching for the perfect workshop—James B. Farnum of Johnson City, Tenn., writes that he is working on a dream that has been 25 years in the making—designing and outfitting a workshop from scratch—and he's looking for information on "the ideal workshop." He admits it would be difficult to come up with one shop plan that would suit everyone, given variables such as type of work being done, budget, skill levels and availability of space, but he thought the subject would generate a lot of reader interest. How about it? Anybody out there got some shop ideas you would like to write about?

Clarification on antimildew treatments—Troy Chemical Corp., has notified us that the Troysan Polyphase AF1 biocide for the antimildew treatment of wood is not available as an additive at paint stores, as indicated in *FWW* #81. The company says that this material is for industrial use only and coating manufacturers incorporate it into some finishes. "The active ingredient in Troysan Polyphase AF1 is 3-Iodo-2-Propynyl Butyl Carbamate. Consumers should either inquire at the paint store whether the lacquer and varnish contain this active ingredient or check the label on the container for this active ingredient," said a company spokesman.

Tilting bandsaw tables—N. Spragg of Manteca, Cal., was a little confused about references to a bandsaw table that tilts to both the left and right in Mark Duginske's article "Machine-Made Mortises and Tenons" (*FWW* #81). We were wrong. The Delta 14-in. bandsaw won't tilt that way. Unfortunately, we misunderstood Mark's method and explained the tenon trimming

process erroneously. Mark's bandsaw (in fact an Inca, not a Delta), doesn't tilt that far both ways, and neither does any commercially made model we've found. He trims the tenons by resetting the fence. Two fence setups are used for cutting opposite corners of the tenon. We apologize for the error.

Cleaning chisel guides—Don Ginsler of Toronto, Ont., Canada, writes that as a former employee at Lee Valley Tools Ltd. (which carries both the Eclipse and Veritas honing guides), he agrees with Bill Stankus in "Sharpening Chisels and Plane Blades," *FWW* #81, about the value of these blade guides. But he did point out a possible problem with flat spots on the brass roller of the Veritas guide.

This problem occurs when slurry has entered between the pin and the roller, which flushes out essential lubricating oil, leaving behind the slurry. When the slurry dries, it causes the roller to stick and drag on the stone. To prevent this problem, the guide should be taken apart, cleaned and reoiled after each use.

More woodworking schools—Back in *FWW* #81, we published an updated list of schools offering woodworking programs. We tried to make the list as comprehensive as possible, but unfortunately, some institutions were missed. We continue to update the list as other schools let us know about their programs.

ALABAMA

Southwest State Technical College
925 Dauphin Island Parkway
Mobile, AL 36605-3299

KENTUCKY

Western Kentucky University
Industrial Technology Department
Bowling Green, KY 42101

MAINE

Washington County Technical College
Marine Trades Center
Deep Cove
Eastport, ME 04631

MISSOURI

Washington University
Fine Arts Institute
Campus Box 1031
One Brookings Drive
St. Louis, MO 63130-4899

NEW JERSEY

Kean College of New Jersey
Department of Fine Arts
Morris Avenue
Union, NJ 07083

Geoffrey Noden
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Dick Burrows is editor of Fine Woodworking.

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WBS24 — 12 1/2" CAP. 3HP, 1PH OR 5HP,
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JWB25PH—25" X 75", 15HP 3PH
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READER SERVICE NO. 27



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.

ARKANSAS: Juried exhibit—International Turned Objects Show, thru July 23. Arkansas Art Center Decorative Arts Museum, 7th and Rock Streets, Little Rock. Mon. thru Sat., 10 A.M. to 5 P.M.; Sun., 12 to 5 P.M. For info, contact Sarah Tanguy, International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.

CALIFORNIA: Workshops—Various workshops including Japanese woodworking, joinery and sharpening. Contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.

Exhibition—Cardboard Furniture by Brian Gladwell, thru July 1. San Francisco Craft & Folk Art Museum, San Francisco. Featuring approximately 15 pieces of cardboard furniture by the Canadian woodworker. For info, contact Mary Ann McNicholas, Landmark Building, Fort Mason, San Francisco, 94123. (415) 775-0990.

Workshops—Woodworking tools and techniques with Jim Budlong, June 25–July 13; tools and techniques with Michael Burns, July 7–Aug. 10; weekend seminar with James Krenov, July 21–22. College of the Redwoods, 440 Alger St., Fort Bragg, 95437. (707) 964-7056.

Juried exhibition—Artistry in Wood '90, July 6–Aug. 26. The Sonoma County Museum, 425 7th St., Santa Rosa, 95401. For info, contact Wade Belew, Sonoma County Woodworkers Association, Box 4124, Santa Rosa, 95402. (707) 579-0264.

Fair—Wood Fair '90, July 13–15. College of the Redwoods, 7351 Tompkins Hill Rd., Eureka, 95501. (707) 445-6966.

Workshop—Building furniture with hand tools and traditional joinery, July 28–29. For women. Contact Debey Zito, (415) 648-6861.

Exhibit—The Walnut Boutique, thru July 29. Illustrations of walnut including examples of woodworking, photos, text, videos, more. The Chico Museum, 141 Salem St., Chico, 95928. (916) 891-4336.

Workshop—Lumber drying, Aug. 6–10. University of California Forest Products Lab, 1301 S. 46th St., Richmond, 94804. Call Tom Breiner at (415) 231-9487.

Juried conference—5th annual Southern California Woodworking Conference, Aug. 8–12. Harvey Mudd College, Claremont. For info, contact Howard Lewin, 3825 W. 139th St., Hawthorne, 90250. (213) 679-2485.

Exhibit—2nd annual exhibition of turned wood objects by members of the San Diego Woodturners, Sept. 15–16. Julian Town Hall, Julian. For info, contact Nan Bushley, 5065 Sleeping Indian Rd., Fallbrook, 92028. (619) 728-0591.

COLORADO: Classes—Woodworking and related classes, year-round. Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.

Workshops—Basic woodworking with Peter Korn and Harv Mastalir, June 25–29; faux and painted finishes with Kathleen Loe, June 25–29; furniture-making with Stephen Proctor, July 2–6, July 9–13, July 16–20; willow furniture with Michael Emmons, July 9–13; marquetry, veneering and inlay with Silas Kopf, July 16–20; furniture with Sam Maloof, July 21–22; chair design and development with Robert DeFuccio, July 23–27, July 30–Aug. 3; classic European carving with Nora Hall, July 23–27; advanced carving with Nora Hall, July 30–Aug. 3; stool construction with Gary Rogowski, Aug. 6–10; upholstery with Jim Barefoot, Aug. 6–10; wood sculpture with Ellen Driscoll, Aug. 13–17, Aug. 20–24. Anderson Ranch Arts Center, Box 5598, Snowmass Village, 81615. (303) 923-3181.

Juried exhibit—6th annual exhibit sponsored by the Woodworkers Guild of Colorado Springs, Oct. 6–Nov. 11. Deadline for entries: Sept. 28–29. Colorado Springs Pioneers' Museum, Colorado Springs. Contact John Lewis, 918 N. Royer St., Colorado Springs, 80903. (719) 632-8548.

CONNECTICUT: Workshops—Various woodworking workshops including woodturning with Rude Osolnik, June 30–July 1. Contact Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.

Show—4th annual Members Show, thru July 14. Keeney Memorial facility, Wethersfield Historical Society, 200 Main St., Wethersfield. Sponsored by Woodworkers Guild of Connecticut and featuring contemporary and period reproduction furniture, turned bowls, sculptures, more. For info, call Stef D'Ascanio at (203) 651-0466.

Juried exhibit—33rd annual handcrafts exposition, July 19–21. Guilford Green. For info, contact Guilford Handcrafts, Box 589, 411 Church St., Guilford, 06437. (203) 453-5947.

Juried show—14th annual SoNo Arts Celebration, Aug. 4–5. In the waterfront district of South Norwalk. Contact Peter Kanter, SoNo Arts Celebration, Box 569, South Norwalk, 06856. (203) 849-9366.

Exhibit—Wooden Fantasy, Aug. 4–25. Featuring wooden bowls, clocks, toys and folk art by local artisans. The Schoolhouse, Gales Ferry Craft Cooperative, 6 Hurlbutt Rd., Gales Ferry, 06335. (203) 437-1066.

Workshops—Various woodworking workshops, thru Aug. Contact Guilford Handcrafts, Box 589, 411 Church St., Guilford, 06437. (203) 453-5947.

Juried exhibition—Gilding the Lily, Mar. 24–Apr. 20, 1991. Deadline for slides: Sept. 15. National juried/invitational event. For info, contact Creative Arts Workshop, 80 Audubon St., New Haven, 06510.

DISTRICT OF COLUMBIA: Exhibit—Tradition and Innovation: New American Furniture, thru Sept. 3. Renwick Gallery, 17th St. & Pennsylvania Ave. N.W. For info, call (202) 357-2247.

FLORIDA: Juried show—5th annual Starke Festival of the Arts, Oct. 27–28. On the streets of downtown Starke. Entries deadline: Sept. 28. For info, contact Nancee Clark, Box 1530, Gainesville, 32602. (904) 372-1976.

GEORGIA: Exhibit—American Wildfowl Decoys, thru Aug. 4. Museum of Arts and Sciences, Macon. Contact Museum of American Folk Art, Lincoln Square, Columbus Ave. and 66th St., New York, NY 10023. (212) 595-9533.

Exhibit—Hank Murta Adams: It's Not About Joinery, exhibit of furniture, thru Aug. 18. Great American Gallery, 1925 Peachtree Rd. N.E., Atlanta, 30309. (404) 351-8210.

Juried exhibition and fair—International Woodworking Fair Design Competition at the International Woodworking Machinery and Furniture Supply Fair, Aug. 24–27. Georgia World Congress Center, Atlanta. For info, contact Shirley Byron, International Woodworking Fair, 8931 Shady Grove Court, Gaithersburg, MD 20877.

Workshops—Japanese woodworking by Toshihiro Sahara. One Saturday each month, year-round. Contact Sahara Japanese Architectural Woodworks, 1716 Defoor Place N.W., Atlanta, 30018. (404) 355-1976.

Festival—20th annual fall festival, Oct. 13–14. The Prater's Mill Country Fair, 101 Timberland Dr., Dalton, 30720. (404) 259-5765.

IDAHO: Festival—22nd annual Art on the Green, Aug. 3–5. Fort Sherman grounds on the North Idaho College campus. Sponsored by the Citizens Council for the Arts, Box 901, Coeur d'Alene, 83814. (208) 667-9346.

ILLINOIS: Show—45th annual National Hardware Show, Aug. 12–15. McCormick Place Complex, 23rd Street and Lakeshore Drive, Chicago, 60616. Sponsored by the American Hardware Manufacturers Association (AHMA). For info, contact William Farrell, AHMA, at (312) 605-1025.

Show—The Chicago area Woodworking World Show, Oct. 5–7. The Metro Center, Rockford. For info, contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.

INDIANA: Juried show—3rd annual Works in Wood, October. Chesterton Art Gallery. Featuring hand-crafted wood furniture and objects. Deadline for submissions: Aug. 1. Contact the gallery, Box 783, Chesterton, 46304. (219) 926-3441.

Festival—Chautauqua of the Arts, Sept. 22–23. Along the streets of Madison. For info, contact Dixie McDonough, 119 W. Main St., Madison, 47250. (812) 265-5080.

IOWA: Juried show—International Woodcarvers Congress, June 21–24. Davenport Art Gallery, 1737 W. 12th St., Davenport. For info, call Larry Yudas at (319) 359-9684.

Classes—Woodcarving classes, June thru July. Vesterheim, Norwegian-American Museum, 502 W. Water St., Decorah, 52101. (319) 382-9681.

Juried exhibit—Octagon Annual, Nov. 11–Dec. 30. Entry deadline: Sept. 1. Octagon Center for the Arts, 427 Douglas, Ames, 50010. (515) 232-5331.

KENTUCKY: Workshops—Woodturning and joinery instruction, thru October. One day to one week. Contact Jim Hall, Adventure in Woods, 415 Center St., Berea, 40403. (606) 986-8083.

LOUISIANA: Competition—Louisiana Wildfowl Carvers and Collectors competition and auction, Aug. 17–19. University of New Orleans. For info, contact LA Wildfowl Carvers and Collectors Guild, c/o Offshore Navigation Co., Box 23504, Harahan, 70183.

Juried competition—Lafayette Art Association annual national juried competition of two- and three-dimensional art, Apr. 1–30, 1991. Slides deadline: Jan. 15, 1991. For prospectus, contact Marta Fielding, Lafayette Art Gallery, 700 Lee, Lafayette, 70501.

MAINE: Class—Design and build, June 18–29. Shelter Institute, 38 Centre St., Bath, 04530. (207) 442-7938.

Workshop—The Arts of the Sailor, August. Rockport Apprenticeship, Box 539F, Rockport, 04856. (207) 236-6071.

Workshops—Various woodworking workshops, thru Aug. 31. Haystack Mountain School of Crafts, Box 87, Deer Isle, 04627. (207) 348-2306.

MARYLAND: Juried show—27th annual Havre de Grace Art Show, Aug. 18–19. Tydings Memorial Park. Sponsored by the Soroptimist International of Havre de

Grace. For info, contact the art show, Box 174, Havre de Grace, 21078. (301) 879-4404.

Show—Summer art show featuring works by the faculty and students from the Rhode Island School of Design and Southeastern Massachusetts University, thru Sept. 15. Meredith Gallery, 805 N. Charles St., Baltimore, 21201. (301) 837-3575.

MASSACHUSETTS: Fair—25th annual ACC Craft Fair, June 22–24. Eastern States Exposition, West Springfield. For info, contact American Craft Enterprises, Box 10, New Paltz, NY 12561. (914) 255-0039.

Juried exhibit—Handmade for the '90s, June 30–Sept. 9. The Berkshire Museum, 39 South St., Pittsfield, 01201. (413) 443-7171.

Workshops—One- or two-day workshops including bandbox making and making hand tools, thru June. Old Sturbridge Village, 1 Old Sturbridge Village Rd., Sturbridge, 01566. (508) 347-3362.

Workshops—House building, June 25–July 13, July 30–Aug. 17, Aug. 27–Sept. 14; carpentry for women, July 16–20; timber framing, July 23–27; finish carpentry, Sept. 24–28; cabinetmaking, Oct. 1–5. Washington. Contact Will Beemer, Heartwood, Johnson Hill Rd., Washington, 01235. (413) 623-6677.

Workshops—Various summer workshops, July 5–Aug. 24. Nantucket Island School of Design & the Arts, Box 1848, Nantucket, 02554. (508) 228-9248.

Show—Treasure Boxes, thru July 14. Ferrin Gallery, 179 Main St., Northampton, 01060. (413) 586-4509.

Workshops—Various three- to six-day woodworking workshops, thru Oct. 6. Including carpentry with Lance Hodes, Aug. 16–19; rustic furniture with Daniel Mack, Oct. 6. Williamsburg. Contact Horizons Craft Program, 374 Old Montague Rd., Amherst, 01002. (413) 549-4841.

Show—11th annual Doll House and Miniature show and sale, Aug. 19 and workshops, Aug. 18. Sheraton Hyannis, Route 132, Hyannis. For info, contact Ronald Levesque, Box 279, Cataumet, 02534. (508) 564-4500.

Workshop—Traditional timber framing with Jack Sobon and Dave Carlson, Sept. 26–30. Hancock Shaker Village, Hancock. Contact Jack Sobon, Box 201, Windsor, 01270. (413) 684-3223.

Classes—Woodworking classes, throughout most of the year. Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.

MICHIGAN: Seminar—Selling and Understanding Hardwood Lumber, Aug. 6–8. Marriott Inn, Grand Rapids. For info, contact Anthony Weatherspoon, Forest Management Division, Michigan Dept. of Natural Resources, Box 30028, Lansing, 48909. (517) 335-3332.

MINNESOTA: Juried exhibition—8th annual Upper Midwest Woodcarver's Exhibition, July 21–27. Fairgrounds in Blue Earth. Entries by July 21. For info, contact Harley Schmitgen, 311 E. 14th St., Blue Earth, 56013. (507) 526-2777.

Show—The Twin Cities Woodworking Show, Sept. 28–30. Minnesota State Fairgrounds, Snelling & Como Avenues, St. Paul, 55108. Contact The Woodworking Show, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

MISSOURI: Exhibit—Crafted Statements, July 6–Aug. 11. Featuring lathe-turned and hand-carved objects including vessels, sculptural pieces and furniture. Curated by Albert LeCoff and Craig Nutt. Craft Alliance, 6640 Delmar Blvd., St. Louis, 63130. (314) 725-1151.

NEW HAMPSHIRE: Classes—Classes in fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.

Classes—Various craft classes, including woodworking, year-round. Contact The Hand & I, Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.

Fair—32nd annual Canterbury Fair, July 28. Canterbury Center, Canterbury. For info, call (603) 783-4649.

Workshops—Various violin-crafting workshops, thru Aug. 17. UNH Violin Craftsmanship Institute, Brook House, 24 Rosemary Lane, Durham, 03824. (603) 862-1088.

Retreat—Woodworking retreat, July 22–26. Waterville Valley Resort & Conference Center, White Mountain National Forest. Contact WANA, Box 706, Plymouth, 03264. (800) 521-7623.

Juried show—National Rocking Chair Show, Sept. 15, 1990–Jan. 15, 1991. Hanover. For info, contact Lynne DiFrancesco, Rubens and Locke, 40 S. Main St., Hanover, 03755. (800) 333-3448, (603) 643-4327.

NEW JERSEY: Workshops—Half-hull model making with Ken Sasset, June 23–24; carving ball-and-claw feet and cabriole legs with Mack Headley, Jr., June 30–July 1; cabinetmaking with David Van Hoff, July 6–11; cedar/canvas canoe building with Horace Strong, July 14–18; hand-carved signs with Ray Halacy, July 20–22; making and using wooden handplanes with David Finck, Aug. 3–7; gilding with June Fette, Aug. 10–12; 18th-century chairmaking with Eugene Landon, Aug. 15–21; making an acoustic guitar with Dick Boak, Aug. 24–31. For info, contact Peters Valley Craft Center, Layton, 07851. (201) 948-5200.

Exhibit—Recent work of Mary Lou Higgins, thru July 7. Including art furniture. Sheila Nussbaum Gallery, 358 Millburn Ave., Millburn, 07041. (201) 467-1720.

Juried fair—20th annual Peters Valley Craft Fair, July

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Events (continued)

28-29. Outdoors. Contact Peters Valley Craft Fair, Layton, 07851. (201) 948-5200.

NEW MEXICO: Workshops—Everything about a table-saw with Max Wilson, July 14; varnishing with Skip Hanson, Aug. 11. Contact Albuquerque Woodworkers' Association, Box 36133, Albuquerque, 87176-6133.

Classes—Woodworking classes, beginning Aug. 13. Northern New Mexico Community College, El Rito, 87520. (505) 581-4501.

NEW YORK: Classes—Various woodworking classes. Constantine, 2050 Eastchester Rd., Bronx, 10461. (212) 792-1600.

Classes—Woodworking classes at all levels, including gilding, June 23; table-saw techniques, June 30; stenciling with bronze powders, July 7; portable power tools, July 14. Contact The Craft Students League, 610 Lexington Ave. at 53rd St., New York, 10022. (212) 735-9732.

Classes—Finishing and refinishing, June 23; tool sharpening, June 30; constructing a flat-bottom skiff, July 7-8, 14-15, 21-22, 28-29; constructing a Nova Scotia dinghy, Aug. 18-26. Shipyard Museum, 750 Mary St., Clayton, 13624. (315) 686-4101.

Workshops—Hand-tool workshops with Robert Meadows, June 23-24, July 21-22, Aug. 18-19. The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.

Festival—1st Albany Wooden Boat Fest, June 23-24. Corning Preserve on the banks of the Hudson River. Sponsored by North River Boatworks and the City of Albany. Contact North River Boatworks, 6 Elm St., Albany, 12202. (518) 434-4414.

Juried show—14th annual American Crafts Festival, June 30-July 8. Lincoln Center, New York City. Contact American Concern for Artistry and Craftsmanship, Box 650, Montclair, NJ 07042. (201) 746-0091.

Competition—International Art Competition, Aug. 10-31. Marcuse Pfeiffer Gallery, New York City. Slide deadline: June 30. Multimedia competition, including wood and furniture. Contact I.A.C., Box 1058, Lodi, NJ 07644. (201) 646-0222.

Juried show—Chautauqua Crafts Festival '90, July 6-8, Aug. 10-12. Bestor Plaza, Chautauqua Institution, Chautauqua. Sponsored by the Chautauqua Crafts Alliance. For info, contact Gale Svenson, Chautauqua Crafts Festival '90, Box 89, Mayville, 14757.

Juried festival—16th annual Fall Festival Art and Craft show, Oct. 6-7. Outside. Entry deadline: July 21. Contact Fall Festival Art Committee, Box 808, Ellicottville, 14731. (716) 938-6794.

Juried show—Craft Art from Western New York 1990, Oct. 6-Nov. 25. Buffalo. Deadline for slides: July 16. Open to artists having lived in western New York state. Contact Burchfield Art Center, Rockwell Hall, State University College at Buffalo, 1300 Elmwood Ave., Buffalo, 14222-1095.

Show—The Upstate New York Woodworking Show, Oct. 5-7. Riverside Convention Center, 123 E. Main St., Rochester, 14604. For info, contact The Woodworking Show, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

Exhibit—The Doghouse, thru Oct. 14. Cooper-Hewitt Museum, 2 E. 91st St., New York, 10128. (212) 860-6868.

Meetings—New York Woodturners Association, first Tuesday of each month. Woodturning techniques and exhibits also. The Crafts Student League, YWCA, 610 Lexington Ave., New York City.

NORTH CAROLINA: Workshops—Woodworking with Skip Johnson, June 25-July 6; furniture from the source with Brad Smith, July 9-20; furniture with Lauren McDermott, July 23-Aug. 8; design in wood with Leo Doyle, Aug. 13-24. Penland School, Penland, 28765. (704) 765-2359.

Classes—Five- and six-day woodworking classes. Ladderback chairmaking, June 25-30; Swedish woodenware, July 9-13; Advanced Swedish woodenware, July 16-20; Windsor chairmaking, July 30-Aug. 4; Swiss cooperage, Aug. 13-18. Contact Country Workshops, 90 Mill Creek Rd., Marshall, 28735. (704) 656-2280.

Symposium—International Symposium on Tooling for the Wood Industry, July 26-27. N.C. State University. Contact College of Forest Resources, Box 8005, Raleigh, 27695-8005. (919) 737-3181.

Show—The Carolina Woodworking World Show, Sept. 21-22. M.C. Benton Convention Center, Winston-Salem. Contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.

OHIO: Classes—Sack-back Windsor with Boyd Hutchison and Kevin Malong, July 9-13; making a Shaker box with John Wilson, July 9-13; production spindle turning with Palmer Sharpless, July 9-13; turning for Windsor chairmakers with Boyd Hutchison and Ernie Conover, July 14-15, July 21-22; carved bowls with Al Stirt, July 16-20; continuous-arm Windsor with Boyd Hutchison, July 16-20; writing-arm Windsor with Boyd Hutchison, July 23-27; general woodturning techniques with Rus Hurt, July 23-27; hand-tool joinery with Ernie Conover,

July 23-27. Conover Workshops, 18125 Madison Rd., Parkman, 44080. (216) 548-3481.

Show—The Greater Columbus Woodworking Show, Sept. 14-16. Ohio Expositions Center, 632 E. 11th Ave., Columbus, 43211. Contact The Woodworking Show, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

OREGON: Show—Multimedia show featuring work by woodworker/furnituremaker Tom Farr, July 21-Aug. 18. Made in Jefferson Gallery, 3259 Jefferson Scio Dr. S.E., Jefferson, 97352. (503) 327-2543.

Show—First Hardwood Craft show, July 21. Hardwood Industries Inc., Bend. For info, contact Ken Matthews, 16974 Cagle Rd., Lapine, 97739. (503) 536-1970.

Classes—Various summer tool-making and woodworking classes, thru September. Including woodcarving with Richard Butz, July 23-27. Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.

Juried show—14th annual Artistmarket Place, Sept. 1-3. Streets of downtown Portland. For information, contact Catherine Wygant, 7017 S.E. 84th Ave., Portland, 97266. (503) 774-0919.

PENNSYLVANIA: Educator symposium—The Use of the Lathe: Ideas for the Classroom, June 22-24. George School, Newtown. Instructors include Allen Androkites, Leo Doyle, Albert LeCoff, Rude Osolnik, Mark Sfirri, Palmer Sharpless, Del Stubbs, Contact The Wood Turning Center, Box 25706, Philadelphia, 19144. (215) 844-2188.

Festival—Pocono State Craft Festival '90, June 23-24. Shawnee Inn Resort. Contact Pennsylvania Designer-Craftsmen, Box 718, Richboro, 18954. (215) 860-0731.

Workshops—Bleaching and chemical finishing with Prew Savoy, June 23; Colonial Day featuring demonstrations of crafts, Aug. 4; touch-up and repair of furniture with Jonathan Kemp, Aug. 18; spindle turning with Palmer Sharpless, Aug. 25-26; shellac finishes with Don Williams, Sept. 15. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Rd., York, 17402. (717) 755-8884.

Juried exhibition—Contemporary Philadelphia Artists, thru July 8. Philadelphia Museum of Art, Ben Franklin Pkwy., Box 7646, Philadelphia, 19101-7646. (215) 236-4465.

Juried exhibitions—Pull Up A Chair: A Contemporary Seating Exhibition, Aug. 11-Sept. 23. National competition. Also, national juried exhibition of contemporary crafts, Oct. 6-Nov. 4. Deadline: July 6. For info, contact Lynn Berkowitz, Luckenbach Mill Gallery, 459 Old York Rd., Bethlehem, 18018. (215) 691-0603.

Juried show—Studio Days '90, Sept. 21-30. Open to



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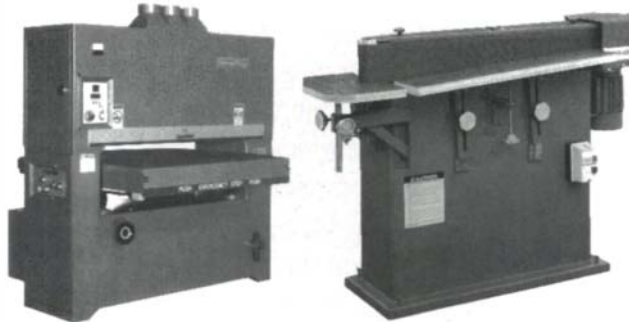
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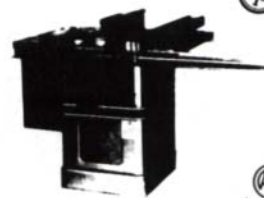
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Exhibition—Lathe-Turned Objects: Trends, Transitions, Tradition, thru July 15. Woodmere Art Museum, Chestnut Hill. Featuring objects made between 1700 and 1990. For info, call Woodmere Art Museum: (215) 247-0476.

Show—The Pittsburgh Tri-State Woodworking Show, Sept. 21-23. Pittsburgh ExpoMart, 105 Mall Blvd., Monroeville, 15146. Contact The Woodworking Show, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

Festival—7th annual Penn's Colony Festival, Sept. 22-24. Route 528, Prospect. For info, contact Penn's Colony Festival, 603 E. End Ave., Pittsburgh, 15221. (412) 241-8006.

RHODE ISLAND: Exhibit—Tomorrow's Heirlooms Today, Sept. 5-9. Featuring contemporary furniture of particleboard and medium-density fiberboard. Warwick Mall, Providence. For info, contact PB/MDF Institute, 18298 Premiere Court, Gaithersburg, MD 20879. (301) 670-0604.

TENNESSEE: Juried exhibition—Woodturning: Vision and Concept II, Oct. 24-Dec. 8. Entries deadline: June 30. In conjunction with exhibit, 4th annual American Association of Woodturners Symposium, including demonstrations and seminars by regional and national turners, Oct. 25-27. Contact Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

Workshops—Various woodturning workshops, thru Aug. 10. Contact Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

Show—Smoky Mountain Artistry in Wood, Oct. 6-7. Rodeway Inn, Knoxville. Contact Gary Falin, 693 Wright Rd., Alcoa, 37701.

TEXAS: Class—Timber framing, Sept. 10-16. Contact Wynter Chauvin, Red Suspenders Timber Frames, Route 7, Box 8383, Nacogdoches, 75961. (409) 564-9465.

UTAH: Juried exhibit—The New Utah Furniture: Contemporary Concepts, Sept. 22-December. Nora Eccles Harrison Museum of Art, Utah State University, Logan, 84322. (801) 750-1412.

VERMONT: Workshops—Joinery: mortises and tenons with Chris Bretschneider, July 21-22; joinery: dovetails

with Chris Bretschneider, Aug. 11-12; Shaker oval boxes with John Wilson, Sept. 5-6. Vermont State Craft Center at Frog Hollow, Middlebury, 05353. (802) 388-3177.

VIRGINIA: Exhibit—Furniture by Wendell Castle, thru Aug. 19. Virginia Museum of Fine Arts, Richmond. For info, contact Rochester Institute of Technology, 1 Lomb Memorial Dr., Box 9887, Rochester, NY 14623. (716) 475-5064.

Competition—7th annual International Creative Marquetry Show (ICMS), Oct. 30-Nov. 21. The Hofheimer Library, Virginia Wesleyan College, Norfolk. Slides deadline: Aug. 1. Judging by local artists. For details, contact Suzanne Cartwright, 63 Church Lane, Sproutton, Ipswich, Suffolk, IP8 3AY, England, or Joyce Howell, Virginia Wesleyan College, 1584 Wesleyan Dr., Norfolk, 23502.

WASHINGTON: Classes—Boatbuilding classes, including galvanized deck and rigging hardware, July 7; art of marine survey, July 16-20; caulking, Aug. 11. Northwest School of Wooden Boatbuilding, 251 Otto St., Port Townsend, 98368. (206) 385-4948.

Classes—Various boatbuilding classes, thru June. Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.

Exhibitions—Vignette mixed-media show, thru June 30; work by Michael Davock, thru July 29; country show featuring furniture accessories, July 5-Sept. 2; curly colorations by Michael Neiman, Aug. 2-Sept. 30. Northwest Gallery, 202 First Ave. S., Seattle, 98104. (206) 625-0542.

Classes—Various woodworking classes, year-round. Contact Port Gamble Klallan Tribe, Box 280, Kingston, 98346. (206) 638-2794.

Juried show—Clock show, Oct. 25. Slide deadline: Sept. 1. Also, woodworking and furniture by area artists on display, year-round. Artwood, 1000 Harris Ave., Bellingham, 98225. (206) 647-1628.

Meetings—Northwest Woodworkers Guild, last Wednesday of each month. Contact Kirk Kelsey, 744 N. 78th, Seattle, 98103. (206) 789-2142.

WEST VIRGINIA: Workshops—Augusta Heritage Arts workshops, July 8-Aug. 10. Davis & Elkins College, Elkins, 26241-3996. (304) 636-1903.

Workshops—Woodturning with Palmer Sharpless, July 23-27; white-oak basketry with Aaron Yakim, July 23-27; woodworking for women with Marie Hoeft, July 27-29; Shaker oval boxes with John Wilson, Oct. 5-6. Crafts Center, Cedar Lakes, Ripley, 25271. (304) 372-7005.

CANADA: Class—Building the Nova Scotia skiff, Sea Urchin, June 23-30. For info, contact Wooden Boat Society, Box 787, Duncan, Vancouver Island, B.C., V9L 3Y1. (604) 746-5789.

Classes—Various woodworking classes including bird carving, woodcarving, wood sculpture, willow chairmaking and more. Beginning July 2. Contact the Haliburton School of Fine Arts, Box 339, Haliburton, Ont., K0M 1S0. (705) 457-1680.

Exhibit—Turned vessels by Ted Hodgetts, July 5-29. Art Gallery of Peterborough, 2 Crescent St., Peterborough, Ont., K9J 2G1. (705) 743-9179. Aug. 9-26; Durham Art Gallery, Box 1021, Durham, Ont., N0G 1R0. (519) 369-3692; Sept. 1-Oct. 31; Fieldcote Memorial Park and Museum, Box 7099, Ancaster, Ont., L9G 3L3. (416) 648-8140.

Workshops—Beginners' woodturning with Ian Waymark, July 16-18; intermediate woodturning with Jason Marlow, Aug. 20-22. Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C., V9A 3S8. (604) 383-9600.

Juried exhibit—Dimensions, last three weeks in September. Slides by July 1. 10th Street Gallery, 328 10th St. N.W., Calgary. Open to residents of Alta., B.C., Sask., Man. Contact Southern Alberta Woodworkers Society, Box 6753, Station D, Calgary, Alta., T2P 2E6. (403) 230-7991.

Meetings—Canadian Woodturners Assoc. meetings, throughout the year. Second Tuesday of each month. Contact Bob Stone, Box 8812, Ottawa, Ont., K1G 3J1. (613) 824-2378.

ENGLAND: Exhibit—Parnham at Smith's Gallery, June 26-30. Smith's Gallery, 56 Earlham St., WC2. Featuring furniture designers and makers. Also, woodworking courses, beginning July 15. Contact Laetitia Powell, Parnham, Beaminstor, Dorset, DT8 3NA. (0308) 862204.

Exhibits—Art in Action, July 19-22, Waterperry House, Oxon.; British Craftsmanship in Wood, Aug. 4-12, Thirlestaine Long Gallery, Cheltenham Gentleman's College; Waywood's annual exhibition, Sept. 8-9, Oxford. For information on all three, contact Waywood, Eynsham Park Sawmill, Cuckoo Lane, N. Leigh, Witney, Oxford. OX8 6PS. (0993) 882748.

SWITZERLAND: Tour—Woodworkers' tour, Sept. 7-16. For information, contact Drew Langsner, Country Workshops, 90 Mill Creek Rd., Marshall, NC 28753. (704) 656-2280.

Tour—Woodworking/woodcarving tour, Sept. 25-Oct. 8. Contact Wayne Barton, Alpine School of Woodcarving, 225 Vine Ave., Park Ridge, IL 60068. (708) 692-2822.

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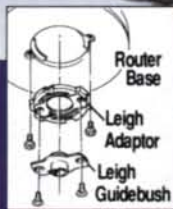
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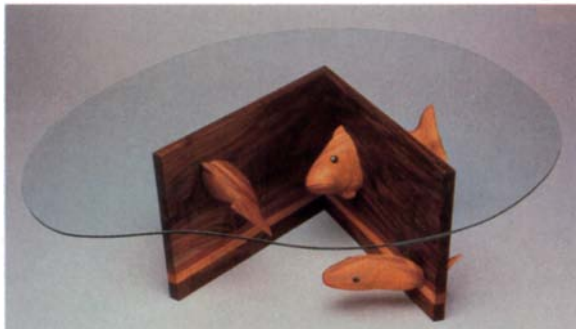
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Photo: John Black



Women in the Woods

Nine furnituremakers from Washington and Oregon were featured in the "Women in the Woods" show held recently at the Made in Jefferson Gallery, Jefferson, Ore. The cherry settee above is one of a series of similar benches made by Eddee Edson of Seattle, Wash., in the past year. Beth Yoe, of Portland, Ore., reinterpreted Chinese "cracked ice" lattice work within the back of her Charles Rennie Mackintosh-inspired maple chair, shown in the photo at right.



Jennifer Schwarz of Seattle, Wash., had several pieces in the "Women in the Woods" show that combined figurative carving within more traditional furniture forms. She livened up her simple, walnut-and-purpleheart coffee table, above, by adding three mahogany fish "swimming" below the surface. Portland, Ore., furnituremaker, Vickie Hughes, made her ball table at right with a Carpathian-elm-burl-veneered top supported on maple rails and black-lacquered legs. Each leg is capped with a sterling silver dome and supported by a chased silver foot.



Woodworking conference

The fifth annual Southern California Woodworking Conference (SCWC) will be held Aug. 8-12, 1990 at Harvey Mudd College in Claremont, Cal. The conference, put together by Flo Bishop and Howard Lewin, co-directors, has become an annual event that features woodworking instructors from all over the country.

I attended the 1989 conference and was impressed by the scope of the four-day pro-

gram. About 25 instructors, including some of today's best-known woodworkers, such as Art Carpenter, Gary Bennett, Michael Dunbar, Rude Osolnik, Richard Raffan and Bob Stocksdale, conducted more than 115 open-forum seminars and 27 hands-on workshops covering a wide range of topics.

Woodturning was emphasized as 13 of the 27 workshops were conducted by turners that included Clead Christiansen, Todd Hoyer and Bonnie Klein. Younger participants also had a chance to get their hands

dirty in toy-making workshops by Sheila Dawson or a stool workshop by Don Weber (shown in progress in the left photo on p. 108). There was so much offered that in spite of 12-hour days, I wasn't able to see and do everything.

This year's conference will feature many of the same instructors, as well as three or four new additions (not yet announced). Also, there will be more emphasis on hands-on classes, and the demonstrations will concentrate on the steps involved in



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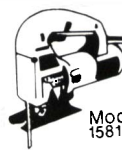
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Don Weber of Mendocino, Cal., teaches John Webster, Porterville, Cal., drawknife techniques, while David Furey, Riverside, Cal., shapes a leg for his three-legged stool.

completing specific projects, rather than just showing disparate techniques.

The on-campus accommodations provided quite palatable, all-you-can-eat meals and a room. While not exactly the Hilton, the rooms were conveniently near classes and the "quad," where instructors and participants shared pizzas, songs and conversations at the end of the long days.

For info, contact SCWC, 3825 W. 139th St., Hawthorne, Cal. 90250; (213) 679-2485.

—Charley Robinson

Confessions of a pack rat

I'm a pack rat. I save everything. There, I've said it. Once you admit it, you're halfway to being cured. But I'm going to take it a day at a time. Today I'm going to start not saving anything. I'm not going to add that little piece of wood under the workbench to my enormous bin of clamp pads; that small chunk of exotic wood will not go into the box labeled "stock for wooden jewelry"—I've never made any wooden jewelry anyway. And I certainly don't need any more bits of veneer to repair joints I've cut badly, and I don't need any plywood scraps for backing boards on the drill press. Today I will not save the sawdust from under the jointer, the tablesaw and the bandsaw, mix it with crank-case oil and make coarse, medium and fine sweeping compound.

Temptation is everywhere, especially under the bandsaw where you can find fantastically shaped cutoffs that are often more interesting than the part you made. One thing I don't save anymore is bench-plane shavings—those beautiful, multicolor, multitexture curls of wood that have to be useful for something. I tried some as decorative mulch in the garden, and it looked great. But the next morning, I discovered that the evening winds had redistributed that beautiful mulch all over the neighborhood.

To rid yourself of a bad habit, it is best to have a specific goal. My goal is to have room

for two people in my workshop at the same time. When people want to tour my workshop, they have to go in one at a time, while from the doorway I yell directions and point out things of interest.

Even though my accumulation of stuff ends up in the workshop, it doesn't always start there. My sources are many and varied, and nothing is safe from the grab. I have coffee cans stacked so high that every so often, for no apparent reason, they tumble down and create a terrible cacophony. However, I've learned to put the full cans at the bottom of the pile. One such can holds my "special" hinges—special in that no two match. When I find a use for them, I'm going to write an article about "things to make that need only one hinge."

Another container labeled "possible feet for little boxes" is full of various-size plastic bottle caps, caps from toothpaste tubes, wooden thread spools and old V-belts. Speaking of thread spools, they're very versatile. Run a bolt through the center and you have a drawer/door pull for a utility project, or slip one over a drill bit and you have a depth stop. Thread spools glued end to end become a file handle or a holder for pencils, drill bits, small files, etc.

Carpet scraps are another versatile item. They can be used on top of sawhorses or on the workbench as project protectors, polishing pads, paint or finish daubers, and holders for small parts while sanding. While that's all well and good, I have enough scraps to recarpet my whole house.

Some functions are served by a variety of different objects. For glue spreaders, I have saved broken hacksaw and bandsaw blades, Popsicle sticks, expired credit cards and plastic handles for foam brushes, not to mention the traditional artist's palette knife and mini paint roller. My many pointed tools, needle files, drill bits, pencils and small cleaning brushes are far overshadowed by the holding devices I have for them: old distributor caps, glued-together cubes of corrugated cardboard, chunks of Styrofoam, cigar tubes and hardware cloth rolled into a cylinder. I needn't look far before I find a container for mixing glue with sawdust or for making up a batch of glue or epoxy: bubbled packing plastic, spray-can caps and screw-top lids work great, although I frequently use the bottom of an empty soft-drink can.

If you think that everything possible has been covered, you don't know the extent of my affliction. I use broken bandsaw blades in a coping saw or scroll saw, or I bond them together into a rasp; plastic jugs serve as various-size funnels or a portable-drill holster; lengths of garden hose protect handsaw teeth; spray-can nozzles replace ones that get clogged; Popsicle sticks are mini sanding blocks; old inner tubes are clamping bands. And there are the usual things everyone has: nuts, bolts, screws,

nails, other hardware, wood, tools, etc.

Today as I relinquish my status as a world-class pack rat, not only will I not save anything, I will take some positive action. I'll retract my standing request from older friends for empty pill bottles, and from golfing friends for old golf balls to put in varnish to expel the air from the can. Out with the trash go those old lawn-chair frames that I planned to make into wind chimes, those old wooden toilet seats that would have made nice oval picture frames, ...

—Dario Biagiarelli, Kirkville, Ky.



The Radi-Plane is available in two models, the maple-bodied roundover model, shown here, and a chamfering plane with a walnut body.

Product reviews

Radi-Plane, L.A. Mathers Co., 3362 E. McAllen Road, Stockton, Cal. 95205.

The Radi-Plane offers a neat, reasonably priced (about \$20) way to put a small radius on the edges of wood, especially when the project is too small to warrant setting up your router or when you have problems finding small-radius roundover router bits. You could, of course, sand the proper radius, but I've always found that job tedious and inconsistent. The well-designed hard-maple body of the Radi-Plane is about 6 in. long with a 90°-angle brass sole and two concave-shape cutters, which are set individually so that the front cutter makes about 80% of the cut and the back cutter provides a clean finish cut. Blade adjustments are made by turning set-screws with an Allen wrench. Depth adjustment is a bit awkward at first because the adjustment screws turn counterclockwise to lower the cutter, which is opposite what you might expect. However, the lateral adjustment screws work well and as expected. The instruction sheet provides good drawings and a clear explanation of how to set up and use the plane; unfortunately, it provides no guidance for disassembly and sharpening.

I avoid a deep starting cut at the end of a board by placing the plane about 2 in. from the end and planing back toward the end. To help reduce tearout, change the direction you are working so that you plane with the grain. Also, tilting the plane slightly to one

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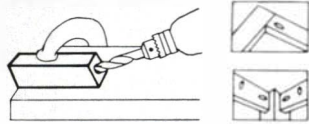
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Rudolph Bass	6	Frog Tool	33	Lignomat	30	Tarheel Filing Co.	20
Berea Hardwoods	30	Furnima	23	Lobo Power Tools	23	The Taunton Press	34, 35, 92
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Calculated Industries	33	Gulf Central Tool	22	Mason & Sullivan	36	Vega	97
Carver Tripp	11	HTC Products	31	McFeely Hardwoods	93	Steve Wall Lumber	103
Cascade Tool	29	Haney Industries	5	Midwest Dowel Works	29	Wedge Innovations	17
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Maurice L. Condon	101	Highland Hardware	109	Nyle Corp.	94	Williams & Hussey	16
Constantine	10	Home Lumber	6	Parks Repair Parts	5	Walter A. Wood Supply	103
Counselor Profiles	30	Horton Brasses	15	Paxton Hardware	93	Wood-Mizer	101
Craft Supplies USA	31	Hydrocote	36	Penn State Industries	18	Woodcraft Supply	15
Day Studio	97	Imported European		Performax Products	28	Woodstock Intl.	31
Delmhorst	10	Hardware	93	Powermatic	111	The Woodworking Shows	101
Delta	9	Incra Jig	27	Rio Grande Univ.	15	Workbench Tool	10

side effectively reduces the depth of cut and helps control tearout. A second pass completes the cut. If you still have problems, reduce the depth of cut by readjusting the cutters. To produce uniform results on thin flexible material, slightly bow the stock so the plane can ride on the convex side.

Although the plane feels comfortable, there are no finger holds and large jobs can make your hands sore. Once you get the feel of the plane, however, it produces good results, even if your fingers do get tired. Radi-Plane is available from numerous mail-order sources, including Trendlines, 375 Beacham St., Chelsea, Mass. 02150, and Leichtung Work Shops, 4944 Commerce Parkway, Cleveland, Ohio 44128.

—Mike Coldiron

The Woodworkers Club of Austin, Tex.



A plate-glass bottom on the Donnell sanding plane provides a flat surface for fine finish-sanding.

The Donnell Sanding Plane, Ken Donnell, 672 Norlene, Grass Valley, Cal. 95949.

A sanding plane is convenient for sanding pieces smooth and flat. At the heart of the Donnell sanding plane is a dependably flat backing surface: a piece of 1/4-in.-thick plate glass with eased edges. The 2 3/4-in. by 13 1/2-in. glass is glued to the underside of a piece of 3/4-in. medium-density fiberboard (MDF). Two spring-steel clips that secure the sandpaper at either end and a comfortable hardwood handle are attached to the top of the MDF.

Donnell, who designs and manufactures tools and other products for instrument-makers, has a background as a stringed-instrument designer, maker and repairman. He originally designed the sanding plane for leveling the metal frets on the neck of a guitar or other fretted instrument. However, this well-made tool is great for all sorts of finish-sanding jobs or for any situation where a perfectly flat, smooth finish is desired. The extra weight and flatness of the glass make the Donnell sanding plane a pleasure to use. The clips make changing paper fast and convenient (easier than changing paper on some electric palm sanders), and they hold the paper in place, even during hard-pressure sanding with rough paper. Donnell's sanding plane is available for \$35 from Woodworker's Supply of New Mexico (in its catalog as a glass plane), 5604 Alameda Place N.E., Albuquerque, N.M. 87113. —Sandor Nagyszalanczy

Jiggit Bandsaw Dovetail Jig, Jiggit Co., Box 1687, Plattsburgh, N.Y. 12901.

The Jiggit Bandsaw Dovetail Jig, made of 1/4-in. PVC plastic, clamps to a bandsaw table and facilitates cutting through dovetails by holding the work at the flare angle of the pins. The fixture's base is about 10 in. by 12 in. with an overhanging table surface that looks just like a gable roof with a 2-in-12 pitch. In dovetail terms, that translates to a 1-to-6 pitch for the angle of the tails. A notch that runs in about 6 in. from one end of the fixture's peak allows the "rooftop" table surface to straddle the sawblade. Thus, a workpiece is presented to the blade on the sloping left side of the table so that one side of each pin is cut, and then it's presented on the right side of the table so that the pins' other sides are cut. The waste between pins is removed by making multiple cuts at both angles, and the length of the pins is controlled by setting the fixture's stop block behind the blade. To get the best fit, you should trim to the finished depth with a sharp chisel held vertically or you should slightly undercut to the center of the board. This allows the faces of the boards to butt together tightly. After the pins have been cut in this way, the pin stock is used to lay out the tails on the mating piece. The fixture is removed before bandsawing the waste from between the tails. Again, clean up the cuts with a sharp chisel, undercutting slightly for a tight fit.

After cutting dovetails for some small boxes, I found that using this fixture had several advantages over my usual method. I ordinarily cut the angled pin sides by hand with a dovetail saw and then remove the waste between them by making multiple cuts on the bandsaw with the table set at 90° to the blade. This must be done with the inside of the workpiece (the wide side of the pins) up so you don't saw into the flared sides of the pins accidentally. This usually results in some tearing out beyond the ends of the sawcuts, even when the stop line has been scribed. With the Jiggit, the work proceeds faster because the pins are sawn and the waste is removed in a single operation, and the finished product is superior because the cutting is done with the outside of the workpiece up, which means tearout occurs on the inside surface of the joints being cut. This reduces clean-up time significantly in a limited production situation.

I think this bandsaw fixture has definite advantages for the woodworker who wants to cut dovetails, but who hasn't the confidence to cut them completely by hand. It can also be a time-saver for the craftsman who wants a streamlined method for achieving a hand-cut look in a limited production run. The Jiggit Bandsaw Dovetail Jig is available for \$49.95 from Trendlines, 375 Beacham St., Chelsea, Mass. 02150, or from the Jiggit Co. at the address given above.

—David Ray Pine, Mt. Crawford, Va.



Taming of the skew is accomplished with Stabilax, an attachment that provides easier and safer results with this difficult-to-use tool.

Stabilax, Beech Street Toolworks, 440 Beech St., Los Angeles, Cal. 90065.

The Stabilax, made from cold-rolled-steel bar stock with a black oxide finish, works like training wheels for your skew. When locked onto your skew turning chisel with a 3/8-24 Allen-drive setscrew, the Stabilax attachment gives improved support to the tool, thereby making it easier to handle and reducing catches. It's available for 1-in.- and 1 1/2-in.-wide skews, but the Stabilax can also be clamped to a scraper that's used at an angle. The smaller unit, 1 1/8 in. dia. by 2 3/4 in. long, has a 1/4-in. slot and weighs about 7 oz., while the larger model, 1 1/2 in. dia. by 3 1/2 in. long, has a 2 5/8-in.-wide slot and weighs approximately 16 oz.

I found the Stabilax worked very well. Because the large round contact surface centers the downward force, the action is very smooth, which makes it easy to roll beads. The manufacturer's claim that the Stabilax's additional weight helps reduce vibration is true, but it seemed too heavy at times. With more use, the extra weight would probably go without notice.

I always worry when my students use skew chisels because of the inevitable dig ins and spoiled projects, but the safety benefits of the Stabilax are real. The consensus of the dozen high-school wood-working students that tested the Stabilax was that it reduced vibration and catches; however, it is necessary to readjust the tool rest a little farther from the work than normal. While the machine work on this tool is well done, I felt that \$28.45 (including delivery) was a bit high. But perhaps that is the mark of inflation.

—Jerry Blanchard, Carmel, Cal.

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'd like to hear about them. How about writing to us? And, if possible, send photos (preferably with negatives) to Notes and Comment, Fine Woodworking, Box 5506, Newtown, Conn. 06470-5506.

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PEOPLE WITH PLACES FOR THINGS

Do you know these people? They were living fictitiously in Milwaukee, Wisc., in 1963—in the then-childhood eyes of creator Gayle Marie Weitz, who is with her friends in the group photo. Drawing on her recollections of a second-grade social-studies project of stereotypical persona, Weitz's life-size wooden cabinets portray people she had to interview: a businessman, housewife, baby, teenage boy and girl, grandparents and waitress. Not only does each character look as you might expect, but each opens in an appropriate spot to reveal pictorial expressions of thoughts and dreams, as shown below in the housewife's coupons, the teenage boy's comics and the waitress' dreams of Marilyn Monroe and Hollywood.



Photos: Jess Smith

